

ECONOMIC ASSESSMENT OF OIL & GAS TAX POLICY IN OKLAHOMA

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I. Executive Summary

Oklahoma's oil and gas industry is currently undergoing transformative change as it transitions toward new technology-driven long-run growth opportunities. State tax policy will undoubtedly shape this growth going forward. As an aid to policymakers, this report examines the economic implications of renewed growth in Oklahoma's oil and gas industry and evaluates five specific questions concerning oil and gas tax policy:

1) **What is the economic role of Oklahoma's tax policy on the oil and gas industry?**

Five major economic objectives underlie the state's current mix of oil and gas tax policy provisions. To:

- 1) Develop the oil and gas cluster as a key part of the state's economic development framework
- 2) Encourage increased production of state crude oil and natural gas
- 3) Dampen the effect of fluctuating energy prices on the industry and state economy
- 4) Aid the industry in its shift toward unconventional hydrocarbon production
- 5) Maintain Oklahoma's competitive posture relative to other drilling-active states

The economic characteristics of Oklahoma's oil and gas sector make it an excellent candidate for long-term economic development-driven tax incentives. Oil and gas executives and managers recently named Oklahoma as the best spot for oil and gas investment worldwide in the Fraser Institute's 2012 global study of oil and gas markets.

2) **What is the economic basis for tax policy that encourages oil and gas drilling activity?**

Drilling is increasingly a focal point of oil and gas tax policy because of the increased number of economically viable drilling opportunities now available.

- Oil and gas firms drilled 3,050 wells in Oklahoma in 2012, nearly double the level from a decade ago.
- Across all well types, the average cost to drill and complete a well in Oklahoma is estimated at \$3.85 million. A horizontal hydraulically fractured well cost an estimated \$4.15 million.
- The oil and gas industry is the largest single source of capital spending in Oklahoma, by a substantial margin, with drilling expenditures totaling \$11.7 billion in 2012.
- Drilling costs now equal the inflation-adjusted level from 1981 near the height of the Oil Boom.
- State oil production has nearly doubled since early 2010 to an annual rate of 120 million barrels. Natural gas output is up nearly 50% to 2.2 trillion cubic feet annually.

A dramatic surge in drilling expenditures underlies the rebound in state oil and gas production. This is why Oklahoma tax policy cannot simply view the ongoing transition from conventional to unconventional drilling as a one-for-one swap in wells. It is more like a four-for-one swap based on current spending patterns and production rates.

3) **What are the economic costs and benefits of providing severance tax relief to the industry?**

The state currently offers nine tax incentives that provide reduced severance taxes on production from both conventional and unconventional wells.

- In the ten year period FY2004 to FY2013, the state's oil and gas producers made total gross severance tax payments before incentives of \$9.81 billion, or nearly \$1 billion annually.
- Through incentives, producers were refunded a total of \$1.11 billion in prior payments.

- Net severance tax payments, after refunds, the past decade totaled \$8.69 billion, or \$869 million annually.
- A number of competing states offer exemptions from severance taxes for drilling modern unconventional wells, primarily horizontal wells and wells in tight formations. The two largest and most significant exemptions are offered by Texas and Louisiana, Oklahoma's nearest neighbors and strongest competitors for both drilling activity and white-collar oil and gas employment.

By raising severance taxes, policymakers can expect to trigger a series of incremental negative economic outcomes within the industry and state economy, many of which may be unintended. In Oklahoma, most of the effects of higher severance taxes will be borne almost entirely by producers, royalty owners, and refiners in the state. A portion of the increased tax is borne by employees, suppliers, and offsetting losses in other state tax revenues.

4) **To what degree is the state economy tied to the economic health of the industry?**

The state is now as sensitive to the energy sector as it was in 1982 as measured by the share of total earnings statewide (13.5%) derived from the industry.

- Wage and salary jobs in the industry have doubled to more than 57,500 the past decade. Average compensation per worker reached nearly \$110,000 in 2012.
- Although comprising only 3.2% of firms statewide, the oil and gas industry hires 5% of the state's wage and salary workers and pays 7.2% of all employee compensation in the state.
- Relative to the non-energy sectors of the economy the past decade, oil and gas business formation was four times higher, employment growth was twenty times faster, and industry output expanded four times as much.
- The oil and gas industry is the largest single source of tax revenue in the state, paying total direct state taxes of \$1.96 billion in 2012, or more than 22% of all state taxes.
- Severance taxes also served as the key source of deposits to the state's Rainy Day Fund and provided much needed budget stabilization in recent recessions.

The industry continues to make an outsized contribution in terms of both economic activity and tax payments. Oklahoma's oil and gas firms face a relative tax burden that is four times greater than the average business in the state on a per worker basis.

5) **What are the broader economic benefits to the state of tax policy that encourages growth in the oil and gas industry?**

Oil and gas is the most important contributor to economic growth in Oklahoma the past decade and is having visible economic spillover effects across the state economy.

- State per capita income reached 96% of the U.S. average in 2013, up from 85% a decade ago.
- Migration into the state surged beginning in 2006 as state population growth moved above 1% annually for the first time since the early 1980s.
- Oklahoma is home to the second largest concentration of oil and gas industry activity in the nation. Other than Texas, Oklahoma has the highest number of oil and gas wage and salary workers and proprietors and highest total earnings from the industry.
- The oil and gas industry is creating a large number of both high-skill and middle-skill jobs.
- Recent estimates suggest that Oklahoma oil and gas firms made \$22.1 billion in purchases in 2011, of which \$10.2 billion was spent in Oklahoma.

Renewed growth in Oklahoma's oil and gas industry has greatly enhanced the strength and competitiveness of the state economy.

II. Introduction – Industry Growth and Tax Policy

The ongoing transformation of Oklahoma’s oil and gas industry has important implications for policymakers and the state economy.

Oklahoma is at the epicenter of what began as a natural gas boom a decade ago and has since become a dynamic revival of the broader oil and gas industry and its supply chain. The industry has roughly doubled in size the past decade and presents tremendous future growth potential for the Oklahoma economy. Some of the key economic spillover benefits from the industry’s growth include accelerated state job growth, income gains relative to the nation, and strong migration into the state.

Tax policy will undoubtedly influence growth in the industry going forward. The task of forming tax policy in a top-tier energy-producing state has always been a complex matter. Oklahoma’s overall economic cycle remains tied to the energy sector and effective tax policy must recognize the closely intertwined nature of the industry and the broader economy. In fact, the state currently derives 13.5% of total earnings statewide from the oil and gas industry, the same approximate share as in the late 1970s and early 1980s.

The new growth environment has also brought along with it new challenges for the industry and policymakers. There is now fierce competition underway nationally and globally to attract expanding oil and gas investment. The recent upward shift in energy prices set off a massive scramble to scale up activity and position assets for the intermediate to long-term. Competing states recognize the opportunity and are aggressively using tax policy to retain and attract this activity.

The industry’s new competitive framework similarly presents additional financial and operational challenges to the state’s oil and gas firms. The industry is now more capital-intensive than ever and remains highly susceptible to commodity price fluctuations and macro-economic risk.

For policymakers, the changing environment for oil and gas makes balancing the need for revenue with the desire to foster growth in the state’s trademark industry more challenging than ever. The oil and gas industry remains the largest single source of state tax revenue, and important shifts have taken place in the types and amounts of taxes paid by the industry. The channels of economic influence on the state economy have also changed as ownership and investment in the industry are now equally important as employment and wages as a source of economic stimulus.

As an aid to policymakers, this report examines the economic implications of renewed growth in Oklahoma’s oil and gas industry and evaluates five specific questions concerning oil and gas tax policy:

- 1) What is the economic role of Oklahoma’s tax policy on the oil and gas industry?
- 2) What is the economic basis for tax policy that encourages oil and gas drilling activity?
- 3) What are the economic costs and benefits of providing financial incentives to the industry?
- 4) To what degree is the state economy tied to the economic health of the industry?
- 5) What are the broader economic benefits to the state of tax policy that encourages growth in the oil and gas industry?

Understanding these issues is vital to forming effective and predictable tax policy in the current environment. As home to the nation’s second largest concentration of oil and gas business activity behind only Texas, tax policy set in Oklahoma will influence the industry within the state’s borders and beyond.

III. What is the economic role of Oklahoma's tax policy on the oil and gas industry?

Several clear economic objectives underlie the state's current mix of oil and gas tax policy provisions. These include encouraging long-run growth in the industry, expanding the production of crude oil and natural gas in the state, and dampening the effect of oil and gas price volatility on the industry and state economy. More recently, drilling-based tax provisions have aided the industry in its ongoing transition to unconventional methods of oil and gas production. All of these efforts work more broadly to help Oklahoma maintain its competitive posture relative to other states as competition for oil and gas activity intensifies.

Major goals of Oklahoma's oil and gas tax policy

1. Encourage growth and development of the state's oil and gas cluster

Fostering growth in the state's trademark industry has long been a key objective of Oklahoma oil and gas tax policy. This objective was recently adopted as a formal component of the state's overall economic development strategy.¹

The state now focuses its efforts on the energy sector and four other targeted economic *ecosystems* - aerospace and defense, agriculture and biosciences, information and financial services, and transportation and distribution. These industries are believed to offer the greatest growth and wealth generating potential among those industry sectors that have a high concentration in Oklahoma.

Research findings suggest that the state's strategy of focusing on key growth industries and clusters can provide significant economic payoffs to a region. A recent comprehensive study of the payoff to regional specialization by Michael Porter's Harvard-based Institute for Strategy and Competitiveness illustrates the broad range of potential gains from fostering growth in key clusters.²

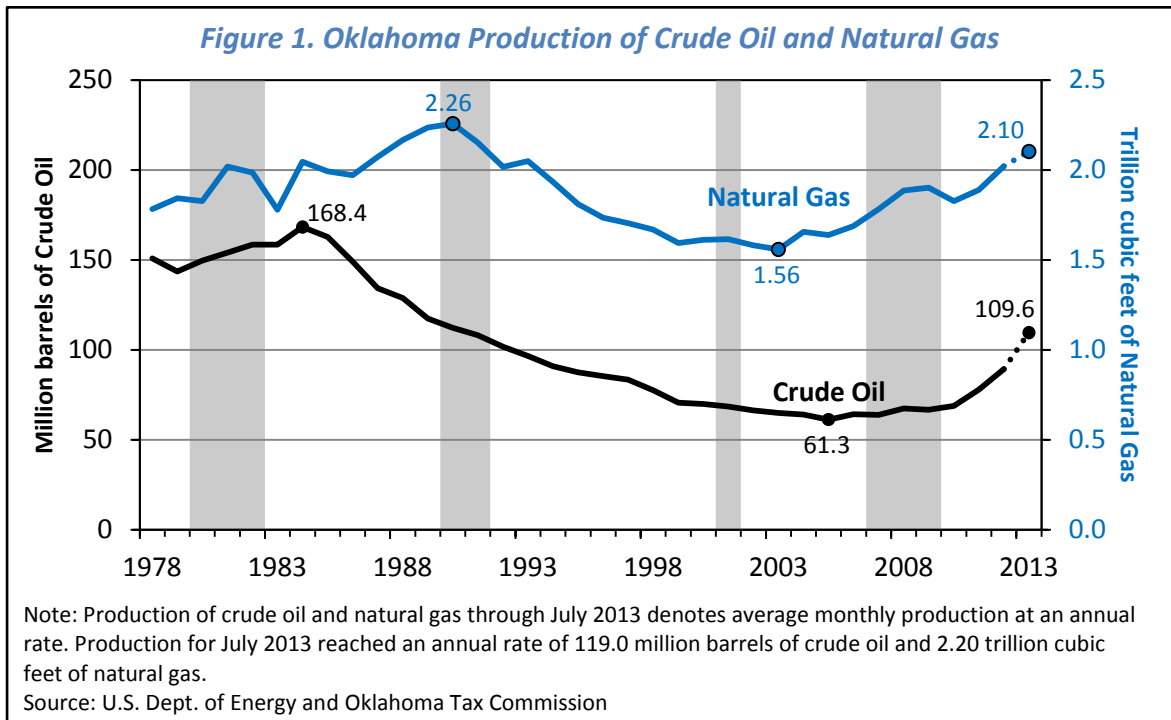
"We find... significant evidence for cluster-driven agglomeration. Industries participating in a strong cluster register higher employment growth as well as higher growth of wages, number of establishments, and patenting. Industry and cluster level growth also increases with the strength of related clusters in the region and with the strength of similar clusters in adjacent regions. Importantly, we find evidence that new regional industries emerge where there is a strong cluster environment. Our analysis also suggests that the presence of strong clusters in a region enhances growth opportunities in other industries and clusters. Overall, these findings highlight the important role of cluster-based agglomeration in regional economic performance."

Oklahoma's oil and gas sector has long lived up to its billing as a growth engine in both the short- and long-run.

2. Encourage increased production of crude oil and natural gas

Much of the tax policy currently in place was designed for the challenges presented by declining production levels and the potential long-run decline of the industry. State oil production declined every year between 1984 and 2005, falling by nearly two-thirds from 168 million barrels to only 61 million barrels. Natural gas production similarly peaked in 1990 at 2.26 trillion cubic feet (tcf) before declining by one-third to its most recent bottom at 1.56 tcf in 2003.

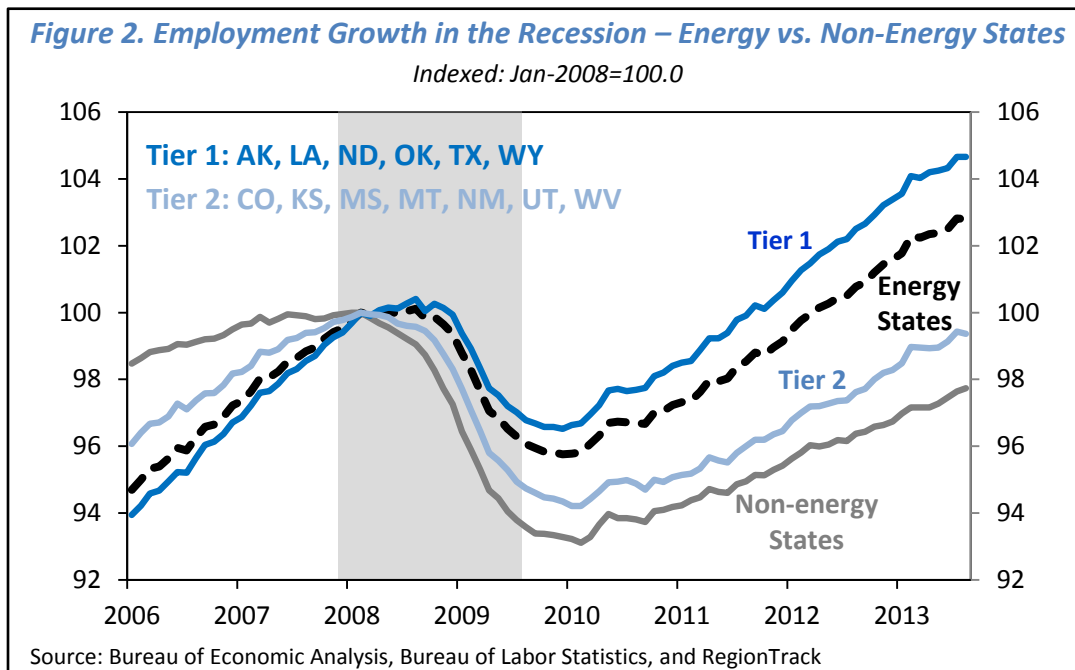
Strong growth in the industry since 2002 and a sharp rebound in production of both crude oil and natural gas have since reversed this view of the industry (see Figure 1). Recent estimates (as of July 2013) place current state crude production at an annual rate of approximately 119 million barrels, a near doubling of production since early 2010. Similarly, natural gas output is up by about 40 percent since 2003 to an annualized rate of 2.2 tcf.



The state is fully participating in the ongoing revival of the industry and faring well against competing producing regions. In fact, Oklahoma is the only major energy-producing state to experience a sharp rebound in both crude oil and natural gas production in recent years.

3. **Dampen the effect of fluctuating energy prices on the industry and state economy**

Tax policy in an energy state must recognize the highly intertwined nature of the industry and the state economy. This is especially true in Oklahoma and the other top-tier energy states (see Figure 2). These states have a much different economic cycle than non-energy producing states and often move countercyclical relative to the national economy.



The unique economic cycle in the energy states is usually most visible during recessions. This behavior was especially evident during the most recent recession and recovery as the major energy-producing states consistently ranked among the top performers. The top-tier energy states entered the recession later, had much smaller downturns, and exited the recession at a faster pace than the group of non-energy states.³ Oklahoma remains a Tier 1 energy state and was similarly cushioned by offsetting strength in the energy industry during the recession.

4. **Aid the industry in its shift toward unconventional hydrocarbon production**

More recently, state tax policy has aided the industry in its ongoing transition to unconventional methods of hydrocarbon production and the integration of new drilling technologies. The sharp rebound in state oil and gas output in recent years is traced almost fully to the introduction of modern seismic imaging technology, advances in horizontal and directional drilling, and new unconventional production techniques in shale and tight formations, including hydraulic fracturing. Along with opening new fields, these techniques have revitalized many of Oklahoma's legacy fields that were long ago written off as economically marginal.

Tax policy plays a further role in encouraging the ongoing development of best practices in exploration and drilling. **Despite the widespread use of horizontal drilling and fracturing, the application of these techniques remains far from standard.** There tends to be a steep learning curve within each play that requires extensive experimentation to find and adapt best practices. Well quality is still improving as producers experiment with multi-well pads, horizontal lengths, and frac size. Well production results similarly vary greatly across producers within a given basin.⁴ And while technological advances have reduced the traditional risk of drilling a dry hole, firms now face the potentially greater risk of drilling un-economic wells. Incentives can be especially important to small producers who face these same risks yet may be at a significant cost of capital or technological disadvantage.

Future industry advances are also likely in the areas of water use, reclamation, and disposal; energy efficiency and emission reduction in production; multi-well pad drilling; and alternative fracturing techniques. These and other future advances and industry best practices will almost certainly be intertwined with future state tax policy.

5. **Maintain Oklahoma's competitive posture relative to other drilling-active states**

The historical attractiveness of Oklahoma to oil and gas producers is a combination of good geology; supportive regulatory climate; competitive tax structure; flexible legal environment; developed markets for equipment, supplies, and labor; and other factors. Recognizing the state's attractive operating climate, **oil and gas executives and managers recently named Oklahoma as the best spot for oil and gas investment worldwide in the Fraser Institute's 2012 global study of oil and gas markets.**⁵ The state has consistently ranked among the top ten in recent years.

However, Oklahoma is not alone in offering an attractive operating environment. The neighboring states of Texas, New Mexico, and Kansas are also ranked among the top areas worldwide for oil and gas investment in the Fraser survey. In the U.S., the explosive growth of the industry has spread well beyond the borders of the traditional Oil Patch. Several emerging states are vying for a greater share of industry activity including North Dakota, Mississippi, Pennsylvania, and Arkansas. Many domestic producers, including Oklahoma-based Devon Energy, have sold substantial international and offshore assets in order to focus their activities in these growing domestic markets.⁶ Financial incentives are being offered by several states to attract this expansion of corporate facilities and drilling activity. Capital investment from overseas is also entering these markets as international firms seek to gain a foothold in unconventional fields. Opportunities abound outside the U.S. as well. International markets with similar rankings for oil and gas investment include nearby Manitoba and Saskatchewan in Canada. The stakes are high and competition to capture this industry growth has intensified considerably.

IV. Why should Oklahoma tax policy encourage oil and gas drilling activity?

Drilling is increasingly a focal point of oil and gas tax policy because of the increased number of economically viable drilling opportunities now available. A large number of newly discovered and existing formations are under active development using unconventional drilling and stimulation techniques. More importantly, from an economic point of view, the process of drilling a well with these new techniques is now considerably more capital intensive and a much more significant economic event. The increased economic weight carried by drilling suggests added potential opportunity to influence overall state economic activity through tax policy.

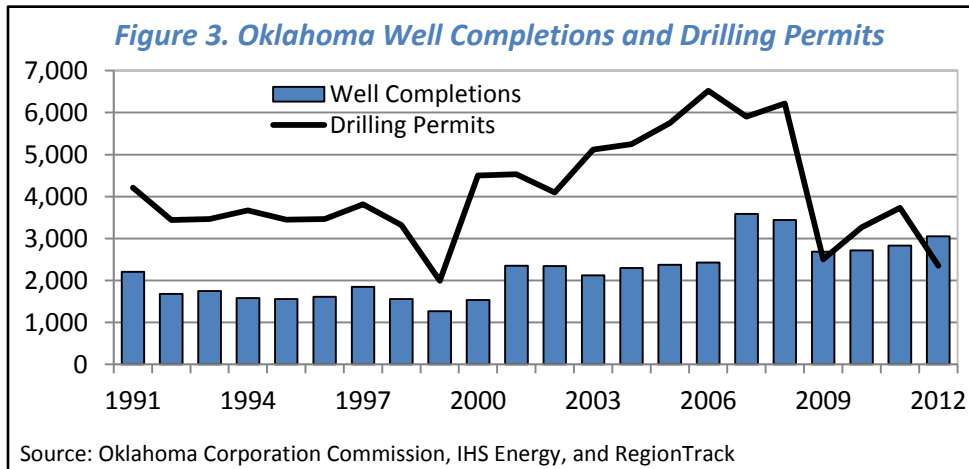
Drilling triggers a long-lived stream of economic activity

The decision to drill for crude oil and natural gas triggers a large and long-lived stream of economic impacts within the state. Upfront lease payments and other forms of compensation are provided to landowners and mineral right owners to conduct geological and geophysical activity and reserve the right to drill. Significant capital spending is then incurred for drilling and completing a well. Infrastructure needs include roads, electricity, water delivery, fencing, and other site preparations. When a well is brought online it begins a multi-year stream of production that generates revenue for firms and operators, payments to royalty owners, and tax revenue to state and local governments. Related activities include chemical refining and processing, pipeline and truck transportation, and storage. Wells must also be monitored and serviced on a continual basis by local servicing firms. Manufactured goods produced within the state support the entire process from initial drilling to final shut-in. This activity also requires the ongoing use of significant legal, financial, and engineering services. Drilling is the single activity that starts the whole process rolling. Longer-term, drilling adds to reserves and makes increased future production possible.

More wells at an increasingly higher cost

The increased scale of drilling activity in Oklahoma in recent years is not well understood. More rigs are currently drilling in Oklahoma (176 rigs) than all states but Texas (821 rigs), with North Dakota (163 rigs) a close third.⁷ No other state has half the amount of rigs deployed in Oklahoma.

Well completions in Oklahoma have nearly doubled from the lull between 1991 and 2000 when only about 1,600 wells were drilled annually (see Figure 3). Since 2001, the point when natural gas prices first spiked, drillers completed between 2,200 and 3,500 wells annually, an average pace of 2,600 wells per year.⁸ Completions accelerated again in 2007 as crude prices spiked and have since averaged slightly more than 3,000 annually. An estimated 3,050 wells were completed in 2012 based on the most recent data available.



Most wells completed in Oklahoma are now drilled horizontally and hydraulically fractured. Only roughly ten percent of active rigs are currently drilling traditional vertical wells in the state, and the percentage continues to decline. About one dozen rigs are reportedly drilling horizontally or directionally for deep oil below 15,000 feet in Oklahoma, but no active rigs are drilling for deep gas. Nearly all of the remaining rigs are drilling horizontal or directional wells less than 15,000 feet deep.⁹

Drilling costs across Oklahoma formations

Across all well types, the average cost to drill and complete a well in Oklahoma in 2012 is estimated at \$3.85 million.¹⁰ Although drilling efficiencies are slowly lowering per-well costs for horizontally drilled wells in most active plays, the average well cost could rise significantly in future years as more challenging formations in the state are developed.

Drilling costs in Oklahoma vary considerably by well type and formation, from \$500,000 for a shallow vertical well to \$15 million for a deep horizontal well. The average cost to drill and complete a modern hydraulically fractured horizontal well in Oklahoma in 2012 is estimated at \$4.15 million. The cost of most horizontal wells lies within a range of \$2.5 million to \$10 million depending upon well depth, number of laterals, lateral lengths, number of fracturing stages, and other characteristics of the basin in question. Deep wells drilled below 15,000 feet become increasingly costly to drill as depth increases and can easily double or triple the cost relative to a shallower well.¹¹

Recent reports of drilling costs across a range of formations in Oklahoma include \$2.7 million for wells in the Marmaton formation in the Oklahoma Panhandle; \$3 million to \$3.7 million in the Mississippi Lime formation in north central Oklahoma; \$5 million to \$9 million in the Granite Wash in western Oklahoma; and \$9.5 to \$10 million for Cana-Woodford wells in south central Oklahoma.¹² Average well costs in some Oklahoma formations are much lower than in other competing domestic formations. For comparison, current average well costs are generally reported as \$7 million to \$9 million in the Haynesville Shale formation in Louisiana; \$7 million to \$11 million in the Bakken formation in North Dakota; and \$5 million to \$7 million in the Permian Basin in Texas.¹³

How capital intensive is oil and gas drilling in Oklahoma?

The oil and gas industry is the largest single source of capital spending in Oklahoma, by a substantial margin.¹⁴ Based on an estimated 3,050 wells completed in Oklahoma in 2012 at an average cost of \$3.85 million, oil and gas drilling produced capital spending of \$11.7 billion. This is consistent with Oklahoma capturing a roughly 7-10% share of total domestic drilling investment in recent years, which has ranged from \$70 billion to \$120 billion annually since 2005.¹⁵

This is a dramatic change from the world of conventional drilling. Between 2000 and 2007, a period which mostly pre-dates the shift to horizontal drilling, the average well drilled to a depth less than 15,000 feet cost only \$1.2 million to complete.¹⁶ Average annual spending in the period based on 2,600 completions annually is \$3.12 billion, or roughly one-fourth the level of current spending.

For historical perspective, Oklahoma drillers spent \$4.62 billion, to drill and complete 11,699 wells in 1981, or \$395,000 per well.¹⁷ Adjusted for inflation, total drilling expenditures in 1981 are \$11.6 billion in current dollars. Remarkably, total current drilling expenditures in the state are roughly equal to the inflation adjusted level experienced near the peak of the drilling frenzy back in 1981.

Relative to other state industries, capital spending in manufacturing ranks a distant second.¹⁸ Recent estimates suggest that state manufacturers made capital purchases totaling \$1.58 billion in 2007 and \$1.78 billion in 2011.¹⁹

Comparisons to construction activity can help place the scale of capital spending by the oil and gas industry into perspective. While the construction industry itself engages in relatively little capital spending,

it is an outlet for capital investment for nearly every industry sector, including oil and gas, the public sector, and households. In terms of single family housing, \$11.7 billion in spending is equivalent to constructing almost 67,000 single family homes valued at \$175,000 in a single year. This amount represents several years of housing stock for Oklahoma. Fewer than 10,000 single family building permits were issued in 2012, and the state has added only about 10,000 to 15,000 total housing units annually since 2000. In terms of commercial construction, \$11.7 billion in spending would be equivalent to completing the construction of more than 15 Devon Towers annually at its original estimated cost of \$750 million (even though the building took three years to complete).

Because of the sharp rise in cost per well, the drilling and completion of an average well today is a much more significant economic event than it was as recently as 5 years ago. Increased current spending is due in part to a 50% rise in well completions, but more importantly to a net increase in capital spending per well of approximately \$3 million. This is why **Oklahoma tax policy cannot simply view the ongoing transition from conventional to unconventional drilling as a one-for-one swap in wells. It is more like a four-for-one swap based on current spending patterns.**

Drilling is producing strong production gains

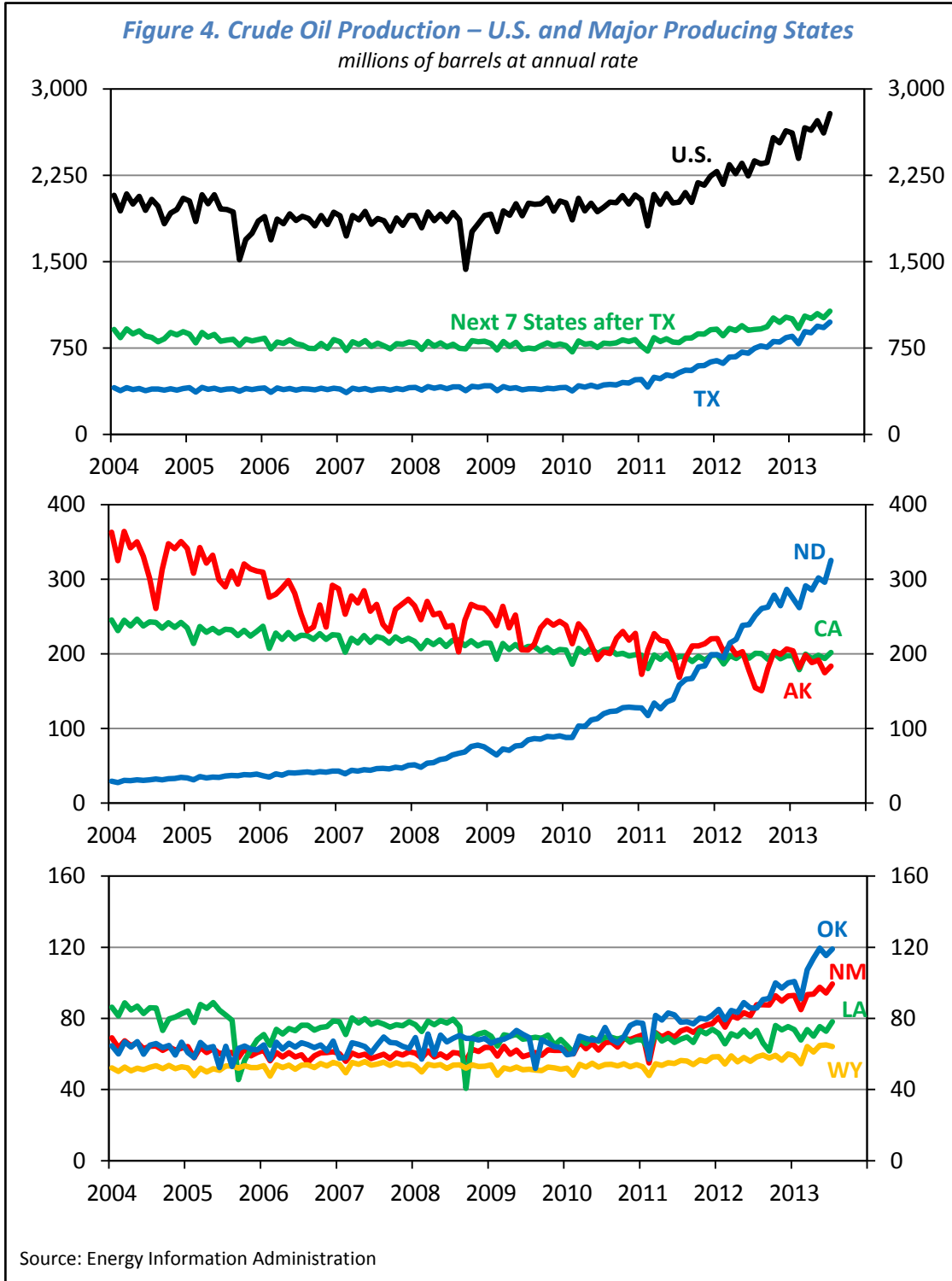
The recent surge in drilling activity has produced a dramatic turnaround in state oil and gas output. However, not all energy-producing states are enjoying the same success in reversing production declines. **Oklahoma is the only major producing state to experience large increases in both crude oil and natural gas production in recent years.** Production trends for crude oil and natural gas in the U.S. and the major producing states are shown in Figures 4 and 5.

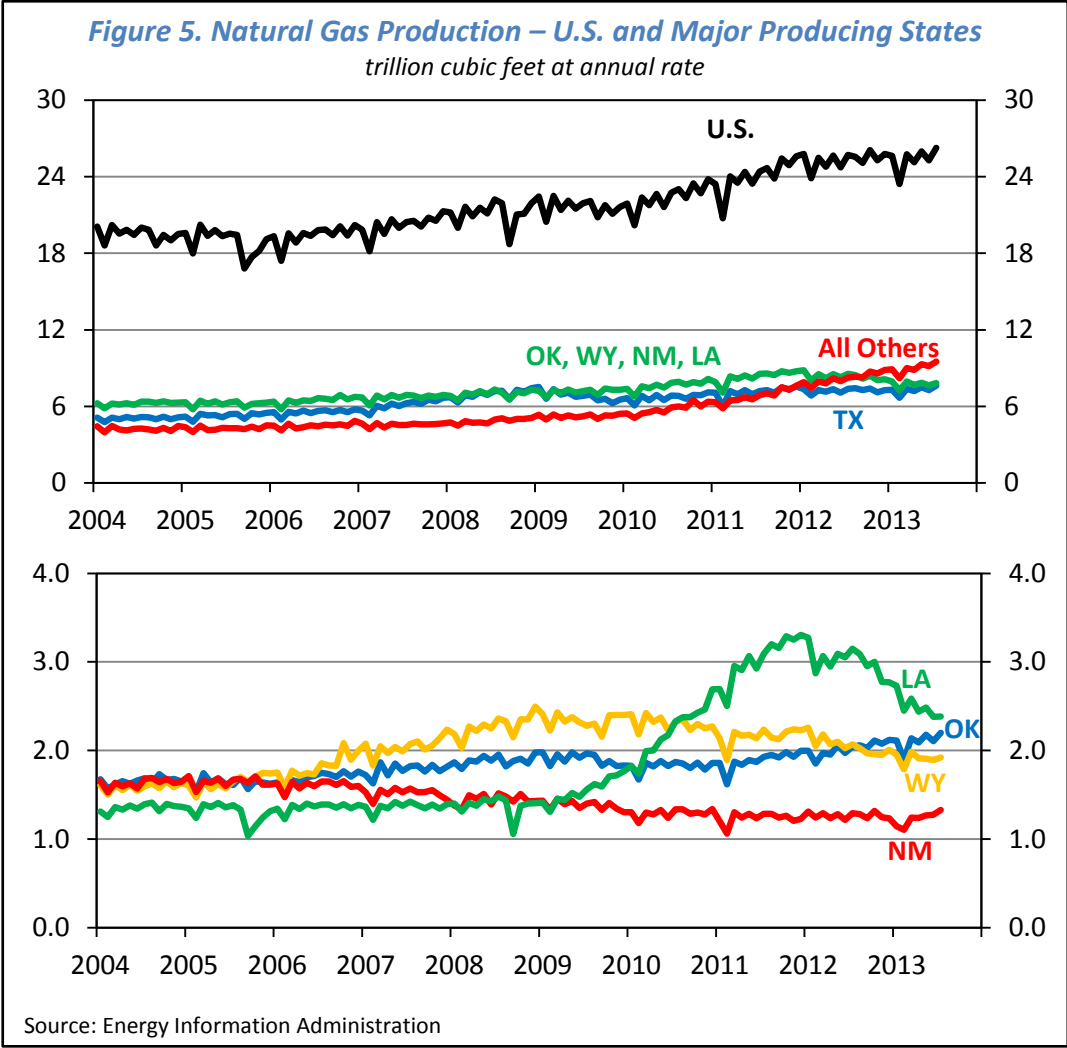
The geography underlying the nearly 3 billion barrels of oil produced in the U.S. annually is roughly 1 billion barrels from Texas; 700 million barrels combined from North Dakota, Alaska, and California; 375 million barrels combined from Oklahoma, New Mexico, Louisiana, and Wyoming; and 750 million barrels from all other states combined.

The surge in U.S. crude production since early 2010 is not evenly distributed across the major producing states. North Dakota production has more than tripled; Texas and Oklahoma have roughly doubled production; New Mexico has added 50%; and Louisiana and Wyoming have seen only modest increases. Only Alaska and California have not seen long-run declines in production reversed or ended. Oil production is off roughly 5% in California and 20% in Alaska in the short run, and off 20% and 50%, respectively, the past decade.

Natural gas production gains since early 2006 are similarly concentrated among only a few states. Oklahoma gas production is up almost 50% in the period, even after a pull-back in production in both 2009 and 2010 under low gas prices. Louisiana production has more than doubled since early 2009, but is off by more than 25% from the peak in early 2012 under weak gas prices and a slowdown in drilling in the Haynesville Shale. New Mexico has seen no clear sign of a bottom in gas production, with a more than 15% decline the past decade. Wyoming gas production peaked in late 2008 and has since declined steadily by almost 20%.

The strong gains in Oklahoma's production of both crude oil and natural gas suggest that drilling activity at its current pace can sustain or expand future state production. This will also provide continued underlying support to the state's stream of severance tax revenue going forward. A recent U.S. Department of Energy drilling productivity report indicates that the current pace of drilling in multiple major oil and gas basins across the nation is sufficient to add to future production, even after any decline in legacy well output.²⁰





V. What are the economic costs and benefits of providing incentives to the oil and gas industry?

Oklahoma has long used tax policy to encourage growth in the oil and gas sector. Incentives are currently targeted at a variety of types of drilling and production activity in Oklahoma. Severance tax revenue has surged along with drilling and production activity in recent years, and a portion of this revenue is returned to producers to promote future industry growth.

The mix and size of current oil and gas industry drilling incentives

The basic severance tax structure in Oklahoma is based a three-tier tax rate tied to the Oklahoma price of crude oil and natural gas.²¹ For crude oil, the tax rate is 7% of the value of production if the price of oil equals or exceeds \$17 per barrel; 4% if the price equals or exceeds \$14 but is less than \$17 per barrel; and falls further to 1% if the price is below \$14 per barrel. Similarly, for natural gas, the tax rate is 7% of the value of production if the price of natural gas equals or exceeds \$2.10 per thousand cubic feet (mcf); the rate falls to 4% when the price equals or exceeds \$1.75 but is less than \$2.10 per mcf; and falls further to 1% if the price is below \$1.75 per mcf. The tiered rate structure works to increase tax revenue in periods of high prices and to soften the economic impact that extremely low oil and gas prices may have on the industry and the state economy.

There are currently nine major tax incentives²² that provide additional tax relief beyond the basic tiered severance tax structure.²³ With some exceptions, these incentives are typically:

1. targeted at particular desirable well types;
2. tiered to the market price of oil and gas to provide greatest relief during periods of low prices;
3. paid as a rebate, or discount, of prior tax payments;
4. available only as a single exemption even if a given well qualifies for multiple exemptions; and
5. subject to sunset provisions (all nine major incentives are set to expire before July 1, 2015).

Five incentives are triggered only if price falls below \$30 per barrel for crude oil or below \$5.00 per mcf for natural gas. These incentives have been active for natural gas since FY2010 due to low natural gas prices but have not been active for crude oil since FY2004. They include:

1. **Reestablished production from an inactive well**
2. **Incremental production from enhanced recovery**
3. **Deep wells between 12,500 and 14,999 feet** (spud before July 1, 2009)
4. **New discovery wells**
5. **Production using 3-D seismic shoots**

Incentive(s): For these five well classifications, the severance tax rate is effectively reduced to 1% for 28 months when the Oklahoma market price (indexed to inflation) falls below \$30 per barrel for crude oil or below \$5.00 per mcf for natural gas.²⁴

Economic Objective(s): These five incentives are generally agreed to have a strong underlying economic rationale for inclusion in the state's incentive offerings and have produced relatively small total rebates to the industry in past years. They also encourage drilling and production activities that are likely to be cut back under extremely low oil and gas prices. Incentives for inactive wells and enhanced recovery seek to maximize production from existing wells. Deep well incentives recognize the rapid rise in drilling cost as well depth increases, while new discovery wells and 3-D seismic shoot incentives target the development of new resources and reserves.

Two additional incentives, economically at-risk leases and enhanced recovery projects, are not subject to market price limits. Both incentives target increased production from existing wells.

6. **Economically at-risk leases**

Incentive: Wells operated at a loss or that earn less than the cost of severance taxes are taxed at a 1% effective rate for 28 months. The exemption is available to producers regardless of the price of crude oil and natural gas.

Economic Objective: Some wells will be economically at-risk and subject to shut-in at every market price. This incentive reflects the historical stance of state policymakers toward assisting producers keep the state's economically marginal wells operating. It also reduces any influence severance taxes may have in the decision to shut-in an at-risk well.

7. **Enhanced Recovery projects**

Incentive: The incremental production from both secondary and tertiary recovery projects is fully exempt from severance taxes for working interest owners (for up to 5 years or termination for secondary projects; up to 10 years or payback for tertiary projects).

Economic Objective: Encourages efforts to increase production and extend the life of existing wells using enhanced recovery efforts.

The two well types receiving the greatest share of incentives in recent years are deep wells drilled below 15,000 feet and horizontally drilled wells.

8. **Deep wells 15,000 feet or deeper (ultra-deep)**

Incentive: Recent legislation²⁵ established a fixed severance tax rate of 4% on all production from wells below 15,000 feet. Wells with a spud date prior to July 1, 2005 are still subject to the basic price limits of \$30 per barrel for crude oil and \$5.00 per mcf for natural gas, while newer wells are taxed at 4% regardless of the market price.

Economic Objective: This places new deep oil and gas production on the same footing (a 4% rate) with the first tier of price relief in the basic severance tax structure. From an economic perspective, this encourages firms to engage in some of the most costly²⁶ and capital-intensive drilling activity in the state. It also recognizes the extremely high production rate²⁷ of deep wells versus shallow wells. Production is exempt for 48 months for wells between 15,000 and 17,499 feet, and 60 months for those 17,500 feet or deeper. This variation in the exemption length reflects the increasing rate at which both well cost and production rate rise as well depth increases.²⁸

9. **Horizontally drilled wells**

Incentive: As of July 1, 2011, the primary drilling incentive in place in Oklahoma is a 1 percent severance tax rate for 48 months for production from horizontally drilled wells. Wells producing prior to July 1, 2007 lose the exemption if well payback is achieved before 48 months. The new tax rate is not subject to market price caps.

Economic Objective: The incentive encourages firms to engage in drilling modern unconventional wells in Oklahoma. Other producing states are aggressively competing for this activity, with several states (most importantly Texas and Louisiana) offering similar drilling and production incentives for unconventional wells. These wells are known to have much greater initial production rates and much faster decline rates than conventional wells. From an economic point of view, this pulls revenue and economic activity into the early years of a well's life rather than produce a much slower stream of economic activity spread across 20 to 40 years, or more. Most new wells are expected to accelerate much of their lifetime economic impact into the first 5 years, and nearly all of it within 15 years.²⁹ Horizontal wells also come at much greater capital cost and with greater

future commodity price and financial risk than conventional wells. Incentives for unconventional wells further reflect the increasing costs of developing and adopting best practices in water and electricity use and other resource management techniques.

Are incentives a significant portion of severance tax collections?

The economic significance of recent state oil and gas incentive rebates can only be evaluated when placed in context with total gross payments made by the industry in the same period. Figure 6 summarizes total payments and refunds between FY2004 and FY2013. The period coincides with surging severance tax revenue driven by elevated oil prices, rising drilling activity, and a sharp increase in statewide production of both crude oil and natural gas.

Figure 6. Oklahoma Severance Tax Revenue and Refunds
millions of dollars

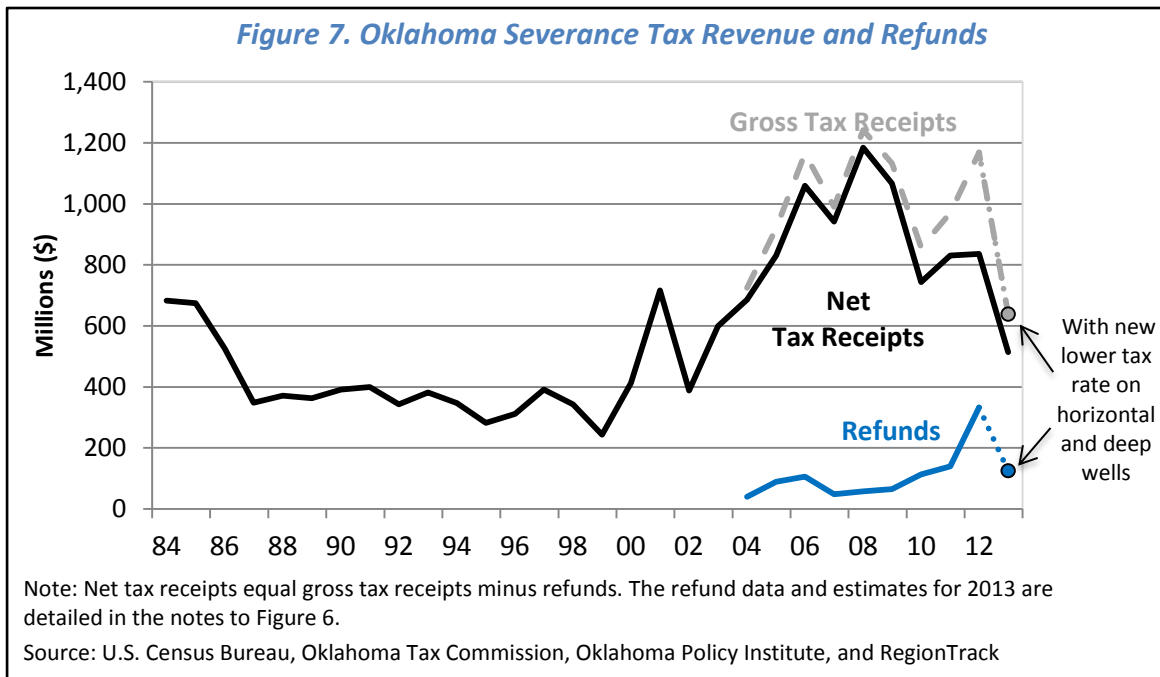
Fiscal Year	Value of Oil and Gas Production	Gross Severance Tax	Refunds Filed	Tax Rate Reduction	Net Severance Tax Receipts
2004	\$10,685	\$725.2	\$39.6	-	\$685.6
2005	13,426	920.2	89.4	-	830.8
2006	14,942	1,165.6	105.7	-	1,059.9
2007	15,145	989.7	47.6	-	942.1
2008	18,151	1,241.8	57.0	-	1,184.8
2009	15,611	1,132.5	65.3	-	1,067.2
2010	12,134	856.5	112.8	-	743.7
2011	14,125	969.8	139.2	-	830.7
2012	13,906	1,168.4	*332.5	-	835.9
2013	14,088	513.6	-	*125.0	513.6

*Notes: For consistency, severance tax refunds filed for production that occurred in 2010 and 2011 but deferred for payment by the state legislature until 2013 are included in the 2012 total. This is the year in which the refund requests were filed and makes 2012 data more consistent with prior years. The tax rate reduction amount for 2013 is a simple annualization of the effect of the reduced tax rate now in effect for 2012 production from horizontal wells as estimated by the Oklahoma Policy Institute from Oklahoma Tax Commission data. Deep well incentives are now received as a reduced tax rate rather than a refund of payments. The refund data end in 2012 because producers pay a reduced severance tax rate upfront for both horizontal and deep wells beginning July 1, 2011. Value of oil and gas is stated on an approximate fiscal year basis but is subject to uncertainty between production month and reporting month.

Source: Oklahoma Tax Commission, Oklahoma Policy Institute³⁰, and RegionTrack

In the ten-year period, the state’s oil and gas producers made total gross severance tax payments before refunds of \$9.81 billion, or nearly \$1 billion annually. Through incentives, state producers were refunded a total of \$1.11 billion.³¹ Refunds averaged \$111 million annually, with the largest totaling \$332.5 million in FY2012. Refunds for horizontal drilling totaled approximately \$633 million; deep well incentives totaled \$270 million; all other refunds were approximately \$200 million in the period. Total refunds in the period averaged approximately 11% of gross severance taxes paid by the industry and represent about 0.8% of the \$135 billion in oil and gas produced in the period.

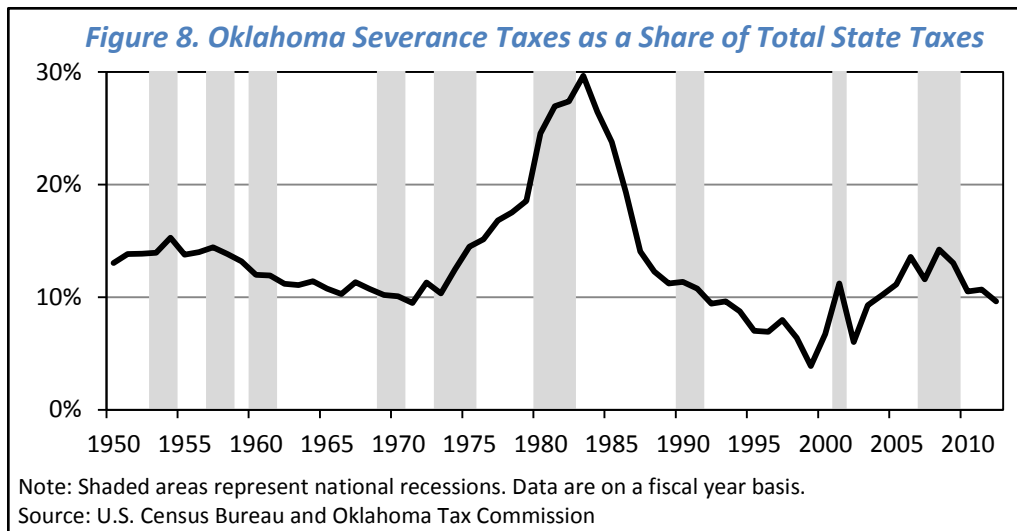
However, even net of refunds, state severance tax receipts set record highs³² in current dollars in the period and produced significant amounts of unanticipated state tax revenue (see Figure 7). In the ten-year period, **the industry made net severance tax payments after incentives totaling \$8.69 billion, an average of \$869 million per year.** Over the ten-year period, net severance taxes topped \$1 billion in three years, exceeded \$800 million in seven years, and produced at least \$500 million in all ten years. For comparison, net severance taxes averaged only \$400 million annually between 1987 and 2002, exceeding \$400 million only once in the period (\$716 million in 2001).



Recent gains in state production of oil and gas have also reversed the more than 15-year decline in severance taxes as a share of total state taxes that began in the early 1980s (see Figure 8). As a share of total taxes, severance taxes bounced from a low of 3.9% in 1999 to a peak of 14.2% in 2008. Severance taxes in FY2010 to FY2012 averaged more than 10% of total state taxes. This high share of total taxes from severance taxes has only been experienced during the 1950s and the Oil Boom. The FY2013 share is expected to remain near 7% despite lower severance tax revenue in the period.³³

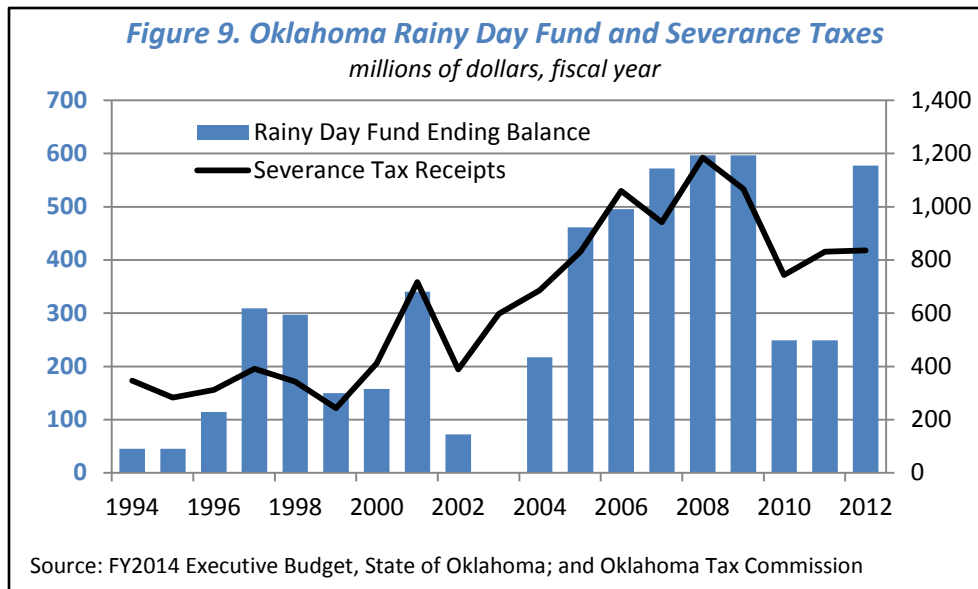
Severance taxes play a key role in budget stabilization

It is also important to recognize the critical historical role played by severance taxes as a buffer during recessions (see Figure 8). Most recessions are accompanied by rising energy prices which tends to raise severance taxes to the state and increase the share of the budget supported by oil and gas production. This countercyclical budget support is especially evident in 1973-75, 1980-83, 2001, and 2007-09. Similar but smaller budget support is found in earlier recessions in 1954 and 1957. Current production and drilling trends suggest that severance taxes are likely to continue to provide an elevated share of total state taxes.



Severance tax revenue plays an added role in budget stabilization through the state’s Rainy Day Fund.³⁴ Historically, deposits to the Fund are highly correlated with years when severance tax receipts exceed budget projections. No other industry in the state is capable of generating enough unanticipated tax revenue to influence the overall state budget.

Figure 9 compares the Rainy Day Fund balance with severance receipts in the FY1994 to FY2012 period. Even after refunds, severance taxes made a major contribution to stabilizing the state budget in this period. Extremely large severance tax payments in FY2001 and from FY2005 to FY2009 underwrote much of the contribution to the Rainy Day Fund in the periods. Appropriations from the Rainy Day Fund during the past two recessions played a key role in softening the effect of the recessions on state spending.



Nearby states offer significant drilling incentives

Because of the broad range of economic benefits beyond severance taxes that are generated by oil and gas activity, Oklahoma faces tremendous incentive-based competition from other energy-producing states. Nearly all oil- and gas-producing states offer incentives designed to encourage production from a range of well types. Most commonly these include economically marginal wells, wells in need of stimulation, and low-output wells.

However, a number of states also offer exemptions from severance taxes for drilling modern unconventional wells, primarily horizontal wells and wells in tight formations. The two largest and most significant exemptions are offered by Texas and Louisiana, Oklahoma’s nearest neighbors and strongest competitors for both drilling activity and white-collar oil and gas employment.

1. **Texas: High-Cost Gas Exemption.**³⁵ Texas offers a total exemption from severance taxes for up to 50% of drilling and completion costs for a ten-year period for qualifying wells. The exemption has covered more than half of the natural gas production in Texas since FY2009. Total exemptions to producers averaged \$1.23 billion annually between FY2004 and FY2009, reaching \$2.9 billion in FY2009. The exemption is available on wells in nearly 1,700 designated tight formations that will not produce significant amounts of gas without stimulation. Approximately 6,000 wells were certified as high-cost in FY2009.

2. **Louisiana: Horizontal Wells Exemption.** Louisiana exempts producers from severance taxes on horizontal wells for two years or until well payback. Exemptions to producers totaled \$239 million in FY2010, \$235 million in FY2011, and \$265 million in FY2012.³⁶

Significant incentives are also being offered by third-tier and emerging energy states that are eager to secure a stronger foothold in future unconventional oil and gas production. Examples include:

3. **Arkansas: High-Cost and Newly Discovered Natural Gas.** Arkansas offers a severance tax rate of 1.5% for 24 months for new natural gas discoveries and 36 months for high-cost gas.
4. **Mississippi: Horizontal Wells.** Mississippi recently enacted (effective as of July 1, 2013) a severance tax rate of 1.3% for 30 months or until payout of well costs for all horizontal drilling in the Tuscaloosa Marine Shale, an emerging liquid-rich play.
5. **Pennsylvania: Natural Gas.** Pennsylvania has long assessed no severances taxes on production from unconventional natural gas wells, making them subject only to an ongoing annual impact fee based on the age of the well and price of natural gas. Producers paid an average impact fee of \$42,800 per unconventional well in 2012, or a total of \$202.5 million across 4,734 eligible wells.³⁷

Do financial incentives matter to the oil and gas industry?

Proponents of higher severance tax rates frequently cite an informal survey of Oklahoma oil and gas producers as anecdotal evidence that financial incentives don't influence producers. The survey, conducted by Steve Agee of Oklahoma City University, contains some very useful insights into the factors driving oil and gas activity in Oklahoma. The broader results confirm that factors such as geology, oil and gas prices, well cost, and estimated reserves drive the decision to drill, and that tax incentives fall near the bottom of the list of considerations for drillers. However, answers to two key questions in the survey suggest quite the opposite conclusion when it comes to the issue of whether oil and gas incentives matter in the decision to drill. They instead suggest that state oil and gas incentives are working exactly as intended – for many producers and at the margin.³⁸

Two aspects of the survey deserve focus.

First, it is important to note that few significant incentive rebates were received by producers in the years immediately prior to the release of the survey results in early 2009. Total rebates were an extremely small share (less than 5%) of surging severance tax payments. And rebates were not especially common for horizontal and deep wells at the time. In 2007 and 2008 only roughly 17% of all wells drilled in the state were horizontal and less than 10% were deep, and the majority of these wells were being drilled by the largest operators in the state. Hence, it would be surprising if more than a handful of operators reported being influenced significantly by these incentives. Yet, 11 out of 24 survey respondents indicated that state tax incentives were either very influential or always calculated when making a well-participation decision (the two strongest affirmative answers). Given the incentive structure in place at the time and the relatively immature stage of horizontal drilling, the survey results can just as readily be interpreted as clear evidence that incentives do in fact enter the decision-making process at many oil and gas firms in Oklahoma, particularly for the mostly small independent producers comprising the sample. This is further suggested by the fact that 20 of 24 respondents had filed for a severance tax rebate in the past.

Second, the fact that respondents reported state tax incentives as generally less important overall than the price of oil and gas, geology, operating costs, well location, reserves projections, and equipment availability comes as little surprise given that tax incentives affect a wells cash flow only at the margin. Again, what is surprising from the survey is that incentives are reported as the least important factor by only 9 of the 23 respondents. Listed as the least important factor by one or more respondents was the current price of oil or gas, the price of oil or gas in the futures market, well accessibility and infrastructure, familiarity with

Top Economic Facts about Oklahoma's Oil and Gas Industry

1. Renewed growth in Oklahoma's oil and gas industry has greatly enhanced the strength and competitiveness of the state economy.

The state's trademark industry has roughly doubled in size the past decade. This growth has contributed to faster state employment growth, a surge in population, income gains relative to the nation, strong rural growth, and significant tax revenue to the state.

2. The oil and gas industry continues to have an outsized influence on overall state economic activity.

Oil and gas firms account for only 3.2% of all business establishments but hire 5% of wage and salary workers, produce 10% of state GDP, and generate 13.5% of total earnings statewide.

3. Oil and gas served as the state's key job engine the past decade.

Between 2002 and 2012, Oklahoma oil and gas firms created 29,000 new wage and salary jobs while all other private industries combined added only 56,000.

4. Oil and gas drilling is the largest source of private capital spending in the state.

Capital spending on oil and gas drilling activity totaled an estimated \$11.7 billion in 2012. This is equivalent to the construction of nearly 67,000 new single-family homes annually valued at \$175,000 each.

5. The oil and gas industry is the largest source of state tax revenue in the state.

Oklahoma oil and gas firms, owners, and employees paid direct state tax payments of nearly \$2.0 billion in 2012, or 22% of all state taxes. Severance tax payments to the state the past ten years totaled \$8.69 billion after rebates, or \$869 million annually.

6. Oklahoma is the only major energy state to experience a strong rebound in both crude oil and natural gas production in recent years.

State oil production has nearly doubled since early 2010 to an annual rate of 119 million barrels. Natural gas production is up nearly 40% to 2.2 trillion cubic feet annually.

7. Oklahoma remains a Tier 1 energy state with an economic cycle highly influenced by activity in the oil and gas sector.

The energy sector provided the state economy with a significant economic cushion during the recent national recession and has boosted the overall rate of state economic growth the past decade.

8. Growth in the oil and gas industry has pushed migration into the state to its highest levels in three decades.

More than 118,000 new residents relocated to Oklahoma between 2002 and 2012, more than three times the rate experienced from 1991 to 2001. Recent state population growth exceeded 1% annually for the first time since the early 1980s.

9. Strong earnings gains in the oil and gas industry have propelled Oklahoma per capita income to 96% of the U.S. level.

Oklahoma personal income per capita is up from 85% of the national average only a decade ago. The gains are largely traced to the performance of the oil and gas industry.

10. Oil and gas activity forms the core of entrepreneurial and investment activity in Oklahoma.

Nearly 40% of all income produced by proprietors and partnerships statewide is derived from the oil and gas industry. Most of the largest and best-performing public companies based in the state are in the energy industry.

11. Oil and gas is driving much of the economic growth in the non-metro areas of the state.

Oil and gas activity is having a transformative effect in many smaller, non-metro areas of the state. In the recovery years of 2010 through 2012, job growth in the non-metro energy-producing counties totaled 5.3% versus only 1.1% in the non-energy counties.

12. Oklahoma is home to the second largest concentration of oil and gas activity in the U.S.

Other than Texas, Oklahoma has the highest number of oil and gas wage and salary workers and proprietors and the highest total earnings from the oil and gas industry.

13. Energy states continue to enjoy faster long-run job growth than non-energy states.

Since 1965, Oklahoma has added roughly 20% more jobs than the average of the non-energy producing states. Every energy state except West Virginia has outperformed the non-energy states in job growth since 1965.

14. Spillover effects from oil and gas are driving economic activity in other Oklahoma industries.

Oklahoma oil and gas firms made an estimated \$22.1 billion in purchases in 2011, of which \$10.2 billion was spent within Oklahoma.

the drilling location, land use restrictions, and drilling rig availability. This is hardly the expected outcome if incentives don't matter.

What the survey seems to confirm is well known - the primary factors in the decision to drill are the stalwarts of geology, estimated recoverable reserves, and well cost. Incentives, however, do in fact matter to many producers.

What happens if you raise severance taxes?

Proponents of higher tax rates also suggest that severance taxes can be raised and incentives reduced or eliminated with few economic consequences. Frequently cited is a 2000 paper by Gerking and others³⁹ examining severance taxes in Wyoming as evidence that oil and gas production is highly insensitive to tax rates. In one scenario, production rises by only 1.7 percent in the long-run in response to a 4% reduction in the severance tax rate. The conclusion of the research is that lowering severance tax rates produces only a small positive impact on future drilling and production activity and overall state economic activity, while having a large negative impact on future tax revenue.

This isn't the full story though. The model developed in the paper is quite useful in that it provides a framework for making simulation-based estimates of future drilling activity and production in response to changes in severance tax rates. However, it is greatly limited in an important way in evaluating the impact of incentives in the current environment of rapidly expanding supply. The simulations in the paper are structured for a world of declining production and based on fixed relationships concerning production, reserves, and drilling intensity. In short, a low response of production and drilling to tax rate changes is estimated and then imposed on the model. This was perfectly consistent with historical data available at the time through 1997. As described in the paper:

“A key question regarding these simulation results is: Why is the response of oil and gas output so small when production taxes are changed or tax incentives are applied?”

Four reasons are noted: 1) production taxes only indirectly stimulate drilling, which is what drives future production; 2) added federal tax liability may offset some of the gain in certain states; 3) incentives are only designed to work at the margin as they increase the producer's cost only by an estimated \$0.40 per barrel at a \$25 wellhead price; and 4)

.... most importantly, production of (as contrasted with exploration for) oil and gas is driven mainly by reserves, not by prices, production tax rates, or production tax incentives. This is a basic fact of geology and petroleum engineering and is easily illustrated by Wyoming's own history of oil production..... Thus, even comparatively large price increases or tax reductions are not expected to call forth much additional output.”

In recent years we have seen that energy price increases *can* call forth large changes in both drilling activity and production when a technology or geology driven supply shift takes place. Oklahoma production has done just that in recent periods of elevated prices (most of the period from 2007 to the present for crude oil and most of 2001 to 2008 for natural gas). The study further treats well types and well costs as uniform over time and cannot differentiate between the production potential and cost-differential of older conventional wells versus modern horizontally drilled wells and deep wells. The current world of drilling, production, and reserves bears little resemblance to the parameters estimated in the model when the study was prepared.

In the short-run, production changes driven by changes in tax incentives are always likely to be modest. However, only going forward will we be able to form better estimates of the long-run response of oil and gas production to incentives. Although existing research suggests that incentives will produce only marginal changes in future drilling and production activity above what would have taken place otherwise, prior estimates are highly likely to understate the potential effect in the current environment. Oklahoma,

for example, has witnessed a rather large rebound in oil and gas production the past few years that was accompanied by strong growth in tax incentives. We do not know precisely how much of the new drilling and production activity in the state is directly due to enhanced incentives, but a marginal portion of it almost certainly is.

In short, the concern remains that prior studies were conducted in an era when almost nothing influenced production. Not higher prices for oil and gas, lower drilling costs, cheaper labor costs, or the presence of financial incentives. Production in the short-run was dominated by geology, with supply essentially capped and declining at a relatively steady rate, particularly for oil. But the biggest problem may be that focusing on production alone ignores a range of other possible effects triggered by higher severance taxes.

Possible effects of higher taxes extend well beyond drilling and production

The economic reality is that, in exchange for the incremental severance tax revenue raised, policymakers can expect to trigger a series of incremental negative economic outcomes within the industry and state economy, many of which may be unintended. In Oklahoma, most of the effects of higher severance taxes will be borne almost entirely by producers, royalty owners, and refiners in the state. A portion of the increased tax will also be borne by employees, suppliers, and offsetting losses of state tax revenue.

The range of potential effects from raising severance taxes include:

1. **Marginal reduction in current production from existing wells.** There will be a small decline in short-run production from existing wells. Economists generally agree that any tax-induced production declines will likely be small for all but the largest increases in tax rates. This is because current production from existing wells is driven largely by geology and reserves. Tax incentives are only able to slightly push activity higher or lower at the margin in the short-run. Production is most likely to fall for existing wells near shut-in⁴⁰ or with discretionary production.
2. **Well investment effects and a marginal reduction in future production.** It is the long-run effect on production that matters most and is the least predictable. A severance tax-hike adds additional costs onto the burden of cash flows from existing and prospective wells. The primary channel through which higher severance taxes work is a reduction or delay in new investment in wells. A comprehensive Rand study⁴¹ examining the mechanics linking higher severance taxes to oil production in California illustrates the inevitable result that some investment activity will not take place as severance taxes rise. From a capital budgeting perspective, some of the lowest graded drilling options in Oklahoma will be delayed, downsized, or bypassed. This is commonly referred to as ‘high-grading’ in the natural resources literature.⁴²
3. **Reduced royalty income.** One of the biggest losers under a severance tax increase is the group of Oklahoma land and mineral right owners receiving oil and gas royalties who have typical “net” leases with oil and gas operators. Their royalty payments are calculated only after severance taxes and other expenses are paid. Increased severance taxes result in a direct reduction in the income of royalty owners in Oklahoma, which subsequently reduces state taxable income and income tax payments and sales tax collections.
4. **Cost pass-through downstream.** Along with sharing the cost of higher severance taxes with royalty owners, another option for oil and gas producers is to pass some of the cost increase downstream to refiners. In general, however, the more integrated the market for crude available to state refiners, the less able state producers will be to pass any cost increase to them. Given the role of Cushing as the primary transshipment point for West Texas Intermediate crude, state refiners are likely to have little difficulty in finding alternative sources of crude. Hence, state producers will have limited pricing power with refiners and any cost pass-through that may occur would be modest. What can’t be passed on is borne by producers.

5. **Profitability and corporate income effects.** Severance tax increases result in a direct cost increase and profit reduction for oil and gas operators and investors. This produces an incremental reduction in state corporate and non-corporate earnings for those producers based in the state, which then reduces corporate tax payments and personal tax payments by proprietors and partnerships. Some of this effect is reduced by producers based outside Oklahoma.
6. **Employment and personal income effects.** Reduced profitability of state oil and gas firms will incrementally reduce in-state employment and income earned by wage and salary workers. This subsequently reduces personal income tax and sales tax payments to the state.
7. **Property value effects.** The value of land and mineral rights related to oil and gas production are determined in part by the value of current and future lease and royalty payments generated. Higher severance taxes work through this channel to reduce the market value of oil- and gas-producing real estate in the state. This is particularly true in the rural and agricultural counties of the state. A recent working paper⁴³ from the Federal Reserve Bank of Kansas City estimates that payments related to **energy development added about \$104,000 to the net worth of farm households in the region receiving payments in recent years.** Three-quarters of the estimated effect is through increased property values. Higher severance taxes will work to reduce these wealth effects.
8. **Shut-in effects.** **Higher severance taxes directly increase the operating cost of a well and increase the likelihood of a financial decision to shut-in a well.** This will incrementally reduce the life of all existing wells subject to the tax increase. Accelerated well shut-ins have implications for the severance tax stream, income taxes paid on income received by well participants, and royalty payments.
9. **Small-firm effects.** The increased capital-intensive nature of drilling makes incentives more valuable to small firms. Those with intentions to drill only a single well or a small number of wells are impacted disproportionately by increased severance taxes relative to large firms with a diversified drilling base. The risk undertaken by small producers drilling a single well at a cost of \$4-8 million remains substantial. In addition, **Oklahoma's oil and gas industry is still heavily represented by small firms, with 75% of firms having fewer than 10 employees and 97% having fewer than 100 employees. Oil and gas firms with fewer than 100 employees currently employ 50% of all oil and gas workers in the state.**⁴⁴

These effects extend well beyond just a pullback in short-run production, but there are yet other potential economic concerns with increasing severance taxes.

1. **A tax rate change will alter any competitiveness effects in place relative to other competing states.** Texas and Louisiana continue to offer large incentives for production from unconventional wells. Higher severance tax rates will also send an important signal to industry participants about the state's broader stance toward the oil and gas industry.
2. **Some deadweight loss in the private sector results from added taxation.** This is the economic loss to society of forgone production in the private sector as a result of levying a tax to pay for public services. These costs can potentially be quite large and are recognized by economists as a significant factor in determining overall state growth, vitality, and competitiveness, as well as the long-run growth path of the state economy. Estimates in the economics literature suggest a deadweight loss from severance taxes of 4-6% of the tax revenue raised.⁴⁵
3. **Only a relatively small share of any severance tax increase is likely to be exported outside the state.** It is often suggested that severance taxes are simply exported out of state along with

the minerals and that the tax is ultimately borne by non-Oklahomans. Oklahoma exported about two-thirds of the natural gas produced within the state in 2011 but imported 20% more petroleum than was produced within the state. On net, only 23% of the value of the oil and gas produced in Oklahoma in 2011 was exported outside the state.⁴⁶ The remaining 77% of the value of oil and gas produced within the state was used within the state. This suggests that the bulk of any costs from higher severance taxes that are passed-through to the end-user will ultimately be paid by Oklahomans.

4. **There may also be unintended effects on state philanthropy.** Oil and gas producers are well-known to be among the most important state benefactors in years past and present. It is reasonable to expect that some of the marginal dollars forfeited by the industry in higher severance taxes may in fact be the same dollars otherwise used to make financial donations that can carry extremely high social value.

It is important to note that none of the potential individual effects from higher severance taxes in any single year represent more than an incremental reduction in activity in the oil and gas sector. **It is only when viewed jointly and across several years that the cumulative effect of tax policy that leans against economic activity in the state's most dynamic industry sector begins to add up.** This is precisely the economic rationale for providing the industry with a range of incentives that are seemingly unimportant individually or in any single year, but that when viewed jointly and over a period of many years add up to much desired incremental economic activity in the industry and in the state.

VI. What is the connection of the oil and gas industry with Oklahoma's overall economy?

The growing scale and scope of the oil and gas industry continues to influence overall state economic activity. The industry expanded substantially the past decade and accounted for a large share of total state economic growth in the period. The state's economic cycle remains closely tied to the energy sector, which tends to provide much needed economic stabilization during recessions. The industry also remains the largest single source of tax revenue in the state, providing more than 22% of all state taxes in 2012.

The economic contribution of Oklahoma's oil and gas industry

The growth in Oklahoma's oil and gas industry the past decade has been nothing short of remarkable (see Figures 10 and 11). Between 2002 and 2012, the number of oil and gas business establishments increased by almost 60% and gross domestic product in the industry tripled. Wage and salary jobs doubled to more than 57,500 while wage income more than tripled from \$1.55 billion to \$5.3 billion. Average total compensation in the industry reached nearly \$110,000 per worker in 2012.

Figure 10. Oklahoma Oil and Gas Industry Economic Profile - 2002 and 2012

Economic Measure	Mining			Non-Mining Sectors			State Total		
	2002	2012	%Chg	2002	2012	%Chg	2002	2012	%Chg
Business Establishments:	2,130	3,377	58.5%	82,797	94,730	14.4%	84,927	98,107	15.5%
Fewer than 10 employees	1,656	2,500	51.0%	62,628	71,990	14.9%	64,284	74,490	15.9%
10-99 employees	443	788	77.9%	18,575	21,090	13.5%	19,018	21878	15.0%
100-499 employees	27	81	200.0%	1,415	1530	8.1%	1,442	1611	11.7%
500 or more employees	4	8	100.0%	179	120	-33.0%	183	128	-30.1%
Gross Domestic Product (millions)	\$5,325	\$15,882	198.3%	\$93,452	\$145,651	55.9%	\$98,777	\$161,533	63.5%
Employment:									
Wage & Salary Employment:	28,592	57,564	101.3%	1,527,978	1,606,232	5.1%	1,556,570	1,663,796	6.9%
Fewer than 10 employees	4,699	6,252	33.0%	250,911	275,386	9.8%	255,610	281,637	10.2%
10-99 employees	12,097	22,276	84.1%	660,697	747,855	13.2%	672,794	770,131	14.5%
100-499 employees	6,193	17,058	175.4%	367,953	403,379	9.6%	374,146	420,437	12.4%
500 or more employees	5,603	11,978	113.8%	248,417	179,613	-27.7%	254,020	191,591	-24.6%
Proprietor's Employment	25,104	53,297	112.3%	398,897	497,354	24.7%	424,036	550,651	29.9%
Total Employment	53,696	110,861	106.5%	1,926,910	2,103,586	9.2%	1,980,606	2,214,447	11.8%
Income: (millions)									
Wage & Salary Income	\$1,550.0	\$5,328.4	243.8%	\$43,622.3	\$64,734.7	48.4%	\$45,172.3	\$70,063.1	55.1%
Employee Compensation	1,825.9	6,303.4	245.2%	54,221.0	81,017.9	49.4%	56,047.0	87,321.3	55.8%
Proprietor's Income	3,033.2	8,505.7	180.4%	9,457.1	13,519.2	43.0%	12,490.4	22,024.9	76.3%
Total Earnings	4,859.1	14,809.1	204.8%	63,678.2	94,537.1	48.5%	68,537.3	109,346.2	59.5%
Ratios:									
Compensation per Employee	\$63,861	\$109,503	71.5%	\$35,485	\$50,440	42.1%	\$36,007	\$52,483	45.8%
Income per Proprietor	120,826	159,591	32.1%	23,708	27,182	14.7%	29,456	39,998	35.8%
GDP per Employee	186,241	275,904	48.1%	61,160	90,679	48.3%	63,458	97,087	53.0%
GDP per Establishment	2,500,001	4,703,040	88.1%	1,057,722	1,439,828	36.1%	1,091,674	1,545,246	41.5%

Source: Bureau of Economic Analysis, Bureau of Labor Statistics, and RegionTrack

Although comprising only 3.2% of firms statewide, the oil and gas industry hires 5% of the state’s wage and salary workers and pays 7.2% of all employee compensation in the state. Earnings in the sector now account for 13.5% of total earnings statewide, the same approximate share seen at the height of the Oil Boom in 1982. **Relative to the non-energy sectors of the economy, oil and gas business formation was four times higher, the pace of employment growth was twenty times faster, and industry output expanded four times as much.**

Figure 11. Economic Contribution of the Oklahoma Mining Sector

	2002	2012	%Chg
Oil Production:			
Total Production (million barrels)	66.421	89.300	34.4%
Price of Crude Oil per barrel*	\$24.49	\$89.97	267.4%
Value of Production (billions)	\$1.63	\$8.03	393.9%
Gas Production:			
Total Marketed Production (trillion cubic feet)	1.582	2.021	27.8%
Price of Natural Gas per mcf*	\$2.94	\$2.63	-10.5%
Value of Production (billions)	\$4.65	\$5.32	14.3%
Total Value of Oil and Gas Production (billions)	\$6.28	\$13.35	112.7%
Royalty Payments* (billions)	\$1.07	\$2.40	124.3%
Drilling Activity:			
Well Completions*	2,339	3,050	30.4%
Average Well Cost (millions)*	\$1.65	\$3.85	133.3%
Drilling Expenditures (billions)	\$3.86	\$11.73	203.9%
Mining Industry Share of Total State Activity by Type:			
Establishments	2.4%	3.2%	
Gross Domestic Product	5.4%	9.8%	
Wage & Salary Employment	2.7%	5.0%	
Proprietor's Employment	5.9%	9.7%	
Employee Compensation	3.3%	7.2%	
Proprietor Income	24.3%	38.6%	
Total Earnings	7.1%	13.5%	

*Notes: The Oklahoma price of crude oil and natural gas are estimated for 2012 using past ratios of national prices. Royalties are estimated using average rates of 17% in 2002 and 18% in 2012. Approximately half of the royalty payments are assumed to remain in Oklahoma. Well completions for 2012 are estimated from preliminary data. Average well cost is derived from published and unpublished estimates of completions across Oklahoma.

Source: Bureau of Economic Analysis, Bureau of Labor Statistics, Energy Information Administration, IHS, Oklahoma Corporation Commission, and RegionTrack

Oil and gas also served as the state’s key job engine the past decade. **Between 2002 and 2012, Oklahoma oil and gas firms created 29,000 net new wage and salary jobs while all other private industries combined added only 56,000.** Government is the only sector with job growth that rivaled the energy sector.

Growth in the number of proprietors with earnings from the oil and gas sector may be the key economic change the past decade. The number of proprietors doubled from about 25,000 to more than 53,000, while their average earnings increased to \$160,000 annually. And although only 10% of the state’s proprietors are in the oil and gas sector, they earn nearly 40% of all proprietor income statewide. This is a substantial

change in the earnings pattern of the industry and is producing a significantly greater stream of personal income tax and sales tax payments to the state than in past years.

The value of oil and gas production doubled the past decade to more than \$13 billion in 2012, providing a critical boost to the state severance tax stream. This reflects both increased production and higher average prices. **Royalty payments generated from production within the state similarly doubled along with production the past decade to an estimated \$2.4 billion in 2012.**⁴⁷

Tax policy must reflect the unique economic cycle of the state’s trademark industry.

The state’s unique economic cycle must be reflected in tax policy toward the industry. The current high share of total state earnings derived from the oil and gas sector dictates that the Oklahoma economy will likely remain closely tied to economic activity in the energy sector for many years.

The state economy tends to move countercyclical to the nation, most visibly during recessions as oil and gas prices serve as a buffer during downturns. This is traced to the fact that every national recession in the Post-War period has been accompanied by rapid increases in energy prices. High energy prices provide the state with added stimulus entering a recession, which is then typically reversed as energy prices slow along with economic activity. Once the recession ends, the direction and pace of energy prices dictates the path of the state economy in the recovery. This basic economic cycle has characterized Oklahoma and the other top-tier energy states for decades, and continues to do so.

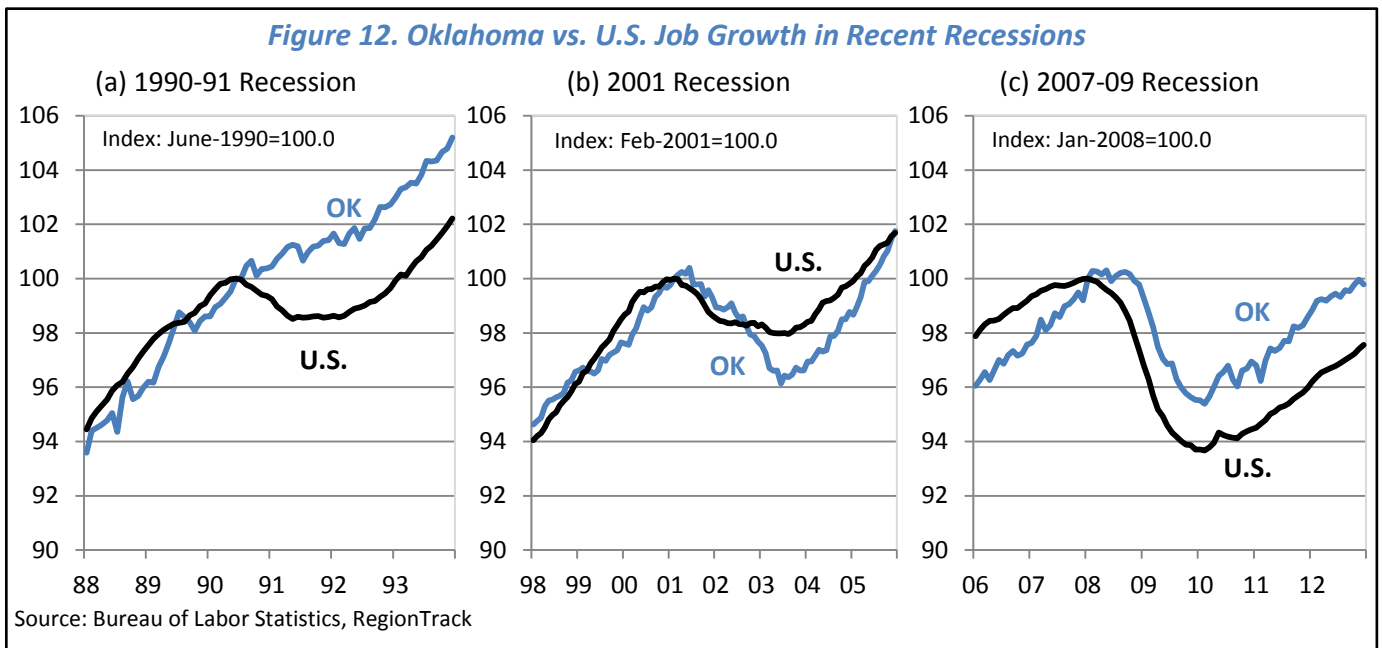


Figure 12 illustrates state job growth relative to the nation during the past three cycles of recession and recovery. The Oklahoma economy essentially ignored the 1990-91 recession, sustaining only a slowing of employment during the depths of the recession. The state benefitted from a spike in crude oil prices above \$30 per barrel prior to the recession, the first sustained move in oil prices since bottoming around \$12 per barrel in 1986. The U.S. economy suffered a job loss of 1.7% during the recession and was very slow to recover. Oklahoma had already increased its job base by 3.5% by the time the nation managed to return to its pre-recession peak two years later.

The 2001 recession in Oklahoma also had a unique pattern driven in large part by oil and gas activity. Both crude oil and natural gas prices increased sharply prior to the recession and were fueling strong growth in Oklahoma. However the U.S. economy, propelled by Y2K concerns and the growing Tech Bubble, was expanding at such a rapid pace prior to the recession that energy-fueled Oklahoma only managed to match

the pace of U.S. job formation. As the recession progressed, oil and natural gas prices collapsed much more quickly than anticipated and created a deeper, but slightly shorter, recession in Oklahoma. The cumulative state job decline was twice as large as the nation, but both oil and gas prices started upward again in late 2002 as the state promptly started a much more rapid job recovery than the nation.

The recent 2007-09 recession revealed a more typical recession pattern for a top-tier energy-producing state. The Oklahoma economy, boosted by high energy prices, was creating jobs much more quickly than the nation heading into the recession. The state avoided the recession for several months after job losses took hold at the national level. **The state lost a total of 80,000 jobs in the recession but the cumulative job loss was nearly 2% smaller than the nation's. An additional 30,000 jobs would have been lost had the state suffered the national decline.** The job recovery then resumed in Oklahoma at a more rapid pace than in the non-energy states as crude oil prices surged once again.

How much does the oil and gas industry pay in state taxes?

A key economic contribution of the oil and gas industry remains taxes. **The oil and gas industry is the largest single source of tax revenue in the state. In fiscal year 2012, direct state tax payments by the industry and its employees totaled an estimated \$1.96 billion (see Figure 13). This is more than 22% of the \$8.83 billion in total state tax revenue collected in 2012.**

Direct tax payments come from four primary sources: 1) severance and excise tax payments on the production of oil and gas (\$867 million); 2) income tax payments by corporations, proprietors, and partnerships (\$523 million); 3) sales and use tax on industry purchases and sales (\$187 million) and 4) personal income and sales taxes paid by employees (\$386 million).

Figure 13. Oklahoma Oil and Gas Industry State Tax Payments
FY2012, millions of dollars

Severance tax:	
Crude oil	\$530.2
Natural gas	305.8
Petroleum excise tax	13.9
Energy resources revolving fund (voluntary)	16.6
Marginal well (voluntary)	0.6
State sales and use tax – industry sales	83.5
State sales and use tax – industry purchases	103.3
Corporate income tax	98.1
Personal income tax – proprietor and partnership earnings	425.3
Personal income tax – employee earnings	239.8
State sales tax – employee and proprietor spending	146.1
Total direct tax payments	\$1,963 .2

Source: Oklahoma Tax Commission, IMPLAN, Oklahoma Office of State Finance, and U.S. Census Bureau

Several steps are taken to provide a fair and representative estimate of the direct tax contribution of the industry. The year chosen, FY2012, is a relatively current period in which industry profitability was well off peak levels from prior years, especially FY2008. Energy prices were also well off recent peaks, particularly for natural gas (West Texas Intermediate crude oil averaged \$94.16/bbl; Henry Hub natural gas averaged \$2.74/mcf). The estimates are also based on a narrow definition of the oil and gas industry by excluding

oil and gas refining, pipeline activity, oil- and gas-related manufacturing, and construction related to oil and gas development. The estimates further exclude minor state tax payments made by the industry for motor vehicles and motor fuels, as well as local property tax payments for real and personal property not used in the production of oil and gas. Most importantly, the estimates do not attempt to account for any indirect or spillover effects on other industries.

The high overall level of tax burden carried by the industry and its employees is well-known. Much of the added burden is severance taxes. There is no other tax stream paid by any other state industry that is comparable to oil and gas production taxes. The industry also shares a disproportionately high share of statewide corporate taxes, paying an estimated 22% in 2012.⁴⁸ The share of total corporate taxes is likely much higher (approaching 50%) in years of peak oil and gas prices such as 2007 and 2008. Oil and gas proprietors earn nearly 40% of proprietor income statewide and bear much more than 40% of the state tax burden on these earnings given their relative high average earnings. Employees of oil and gas firms earn twice the average compensation of workers outside the energy sector and bear more than double the share of income tax burden given progressive personal income tax rates in the state.

Similarly in Texas, in evaluating whether to extend the High-Cost Gas exemption in Texas, the Select Committee on Economic Development of the Texas Legislature recently recommended that the exemption be continued.⁴⁹ They cited the already large tax burden carried by the industry.

“The sub-group heard testimony about the high-cost, gas tax incentive and the overall tax burden imposed on the oil and gas industry. The sub-group learned that the overall tax burden on the oil and gas industry is approximately five times greater than the overall tax burden imposed on the average business in Texas when considering all taxes levied. Even though the high-cost, gas tax incentive allows certain natural gas producers to pay less than the full natural gas severance tax, natural gas producers are still paying approximately four to five times more in taxes than the average business in Texas.” Select Committee on Economic Development of the Texas Legislature on whether to extend the High-Cost Gas Exemption

Similar estimates for Oklahoma suggest that the nearly \$1.96 billion in direct tax payments made by the state’s oil and gas firms, owners, and employees in FY2012 equates to \$17,700 per worker and proprietor in the industry as compared to an average of \$3,986 across all industries. Much as in Texas, **Oklahoma’s oil and gas firms face a relative tax burden that is four to five times greater than the average business in the state on a per job basis.**

How is Oklahoma oil and gas severance tax revenue used?

Under current apportionment rules, severance taxes are first distributed to dedicated funds, and the remaining balance is applied to the General Revenue Fund. Historically, most dedicated uses have been for local road development, common education, and higher education. A breakout of the most recent apportionment shares is detailed in Figure 14. Historical uses of severance taxes since FY1999, including General Revenue Fund contributions, are detailed in Figure 15.

In FY2013, a total of \$513.6 million in severance taxes was apportioned, with \$292.0 million going to dedicated uses and \$221.6 directed to the General Fund. Among the dedicated uses, \$62.5 million was returned to counties for roads, \$62.5 million to local school districts, \$47.4 million to the Common Education Technical Fund, \$47.4 million to the Higher Education Capital Fund, \$47.4 million for the Oklahoma Student Aid Revolving Fund, and \$24.8 million across a range of other dedicated uses.

Figure 14. Oklahoma Oil and Gas Apportionment Shares (FY2014)

Gross Production Tax – Oil Apportionment	
*Common Education Technology Fund	25.72%
*OK Student Aid Revolving Fund	25.72%
*Higher Education Capital Fund	25.72%
County Highways	7.14%
School Districts	7.14%
County Roads and Bridges	3.745%
Statewide Circuit Engineering Dist. Fund	0.535%
Rural Economic Access Plan (REAP) Fund	4.28%
*Tourism Capital Expenditure Fund (33.33%)	
*Conservation Commission Fund (33.33%)	
*Community Water Revolving Fund (33.33%)	
(*indicates a \$150 million cap on contributions to these six funds)	
Gross Production Tax – Natural Gas Apportionment	
General Revenue Fund	85.72%
County Highways	7.14%
School Districts	7.14%

Source: FY2014 Executive Budget, State of Oklahoma⁵⁰

Figure 15. Distribution of Oklahoma Severance Taxes (FY1999 to FY2013)

Fiscal Year	Total Apportionment	General Revenue Fund	Returned to Counties for Roads	To School Districts	Common Education Technical Fund	Higher Education Capital Fund	Oklahoma Student Aid Revolving Fund	Other*
1999	\$249,405,330	82,486,137	18,866,343	18,914,163	1,696,946	1,696,946	1,696,946	106,833,321
2000	404,797,409	245,061,421	28,584,735	28,584,735	25,426,988	25,426,988	25,426,988	8,463,104
2001	735,228,790	486,339,776	50,543,098	50,543,098	34,119,434	34,119,434	34,119,434	11,355,457
2002	411,466,717	226,309,324	25,983,004	25,983,004	24,214,440	24,214,440	24,214,440	8,058,927
2003	592,896,596	365,699,531	38,952,874	38,952,874	28,904,508	28,904,508	28,904,508	9,619,852
2004	691,778,683	443,689,240	46,679,555	46,679,555	32,620,013	32,620,013	32,620,013	10,856,427
2005	863,919,367	495,175,297	61,186,865	61,186,865	45,007,142	45,007,142	45,007,142	14,978,575
2006	1,153,000,311	729,650,586	82,075,804	82,075,804	45,007,000	45,007,000	45,007,000	14,979,001
2007	987,972,285	639,515,862	69,727,349	69,727,349	45,007,000	45,007,000	45,007,000	14,979,001
2008	1,249,985,305	825,190,148	89,009,642	89,009,642	47,372,299	47,372,299	47,372,299	23,118,783
2009	1,158,639,145	727,272,067	80,108,185	80,108,185	47,372,299	47,372,299	47,372,299	22,542,067
2010	857,470,764	444,359,631	60,899,931	60,899,931	47,372,299	47,372,299	47,372,299	23,874,715
2011	964,935,884	509,858,904	68,749,447	68,749,447	47,372,299	47,372,299	47,372,299	28,060,999
2012	882,660,378	430,478,292	70,326,434	70,326,434	47,372,298	47,372,298	47,372,298	122,739,753
2013	513,576,262	221,610,957	62,542,178	62,542,178	47,372,298	47,372,298	47,372,298	24,764,055

Source: Historical issues of *Apportionment of Statutory Revenues by the Oklahoma Tax Commission*.

* "Other" includes, but is not limited to: Community Water Infra-structure Development Revolving Fund, Conservation Commission Infra-structure Revolving Fund, County Bridge and Road Fund, OK Water Resources Board, Tourism & Recreation Capital Expenditure Revolving Fund, and the Statewide Circuit Engineering District Revolving Fund. Funds not included here received only a one-time payment from Severance Taxes.

VII. What are the broader economic benefits of policy that encourages growth in the energy industry?

The transformative effect the oil and gas industry is having on the state economy is clearly visible in recent economic data. The added employment, income, and output generated within the sector are producing significant long-run economic spillover benefits to nearly every sector of the state economy. For the state as a whole, some of the more important economic outcomes include a narrowing of the income gap relative to the nation, added population growth and migration into the state, strong rural development in oil and gas counties, added high wage jobs, and a growing oil and gas corporate presence.

Economic linkages and spillovers

Numerous past studies provide traditional economic impact estimates of the indirect spillover effects generated by the oil and gas industry on the overall state economy.⁵¹ These studies routinely conclude that direct activity within the industry is believed to support at least as much indirect economic activity outside the industry.

A key element of the spillover impact is spending by the industry on goods and services in other sectors of the state economy. **Recent estimates suggest that Oklahoma oil and gas firms made \$22.1 billion in purchases in 2011, of which \$10.2 billion was spent in Oklahoma.**⁵² Key industry sectors receiving large amounts of purchases from oil and gas firms include machinery manufacturing, construction, transportation, and several professional and technical service industries. However, nearly every industry sector in the state receives some level of purchases from the sector.

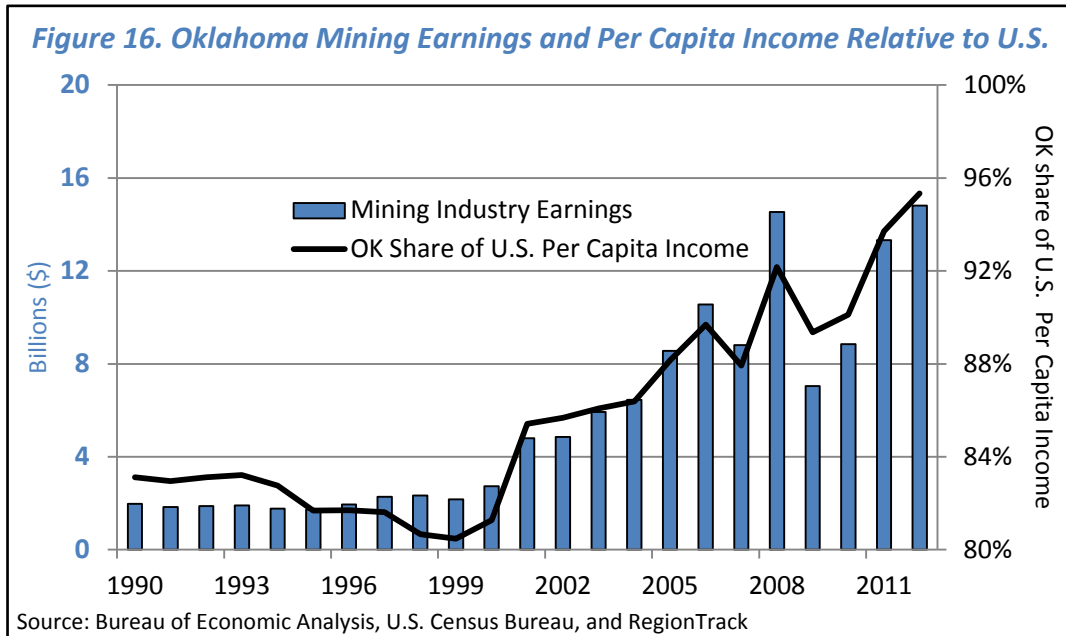
Other synergies with the energy sector are also highly visible. In the state's critical manufacturing sector, many of the largest sectors operate downstream from the production side of the oil and gas industry. Of a total of \$17.5 billion in state gross domestic product derived from manufacturing in 2012, petroleum products manufacturing (refining) accounted for \$3 billion and pipeline transportation accounted for more than \$1.5 billion.

Transportation-related evidence of the broader impact of the oil and gas industry on the state economy includes the ongoing expansions at the Cushing oil depot and additions to the massive intra- and interstate pipeline systems within the state's boundaries. Knowledge spillovers include the recent announcement by GE to locate its \$110 million global oil and gas research center⁵³ in Oklahoma and substantial ongoing contributions to fund research and scholarships at both public and private universities in the state. Perhaps no sign of the reemergence of oil and gas is more visible than the Devon Tower now anchoring downtown Oklahoma City.

State income gains relative to the nation

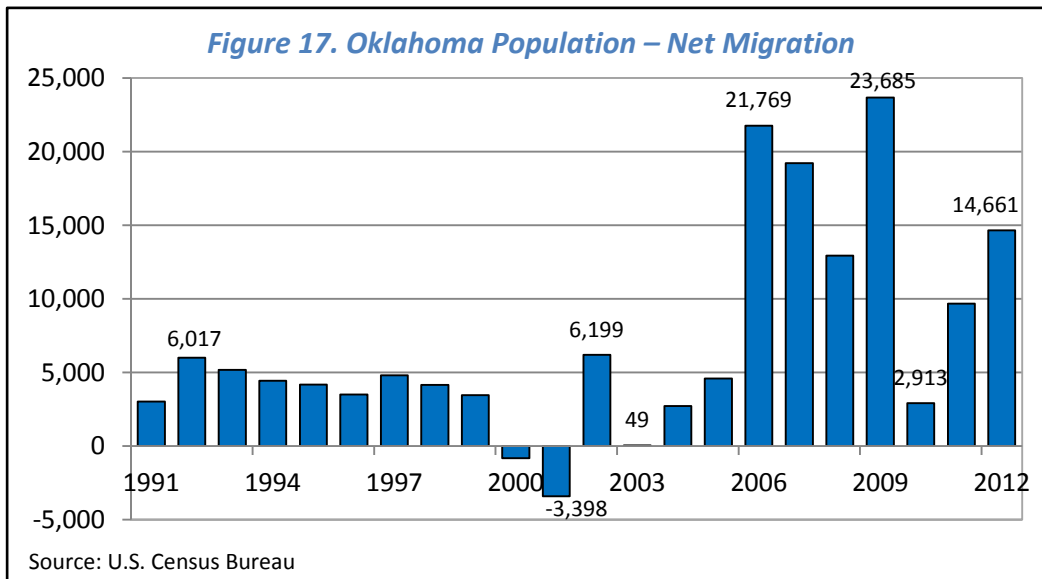
One of the most noteworthy economic success stories in Oklahoma in recent years is the progress made in closing the state's long-standing gap in per capita personal income relative to the nation. State income fluctuated between 80% and 85% of the national average throughout the 1990s but surged beginning in 2001 as the U.S. economy entered recession and Oklahoma entered the beginning of the recent boom in natural gas development.

State per capita income has since bounced to more than 95% of the national average in 2013, with the turnaround primarily traced to strong earnings growth in the state's oil and gas industry (see Figure 16). Total earnings in the sector surged from only about \$2 billion in 2000 to \$15 billion currently. Both wage and salary income and proprietor's income from the mining sector surged in the period and match the improvement in per capita income in near lockstep. All other industries combined contributed only modestly to the net gain relative to the nation.



Increased population growth and migration into Oklahoma

The impact of the oil and gas industry is also clearly visible in the sharp acceleration in migration into the state in recent years (see Figure 17). Migration surged beginning in 2006 as the state unemployment rate began to bottom around 4% and rapid job growth continued unabated from late 2003. Migration averaged nearly 20,000 persons per year between 2006 and 2009 as state population growth surged above 1% annually for the first time since the early 1980s. The demand for workers in oil and gas and related industries underlies the bulk of these population gains.



In-migration subsequently slowed in 2010 following both the national recession and extreme weakness in the oil and gas industry in 2009. This was consistent with the overall pattern of migration nationally in the period. Migration into the state quickly bounced back to nearly 15,000 persons in 2012 as hiring in the oil and gas industry accelerated once again.

Growing corporate presence and high-wage jobs

For policymakers, one of the goals of oil and gas tax policy is to create a deeper concentration of the industry in the state. Corporate and regional offices and the associated white collar and high-skilled labor are arguably equally as important as drilling activity as a source of economic stimulus.

The state has been remarkably successful in this respect. Oklahoma, along with Texas and Louisiana, serve as home to the three greatest concentrations of oil and gas industry activity in the nation (see Figure 18). Oklahoma continues to have the second highest overall concentration. Other than Texas, Oklahoma has the highest number of oil and gas wage and salary workers and proprietors and highest total earnings from the industry. Louisiana is a close third with a similar number of wage and salary workers, but has far fewer proprietors and only half the earnings of Oklahoma.

Colorado’s oil and gas industry remains only half the size of Oklahoma’s but is growing rapidly as the hub for Rocky Mountain development. California’s oil and gas sector is also about half the size of Oklahoma’s, with a much larger presence of multi-nationals but a much smaller base of proprietors. Both North Dakota and Wyoming have a large wage and salary base but both remain hampered in attracting corporate development by a remote location and intense winters.

Oklahoma’s corporate presence is even more impressive when viewed relative to the value of crude oil and natural gas produced. Although a solid second in corporate presence, Oklahoma ranks only sixth in the value of oil and gas production. California, North Dakota, and Alaska all have significantly greater production value but a much smaller corporate presence. Louisiana produces 25% more oil and gas by value than Oklahoma but derives less than half the earnings produced in Oklahoma from the industry.

Figure 18. Mining Industry Profile – Major Oil and Gas Producing States (2012)

	OK	TX	LA	CO	WY	NM	CA	ND	AK
Business Establishments	3,377	9,547	1,928	1,661	1,104	1,027	744	674	249
Employment:									
Wage & Salary	57,564	267,802	51,591	30,046	27,556	23,795	28,033	24,122	16,600
Proprietors	53,297	167,202	21,374	21,600	5,287	7,510	29,646	2,840	2,983
Total Employment	110,861	435,004	72,965	51,646	32,843	31,305	57,679	26,962	19,583
Income: (millions)									
Wage & Salary Income	5,328	32,362	4,578	3,161	2,301	1,770	3,801	2,311	2,128
Employee Compensation	6,303	37,293	5,286	3,716	2,731	2,118	4,433	2,610	2,497
Proprietor's Income	8,506	43,169	2,597	4,075	1,078	724	2,661	181	43
Total Earnings	14,809	80,461	7,883	7,790	3,809	2,842	7,093	2,791	2,539
Value of Oil & Gas Production (millions)									
Total Value	\$13,350	\$87,768	\$16,111	\$8,144	\$9,525	\$11,069	\$21,431	\$20,597	\$19,748
Oil Value	8,034	67,434	7,487	4,236	4,658	7,483	20,437	20,383	18,987
Gas Value	5,316	20,334	8,624	3,908	4,868	3,586	994	214	762

Source: Bureau of Economic Analysis, Bureau of Labor Statistics, Energy Information Administration, and RegionTrack

State labor force development is also increasingly focused on both the quality of jobs and skill-matching. Figure 19 details average wage rates across major occupations in the Oklahoma mining sector. The high average wages paid for high-skill technical workers are well known and provide a much needed boost to

overall state average wages. However, from an economic development point of view, the most important labor force effects from oil and gas may be the large number of high paying extraction, production, and transportation occupations in the industry that require only a high school diploma and extensive on-the-job training. These jobs are accessible to a large group of state workers and include derrick operators, rotary drill operators, roustabouts, and service unit operators, all with average wages between \$35,000 and \$50,000 annually.

Figure 19. Oklahoma Mining Industry Employment by Occupation and Wage

SOC Code	Occupation	Employment	Annual Wage
11-0000	Management Occupations	5,490	\$115,360
13-0000	Business and Financial Operations Occupations	4,040	65,730
15-0000	Computer and Mathematical Occupations	810	79,810
17-0000	Architecture and Engineering Occupations	4,490	133,080
19-0000	Life, Physical, and Social Science Occupations	1,800	129,520
23-0000	Legal Occupations	230	130,650
29-0000	Healthcare Practitioners and Technical Occupations	160	72,190
41-0000	Sales and Related Occupations	1,020	71,450
43-0000	Office and Administrative Support Occupations	6,990	34,890
45-0000	Farming, Fishing, and Forestry Occupations	70	29,030
47-0000	Construction and Extraction Occupations	19,380	42,420
49-0000	Installation, Maintenance, and Repair Occupations	2,260	43,810
51-0000	Production Occupations	3,150	47,640
53-0000	Transportation and Material Moving Occupations	5,780	39,500

Source: Bureau of Labor Statistics, OES Research Estimates, May 2012

The creation of middle tier jobs is critical for achieving balanced state economic development. A recent review of state employment patterns between 2010 and 2013 found that mid-skilled employment is contracting in most states. The few states adding middle tier jobs are generally those with low costs and strong overall job growth.⁵⁴ Since 2010, Oklahoma has created more than 21,000 mid-skill jobs, or 32% of state jobs created in the period, the eighth highest share among the states. Along with Oklahoma, other energy states in the top eight include Wyoming, North Dakota, Alaska, and New Mexico.

The state similarly excels in the creation of mid-level jobs when compared across major metropolitan areas.⁵⁵ Oklahoma City ranks fifth among the 51 largest metropolitan areas with a 2.1% gain in middle skill job growth from 2007 to 2013. In fact, only eight metropolitan areas experienced any growth in the middle of the labor market, with the top six metros all based in the traditional Oil Patch states of Oklahoma, Texas, and Louisiana. Overall, the top 51 metro areas have lost an average of 4.3% of middle-skill jobs since 2007.

Oil and gas activity is driving rural and state development

Despite a heavy concentration of activity in the state’s metropolitan areas, oil and gas activity is having a transformative effect in many smaller, non-metro areas of the state.⁵⁶ Job growth in the non-metro energy producing counties⁵⁷ in the recovery years of 2010 through 2012 averaged 5.3% versus 1.1% in the non-energy counties.

Most notably a group of fifteen non-metro counties with heavy oil and gas activity are generating a large share of state job growth. These counties include Alfalfa, Beaver, Beckham, Canadian, Dewey, Ellis, Garfield, Grady, Grant, Kingfisher, Major, Noble, Roger Mills, Woods, and Woodward. As a group, these

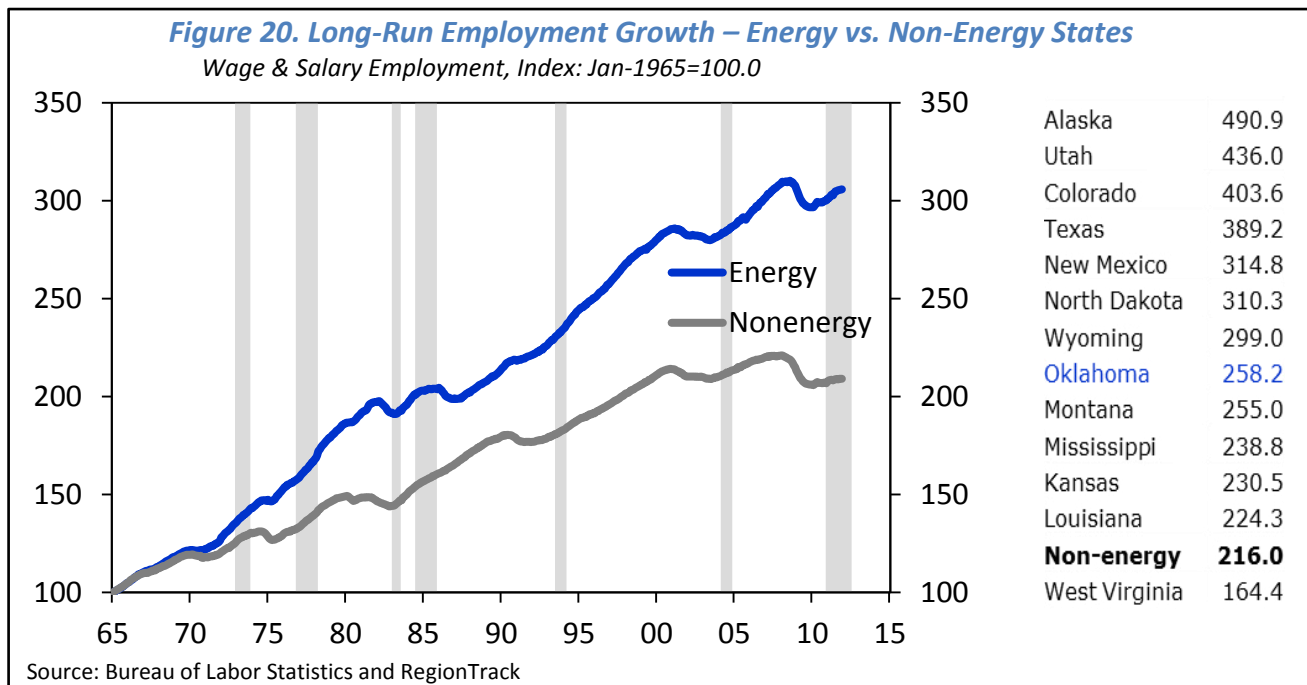
rural counties produced one in five net new jobs statewide in the recovery through the end of 2012. They further accounted for nearly 75% of the new jobs created across all non-metro counties.

Some of these counties easily qualify as ‘hyper-growth’ regions, especially Roger Mills, Beckham, Alfalfa, Woods, Ellis, and Beaver. They have all added 20% percent or more to their local employment base since early 2010 and retail sales gains have exceeded 100% year-over-year at some point in their surge. Geographically they line up along the western and north central borders of the state. Worth noting is the economic revival underway in some of the long-ago established oil and gas hubs around the state such as Anadarko, Blanchard, Newcastle, Clinton, Duncan, El Reno, Elk City, Enid, Weatherford, and Woodward.

Oil and gas activity has long played a central role in the economic success of these regions. A recent comprehensive study⁵⁸ closely examines the specific question of the long-term growth consequences of resource-based specialization for oil abundant counties in Oklahoma, Texas, and Louisiana. These counties are compared to others within a 200 mile radius while accounting for other geographic and economic factors that explain long-term growth. The findings indicate that in the period between 1940 and 1990, the oil abundant counties had higher employment density in mining, manufacturing, and agriculture; higher population growth; higher education levels; and higher per capita income. These counties also enjoyed better infrastructure and were much more likely to be crossed by an interstate or have a local civilian or public airport. Employers were attracted to these counties and willing to pay higher prices for land and labor due to the productive advantage of the oil-abundant counties. In short, being an oil-producing region has produced a range of positive economic benefits for many years.

These rural effects are an important part of the broader story underlying economic growth in Oklahoma the past several decades. Figure 20 illustrates the long-run difference in job formation in the energy states versus the non-energy states. **Since 1965, Oklahoma has added roughly 20% more jobs than the average of the non-energy producing states.** This is not just confined to Oklahoma. Every energy state except West Virginia has outperformed the group of non-energy states in job growth since 1965.

The underlying trends in energy exploration and production suggest that the current confluence of conditions could easily last another decade or longer. Oklahoma is poised to reap considerable economic benefits going forward from continued growth within the state’s energy sector.



VIII. Endnotes

- ¹ A detailed description of the research underlying Oklahoma’s targeted Key Business Ecosystems is available at: <http://okcommerce.gov/location-or-expansion/oklahomas-business-ecosystems/>
- ² See: “Clusters, Convergence, and Economic Performance.” Mercedes Delgado, Michael E. Porter, and Scott Stern. NBER Working Paper No. 18250, July 2012.
- ³ See Table 4 of: Mark C. Snead. “Are the Energy States Still Energy States?” 2009. *Economic Review*. Federal Reserve Bank of Kansas City. Available online at: <http://www.kc.frb.org/PUBLICAT/ECONREV/pdf/09q4Snead.pdf>
- ⁴ Video presentation available online: <https://www.youtube.com/watch?v=G7JhKX0iE9M#at=1787>.
- ⁵ Available online at: <http://www.fraserinstitute.org/research-news/display.aspx?id=18469>.
- ⁶ See: <http://online.wsj.com/news/articles/SB10001424052748704431804574539580310408964>.
- ⁷ See Baker-Hughes rig counts by state as of November 1, 2013. Available online at: <http://phx.corporate-ir.net/phoenix.zhtml?c=79687&p=irol-reports>.
- ⁸ See Oklahoma Corporation Commission annual reports and data files available online at: <http://www.occeweb.com/og/annualreports.htm> and <http://www.occeweb.com/og/ogdatafiles2.htm>.
- ⁹ See Baker-Hughes rig counts by drilling type for each basin and state as of November 1, 2013. Available online at: <http://phx.corporate-ir.net/phoenix.zhtml?c=79687&p=irol-reports>.
- ¹⁰ The estimate is based on a weighted average from a sample of both published and unpublished estimates that center around \$1.85 million per vertical well drilled above 15,000 feet, \$4.15 million per horizontal well above 15,000 feet, and \$6.7 million per deep well drilled below 15,000 feet. An estimated 78% of completed wells in 2012 were horizontal, 5% deep, and 17% conventional.
- ¹¹ See: Mark C. Snead. “The Economics of Deep Drilling in Oklahoma.” February 2005. Center for Applied Economic Research. Oklahoma State University. Available online at: http://economy.okstate.edu/caer/files/economics_of_deep_drilling.pdf; and Suzette Barta and Mark C. Snead. “The Economics of Deep Drilling in Oklahoma: Update 2000-2007.” April 2008. Center for Applied Economic Research. Oklahoma State University. A sample of a 304 deep wells drilled in Oklahoma between 2000 and 2007 suggests an average cost of \$6.7 million per well, with a range from \$4.0 million to \$10.0 million for most deep wells. Wells drilled below 17,500 feet cost an average of \$8.7 million per well.
- ¹² Unit Corp. reports estimated drilling costs of \$2.7 million for a group of wells in the Marmaton formation in the Oklahoma Panhandle: see http://www.oilandgasinvestor.com/Exploration-Production-Industry-News/About-Marmaton_117980. SandRidge, Chesapeake, and Eagle Energy report well costs of \$3 million to \$3.7 million in the Mississippi Lime formation in north central Oklahoma and south central Kansas: see http://www.epmag.com/item/Mississippi-Lime-moves-mainstream-oil-production-two-years_101719. For Granite Wash costs see: <http://investor.apachecorp.com/releasedetail.cfm?ReleaseID=763023> and http://www.ugcenter.com/Granite-Wash/Granite-Wash-Operators-Await-Gas-Prices-Target-Oilier-Zones_116704; Continental Resources reports Cana-Woodford well costs of \$9.5 to \$10 million in south central Oklahoma: see <http://www.worldoil.com/January-2013-Woodford-Shale-SCOOP-helps-advance-Oklahomas-drive-for-oil.html> and <http://www.reuters.com/article/2012/11/28/column-kemp-shale-oklahoma-idUSL5E8MSCY120121128>.
- ¹³ See other recent published estimates of well costs in various formations: <http://www.ogfj.com/articles/2013/09/shale-gas-production-economics-spreadsheet-model-and-inputs.html>; http://www.news-journal.com/business/local_business/haynesville-shale-drilling-showing-new-signs-of-life/article_ec69b364-cd84-514b-962f-ff21927dcbf7.html; http://www.realclearenergy.org/charticles/2013/05/27/well_costs_at_the_bakken_are_declining_107037.html; <http://bakkenshale.com/news/hesss-bakken-drilling-days-well-costs-down/>; <http://www.aogr.com/index.php/magazine/editors-choice/horizontal-drilling-accelerates-in-permian-basin>;
- ¹⁴ By individual commodity, total spending on construction in Oklahoma is roughly equal in size to capital spending by the oil and gas industry. However, construction expenditures are traced to a variety of industries as well as the household sector. Manufacturing is the most capital intensive industry nationally, with oil and gas second. However the high concentration of oil and gas in Oklahoma tips the balance well in favor of oil and gas.
- ¹⁵ See the National Income and Product Accounts (NIPA) available online at Bureau of Economic Analysis (www.bea.gov), Table 5.3.5 Private Fixed Investment by Type. Most of the investment spending reported for “Mining exploration, shafts, and wells” represents activity within the oil and gas sector.
- ¹⁶ Suzette Barta and Mark C. Snead: “The Economics of Deep Drilling in Oklahoma: Update 2000-2007.” April 2008. Center for Applied Economic Research. Oklahoma State University.
- ¹⁷ See article online at: <http://newsok.com/drilling-costs-4.62-billion/article/1974894>.
- ¹⁸ Manufacturing is the only major industry at the national level that produces more aggregate capital spending than mining. See the Census Annual Capital Expenditure Survey at <https://www.census.gov/econ/aces/>.

¹⁹ IMPLAN's (www.implan.com) Oklahoma dataset provides an estimate \$1.78 billion in capital spending in 2011. The 2007 Economic Census indicates \$1.58 billion in capital spending for Oklahoma manufacturers in 2007.

²⁰ See: Drilling Productivity Report. November 2013. U.S. Energy Information Administration. Available online at: <http://www.eia.gov/petroleum/drilling/>.

²¹ Full tax rules governing crude oil and natural gas production in Oklahoma are available online at: <http://www.tax.ok.gov/rules/rule4510.pdf>. Producers also pay an excise tax of 0.095% on the production of crude oil and natural gas.

²² There are other miscellaneous tax exemptions offered to the oil and gas industry. For example, there is a sales tax exemption for the sale of electricity for use in enhanced recovery methods of oil production and in reservoir dewatering projects. Many oil and gas firms have also filed for and received Quality Jobs Acts rebates in recent years. These rebates are not considered specific to the oil and gas industry because they are generally available to all businesses that qualify under Act rules.

²³ The current structure of the basic gross production tax in Oklahoma is described at: <http://www.tax.ok.gov/gp2.html>. Current incentive rebates are described at: <http://www.tax.ok.gov/gp1.html>

²⁴ The rate is reduced based on the prevailing price-based severance tax rate. When the rate is 7% the exemption is 6/7ths; a 4% rate carries a 3/4ths exemption; the exemption is not allowed when the tax rate is at 1%. In all cases, the effective severance tax rate is 1% after the exemption.

²⁵ See House Bill 2432, available online at: <http://legiscan.com/OK/drafts/HB2432/2010>

²⁶ See Table 6A from: Suzette Barta and Mark C. Snead. "The Economics of Deep Drilling in Oklahoma: Update 2000-2007." April 2008. Center for Applied Economic Research. Oklahoma State University. In the sample surveyed, a well drilled between 15,000 feet and 17,500 feet cost an average of \$5.45 million while a well drilled deeper than 17,500 feet cost an average of \$8.67 million.

²⁷ See Table 6A from: Suzette Barta and Mark C. Snead. "The Economics of Deep Drilling in Oklahoma: Update 2000-2007." April 2008. Center for Applied Economic Research. Oklahoma State University. In the sample examined, annualized production from a typical well 10,000 to 15,000 feet deep was 636,516 mcf per year; production was 1,467,831 mcf for wells 15,001 to 17,500 feet deep, more than double the rate of an average shallow well; and 3,581,612 mcf for wells deeper than 17,500 feet, almost six times the rate of an average shallow well.

²⁸ Drilling costs are well known to increase more than linearly with well depth. See Table 6A from: Suzette Barta and Mark C. Snead. "The Economics of Deep Drilling in Oklahoma: Update 2000-2007." April 2008. Center for Applied Economic Research. Oklahoma State University. On a per foot basis, well costs were \$334 per foot for wells 15,000 to 17,500 feet and \$442 per foot for wells deeper than 17,500 feet.

²⁹ For a discussion of decline rates across domestic fields, see: <http://www.ogj.com/articles/print/vol-110/issue-12/exploration-development/evaluating-production-potential-of-mature-us-oil.html>

³⁰ Refund data are based on Oklahoma Tax Commission estimates published in: David Blatt. "Unnecessary and Unaffordable." Oklahoma Policy Institute (OPI), October 2010. Available online at: <http://okpolicy.org/unnecessary-and-unaffordable>.

³¹ This includes an estimated \$125 million reduction in severance taxes due to the lower tax rate on deep wells beginning in FY2013.

³² Receipts reached record highs in current dollars in recent years, though they remain a much smaller share of the state budget than the windfall amounts received in the late 1970s and early 1980s when severance taxes reached a peak of 30% of total tax revenue.

³³ Census Bureau has not yet released a comparable FY2013 estimate for total tax revenue.

³⁴ The state's Constitutional Reserve Fund (CRF) is more commonly known as the Rainy Day Fund.

³⁵ See: http://www.lbb.state.tx.us/Other_Pubs/Natural%20Gas%20Tax%20Overview.pdf and <http://www.rrc.state.tx.us/education/seminars/og/spring2013/downloads/Day2-Session1/1-3C-HighCostGas-Handouts.pdf>.

³⁶ See Tax Exemptions Budget 2012-2013, Louisiana Department of Revenue. Available online at: [http://www.rev.state.la.us/forms/publications/TEB\(2012\).pdf](http://www.rev.state.la.us/forms/publications/TEB(2012).pdf).

³⁷ Pennsylvania natural gas well impact fee information is available online at: <https://www.act13-reporting.puc.pa.gov/Modules/PublicReporting/Overview.aspx>

³⁸ The survey and results are available online at: https://dl.dropboxusercontent.com/u/85965051/Agee_Presentation_to_Appropriations.pdf and https://dl.dropbox.com/u/85965051/Agee_FinalSurveyResponses.docx.

³⁹ See: "Mineral Tax Incentives, Mineral Production, and the Wyoming Economy." Shelby Gerking, William Morgan, Mitch Kuncie, Joe Kerkvliet. December 1, 2000; available online at: <http://eadiv.state.wy.us/mtim/StateReport.pdf> See also: Mitch Kuncie & Shelby Gerking & William Morgan & Ryan Maddux, 2003. "State Taxation, Exploration, and Production in the U.S. Oil Industry." *Journal of Regional Science*, Vol. 43(4), pages 749-770; available online at: <http://legisweb.state.wy.us/2001/interim/app/reports/oiltaxpaper%2011-26-01.pdf>

- ⁴⁰ Leighty and Lin (2012) find that production from marginally productive wells is the most sensitive type of production to tax rate changes in Alaska oil production. See: Wayne Leighty and C.Y. Cynthia Lin. 2012. "Tax Policy Can Change the Production Path: A model of Optimal Oil Extraction in Alaska." *Energy Policy*. Vol. 41, p. 759-774.
- ⁴¹ See: Frank Camm, Christopher W. Myers, R. Yilmaz Arguden, Susan J. Bell, and Thomas Jacobsson. "Effects of a Severance Tax on Oil Produced in California." Sep. 1982. Rand Corporation. Available online at: <http://www.rand.org/pubs/reports/R2940.html>.
- ⁴² See: Robert T. Deacon. 1993. "Taxation, Depletion, and Welfare: A simulation Study of the U.S. Petroleum Resource." *Journal of Environmental Economics and Management*. Vol. 24, p. 159-197.
- ⁴³ See "Rural Wealth Creation and Emerging Energy Industries: Lease and Royalty Payments to Farm Households." June 2013. Jeremy G. Weber, Jason P. Brown, and John Pender. Federal Reserve Bank of Kansas City, Research Working Paper RWP 13-07. Available online at: <http://www.kansascityfed.org/publicat/reswkpap/pdf/rvp13-07.pdf>
- ⁴⁴ Special state-level tabulations of employment by firm size at the industry level are available online from the Bureau of Labor Statistics at <http://www.bls.gov/cew/cewsizes.htm>.
- ⁴⁵ See: Robert T. Deacon. 1993. "Taxation, Depletion, and Welfare: A simulation Study of the U.S. Petroleum Resource." *Journal of Environmental Economics and Management*. Vol. 24, p. 159-197; and Mine K. Yucel. 1989. "Severance Taxes and Market Structure in an Exhaustible Resource Industry." *Journal of Environmental Economics and Management*. Vol. 16, p. 134-148.
- ⁴⁶ The U.S. Department of energy tracks energy consumption and production by fuel type at the state level. See the State Energy Data System, available online at: <http://www.eia.gov/state/seeds/>. 2011 is the latest year for which comprehensive data are available on state-level energy production and consumption. For 2011, Oklahoma produced 1,888.87 bcf of natural gas and 76.681 million barrels of petroleum. The state consumed 655.9 bcf of natural gas and 92.396 million barrels of petroleum. On a market value basis using Oklahoma prices of crude oil and natural gas, net exports of natural gas produced a surplus of \$4.815 billion while net imports of petroleum cost \$1.452 billion. The net surplus for the state is an estimated \$3.364 billion of the \$14.463 billion in value of oil and gas produced within the state in 2011, or 23% of the total value produced. The remaining 77% of the oil and gas produced within the state was used within the state.
- ⁴⁷ Roughly half of these payments are estimated to stay within Oklahoma.
- ⁴⁸ The 22% estimate is derived from a quarterly regression model linking Oklahoma corporate tax receipts to the market value of oil and gas production and the profitability and tax payments of oil and gas firms nationally.
- ⁴⁹ See: Interim Report to the 83rd Texas Legislature, Select Committee on Economic Development. Available online at: http://governor.state.tx.us/files/ecodev/select_committee_report.pdf.
- ⁵⁰ Available online at: <http://www.ok.gov/OSF/documents/bud14.pdf>.
- ⁵¹ See for example: Mark C. Snead and Dolores A. Willett. "The Economic Impact of Oil and Gas Production and Drilling on the Oklahoma Economy." December 2006. Center for Applied Economic Research. Oklahoma State University. Available online at: <http://digitalprairie.ok.gov/cdm/singleitem/collection/stgovpub/id/22158/rec/42>; Mark C. Snead and Suzette Barta. "The Economic Impact of Oil and Gas Production and Drilling on the Oklahoma Economy." October 2008. Center for Applied Economic Research. Oklahoma State University. Available online at: <http://www.oerb.com/Portals/0/docs/State%20Oil%20Gas%20Impact%20Draft%2020080916.pdf>; and Russell Evans. "Oklahoma's Oil and Natural Gas Industry Economic Impact and Jobs Report." Steven C. Agee Economic Research and Policy Institute. Available online at: <http://www.oerb.com/Portals/0/docs/2012%20OERB%20Economic%20Impact%20Study%20FINAL.pdf>.
- ⁵² Expenditure estimates are derived from the 2011 Oklahoma state dataset for the IMPLAN input-output model (www.implan.com).
- ⁵³ See: <http://newsok.com/general-electric-to-build-energy-research-center-in-oklahoma/article/3779406>.
- ⁵⁴ See: <http://www.newgeography.com/content/003993-middle-wage-jobs-that-have-survived-and-states-that-are-fostering-them>.
- ⁵⁵ See: <http://www.forbes.com/sites/joelkotkin/2013/10/24/the-cities-creating-the-most-middle-class-jobs/>.
- ⁵⁶ See: "Local and Regional Growth Patterns in the Recovery." *Oklahoma Economic Outlook*. April 5, 2013. RegionTrack, Inc. <http://www.regiontrack.com>.
- ⁵⁷ These counties are defined as those with 4% or more of total county earnings derived from the mining sector.
- ⁵⁸ See: Guy Michaels. "The Long Term Consequences of Resource-Based Specialisation." *The Economic Journal*. Vol. 121, March 2010, pp. 31-57.

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