



The Economic Impact of Oklahoma's Oil & Natural Gas Industry



2007

The Economic Impact of Oil and Gas Production and Drilling on the Oklahoma Economy

Prepared for

Oklahoma Energy Resources Board

Prepared by

Mark C. Snead, Ph.D.
Director and Research Economist

and

Suzette Barta, Ph.D.
Research Economist

**Center for Applied Economic Research
Spears School of Business
Oklahoma State University**

October 2008

The Economic Impact of Oil and Gas Production and Drilling on the Oklahoma Economy

Contents

INTRODUCTION	1
INDUSTRY TRENDS.....	2
Employment and Wages	2
Oklahoma’s Share of U.S. Crude Oil and Natural Gas Production.....	5
Crude Oil Trends	6
Natural Gas Trends	7
Oil and Gas Drilling Activity.....	8
ECONOMIC IMPACT	10
Linkages to Other Oklahoma Industries	11
Spillover Economic Impacts	12
TAX REVENUE ATTRIBUTED TO THE OIL AND GAS SECTOR.....	17
Gross Production Tax	17
Other Tax Revenue	19
SUMMARY	21
NOTES.....	23

The Economic Impact of Oil and Gas Production and Drilling on the Oklahoma Economy

INTRODUCTION

Oklahoma's oil and gas industry continues to expand to meet the challenges posed by the current environment of diminished energy supplies and increased demand for energy. The oil and gas sector has long served as the trademark industry of Oklahoma and has positioned the state as a vital component of the national energy infrastructure. Oklahoma continues to rank among the top tier of oil and gas producing states, producing an estimated 3.3 percent of the nation's crude, and 8.2 percent of U.S. natural gas output, in 2007.

Oklahoma is currently the nation's 3rd largest natural gas producing state and the 5th largest crude oil producer.

The activity of the state's oil and gas industry produces significant economic multiplier, or ripple, effects that impact most every sector and region of the Oklahoma economy. In 2007, the industry produced an estimated \$40 billion in output, more than three times the output produced at the recent industry bottom in 1999, and employed more than 76,000 workers earning \$8.8 billion in income. The oil and gas industry produces more output per worker than nearly all other industry sectors and is subsequently able to pay comparatively high wages to workers.

The ongoing upward shift in energy prices has once again triggered a surge in activity in the state's oil and gas industry. Drilling and production have expanded across the state as oil and gas firms have added more than 22,500 jobs since the bottom in hiring in 2002. The industry also continues to undergo an important structural change in terms of the relative proportions of oil and gas produced. Though crude oil production continues to decline in importance relative to natural gas, recent statewide data on drilling indicates faster growth in the number of oil wells completed relative to gas wells since 2005.

This report evaluates the current economic impact of Oklahoma's oil and gas industry on

The state produced an estimated 3.3 percent of the nation's crude oil and 8.2 percent of U.S. natural gas output in 2007.

the broader state economy.¹ The report first evaluates current trends in employment, drilling, and production and evaluates the role of the state in U.S. energy production. Next, the impact on the state economy is examined in terms of employment and income generated, output produced, and purchases by the oil and gas industry from other state firms. The final section of the report evaluates the tax revenue generated by oil and gas activity for state and local government.

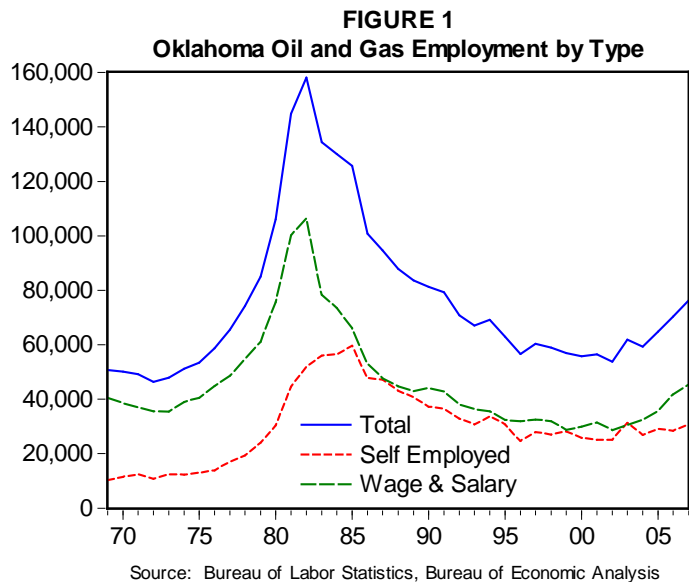
INDUSTRY TRENDS

Oklahoma’s oil and gas industry has transitioned through a significant cycle of restructuring the past two decades in response to changing geological fundamentals and energy market conditions. This section of the paper examines the impact of these changes on the role of oil and gas workers in the state labor force, including trends in total employment and wage levels. The next two sections examine changes in Oklahoma crude oil and natural gas production, along with the state’s role in the national energy infrastructure. A final section examines recent trends in exploration and drilling activity across the state.

Employment and Wages

From 1975 to the height of the oil boom in 1982, Oklahoma’s oil and gas companies added workers at an unprecedented pace, increasing the number of energy-related jobs statewide from approximately 50,000 to nearly 160,000. At the peak of the price-driven boom, nearly 1 in 10 state workers was employed in the oil patch.

Although oil and gas employment entered a long phase of contraction following the bust, the industry nevertheless remained an important and vital element of the state economy. Oil and



Oklahoma’s more than 76,000 oil and gas workers comprise 3.5 percent of the total state workforce.

gas employment as a share of the total state workforce bottomed at 2.7 percent in 2002, with approximately 53,000 workers, the same level seen in the early 1970s prior to the boom.

The surge in oil and gas prices beginning in 2000 has once again generated hiring gains in the industry. As shown in Figure 1, the state’s energy sector responded to market demands to oil and natural gas and increased hiring by more than 40 percent between 2002 and 2007, creating more than 22,500 new oil and gas jobs. Total employment at the state’s oil and gas firms reached a reported 76,297 persons in 2007, or about 3.5 percent of the total state workforce.

The state’s oil and gas companies paid \$8.9 billion in income to workers in 2007.

Table 1 provides a breakdown of state oil and gas employment by type (wage and salary versus self-employed) and activity (production versus drilling). Wage and salary employment in 2007 is estimated at 45,445 workers, while self-employed workers total 30,852. The oil and gas industry historically attracts a large number of entrepreneurs and is unique relative to other state industries in its large share of self-employed workers relative to wage and salaried workers. However, three in four of the new oil and gas industry jobs reported since 2003 are wage and salary positions.

The surge in industry growth is driving income gains in the industry. The state’s oil and gas workers earned total labor income of \$8.9 billion in 2007; employee compensation reached \$4.4 billion, while self-employed workers earned an additional \$4.5 billion in income. Wage and salary workers earned an average of \$97,420 and self-employed workers \$144,424 in compensation in 2007.

Table 1. Oklahoma Oil and Gas Industry Employment and Income (2007)					
	Employment	% Share	Total Labor Income	% Share	Avg. Labor Income
Employment by Type:					
Wage and Salary	45,445	59.6%	\$4,427,228,000	49.8%	\$97,420
Self Employed	30,852	40.4%	4,455,813,000	50.2%	144,424
Total by Type	76,297	100.0%	\$8,883,041,000	100.0%	\$116,427
Employment by Activity:					
Production	67,998	89.1%	\$8,414,221,706	94.7%	\$123,741
Drilling	8,299	10.9%	468,819,294	5.3%	56,494
Total by Activity	76,297	100.0%	\$8,883,041,000	100.0%	\$116,427

Source: Bureau of Economic Analysis, Bureau of Labor Statistics, Oklahoma State Econometric Model

Production jobs outnumber drilling jobs by more than 8 to 1, as shown in Table 1, or approximately 67,998 production jobs versus 8,299 drilling jobs. Production jobs include mostly administrative, professional, and technical staff and are heavily concentrated in the Oklahoma City and Tulsa metropolitan areas. Drilling jobs include mostly field personnel and are dispersed throughout the state. Average pay is significantly higher for production workers (\$123,741) than for drilling workers (\$56,494).

Oklahoma wage and salary oil and gas workers earned an average of \$97,420 in 2007. Self-employed workers earned

The high level of output generated by the oil and gas sector has long allowed the industry to pay attractive salaries relative to other industries in the state. Table 2 illustrates the average pay for wage and salary workers in the highest paying 3-digit NAICS (North American Industry Classification System) industry sectors in Oklahoma. NAICS industries 211 and 213 contain oil and gas production and drilling employment, and both appear among the top ten highest paying industries. In 2007, the average wage for NAICS 211 Oil and Gas Extraction (contains only production workers) was estimated at \$103,370 and Support Activities for Mining (contains both production and drilling workers) at \$65,948. These average pay levels are, respectively, more than 291 percent and more than 186 percent higher than the state average pay of \$35,496 for wage and salary workers across all industries.

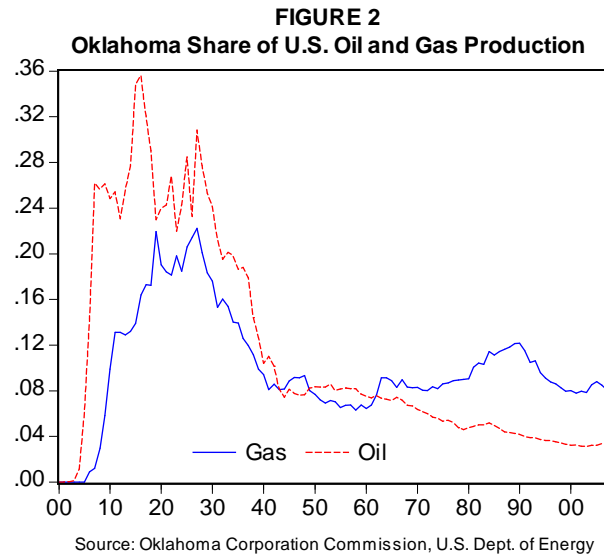
NAICS Industry Division	Average Annual Pay	Employment	Total Wages	Establishments
211 Oil and Gas Extraction	\$103,370	17,955	\$1,856,017,783	1,221
486 Pipe Transmission	83,280	1,790	149,071,296	82
523 Securities, Commodity Activities	78,479	4,503	353,366,497	1,019
221 Utilities	76,392	10,412	795,352,662	452
551 Management of Companies and Enterprises	69,459	13,332	926,040,917	403
324 Petroleum and Coal Products Manufacture	68,688	2,287	157,101,266	62
213 Support Activities for Mining	65,948	26,174	1,726,146,746	1,377
481 Air Transportation	56,803	8,683	493,241,805	70
423 Durable Goods Merchant Wholesaler	52,019	28,972	1,507,117,489	3,187
517 Telecommunications	51,356	14,057	721,891,123	824
All Industries	\$35,496	1,533,982	\$54,449,810,787	99,363

Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW)

Oklahoma's Share of U.S. Crude Oil and Natural Gas Production

Oklahoma crude oil production peaked in 1927-29 with average annual production around 250 million barrels. As shown in Figure 2, Oklahoma's share of total U.S. output approached 35 percent during this period. Much of the decline in the state's share of U.S. crude production occurred in the early 1930s, but the decline slowed markedly and reached a somewhat steady share of about 8 percent in the 1943 to 1966 period before resuming a steady but slower decline that is currently approaching 3 percent of U.S. output.

Oklahoma's share in 1966 was 7.2 percent, 5 percent in 1982 at the height of the oil boom, and 3.3 percent of total U.S. production in 2007. Even though the state's long-run share of total domestic oil production has declined, Oklahoma oil and gas fields remain strong relative to many other states and remain an important component of the overall U.S. energy program. The state's share of crude production has remained level just above 3 percent of national output since 2000.



Rank	State	Crude Production (barrels)	% of U.S. Crude Production	Rank	State	Natural Gas Production (billion CF)	% of U.S. Gas Production
1	Texas	386,816,000	20.8%	1	Texas	6,093.5	30.2%
2	Alaska	262,434,000	14.1%	2	Wyoming	2,256.0	11.2%
3	California	218,524,000	11.7%	3	Oklahoma	1,643.3	8.2%
4	Louisiana	74,433,000	4.0%	4	Colorado	1,627.8	8.1%
5	Oklahoma	60,762,339	3.3%	5	New Mexico	1,526.5	7.6%
6	New Mexico	59,064,000	3.2%	6	Louisiana	1,353.9	6.7%
7	Wyoming	53,442,000	2.9%	7	Alaska	444.4	2.2%
8	North Dakota	44,696,000	2.4%	8	Utah	385.4	1.9%
9	Kansas	36,298,000	1.9%	9	Kansas	371.7	1.8%
10	Montana	32,769,000	1.8%	10	California	312.2	1.5%
	Other	633,201,661	34.0%		Other	4,135.5	26.7%
	United States	1,862,440,000	100.0%		United States	20,151.2	100.0%

Source: U.S. Department of Energy, Energy Information Administration (EIA), Various state oil and gas agencies.

Oklahoma ranked fifth based on crude oil production for 2007, as shown in Table 3. Oklahoma has held this approximate rank since 2002. Among the 33 crude oil producing states and federal offshore fields, only 12 produced 1 percent or more of U.S. crude output.

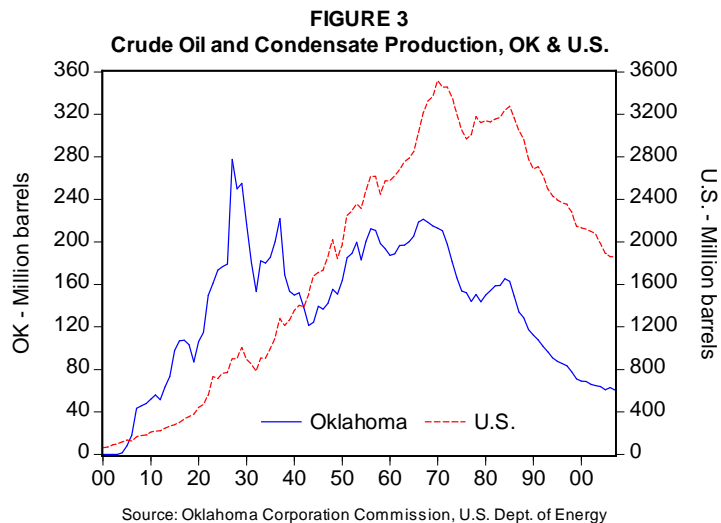
Relative to crude, Oklahoma remains a more important component of the nation’s natural gas infrastructure. As shown in Figure 2, the state’s contribution to national gas output was at its highest in 1932 when it provided 16 percent of the U.S. natural gas supply. The decline in Oklahoma’s share was steep from around 1935 to 1946, then rose slightly to 9.1 percent, and once again began to decline in the early 1950s. Natural gas production showed favorable gains through the 1980s when the state’s share peaked at 12.8 percent in 1989. The decline resumed from that year, albeit at a slower rate.

Oklahoma oil and gas companies produced 60.8 million barrels of oil and 1.64 trillion cubic feet of natural gas in 2007.

Since the recent surge in energy prices beginning in late 2000, the state has maintained at least an 8 percent share of U.S. natural gas production. Based on preliminary 2007 state production data in Table 3, Oklahoma now ranks third at 1.64 trillion cubic feet, behind only Texas and Wyoming. The state was second in the rankings in 2005 but has since fallen one place in the rankings due to rapid gains in gas production in Wyoming and a slight decline in Oklahoma gas production in the period.

Crude Oil Trends

Oklahoma crude oil production levels are shown in Figure 3 relative to overall U.S. production. The highs and lows in state crude production have largely mirrored changes in national production since the early 1940s. Prior to that time Oklahoma was experiencing oil discoveries at a much greater rate than the U.S.



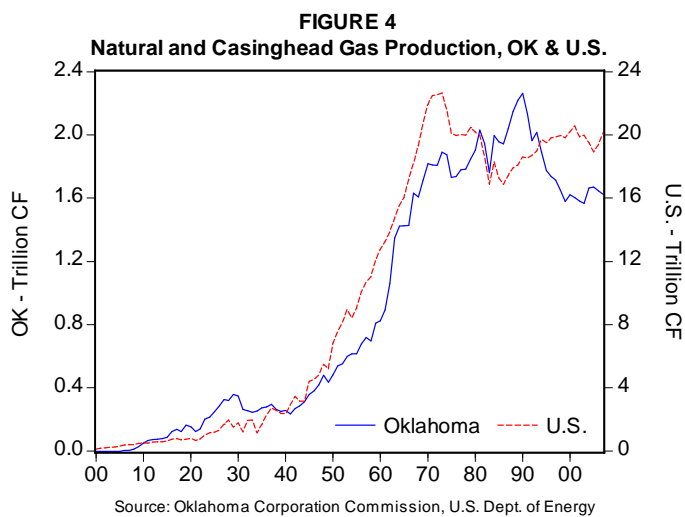
overall. State production has experienced little variability other than a steady decline since the modest bounce in crude output statewide during the oil boom. The boom was primarily visible through higher market prices, not large production increases.

State oil production peaked most recently at 165 million barrels in 1984, well behind the more than 200 million barrels produced two years in the 1950s, six years in the 1960s, and two in the 1970s. Crude oil output totaled 112 million barrels in 1990 and progressively declined throughout the remainder of the decade. Oklahoma’s recent position relative to U.S. production remains constant because the state’s overall decline rate has closely mirrored the decline in production at the national level.

Neither state nor national crude oil production has increased in a meaningful way in response to the recent upward shift in energy prices. Decline rates have slowed and oil well completions have increased, but the responsiveness of state crude production appears to be dominated by geological fundamentals at current market prices. Oklahoma Tax Commission estimates indicate state crude oil and condensate production totaled 60.8 million barrels in 2007, less than 40 percent of the crude production from the recent peak in production in 1984. The decline in crude production since the production peak in 1984 represents a 4.3 percent annual decline rate.

Natural Gas Trends

Figure 4 illustrates the path of long-run natural gas production in Oklahoma from 1900 to 2007, and as compared to the nation in the period. Oklahoma natural gas production maintained a close relationship to U.S. production until the recent state peak set in 1990. In 1990, state production reached 2.22 trillion cubic feet before declining to the recent low of 1.59 trillion cubic feet by 2002. State gas production has remained just above 1.6 trillion cubic feet annually since 2002. In contrast, natural gas output at the national level has remained mostly constant at 20



trillion cubic feet in the period since 1990, pushing the state's share of U.S. production down from 12 percent to 8.1 percent in the period.

While state output of natural gas has declined by one-fourth since the 1990 peak, it has shown more responsiveness to the recent surge in energy prices than state crude production. Oklahoma natural gas output managed to post small increases in both 2004 and 2005, reaching 1.67 trillion cubic feet, and declined only slightly in both 2006 and 2007, reaching 1.64 trillion cubic feet in 2007.

Oil and Gas Drilling Activity

Total well completions in Oklahoma have increased 50 percent since 2000.

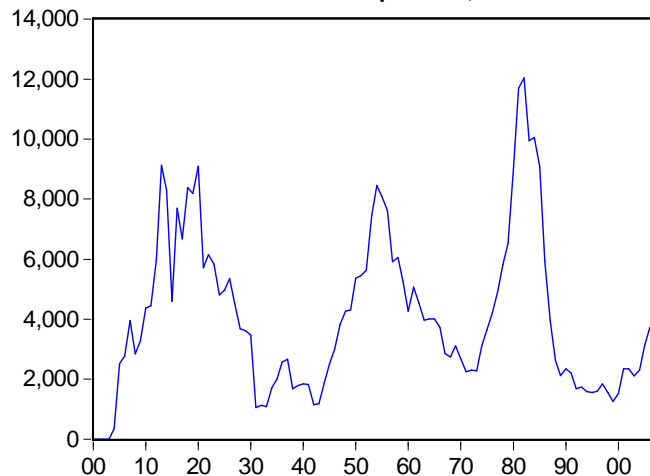
Drilling activity in Oklahoma has completed three major cycles of expansion and contraction in the past century (see Figure 5). The most recent cycle stretched from the mid 1970s to the mid 1980s and culminated with an all-time peak in drilling activity of more than 12,000 well completions in 1982. Following the peak, total completions declined rapidly to only 1,264 in 1999, the lowest number of completions since the World War II era.

However, the recent surge in energy prices has again stimulated drilling activity in Oklahoma. From 2000 to 2007, well completions have been on an upswing with a post-bust high of 3,517 wells completed in 2007, and an average of 3,450 wells completed annually in the 2005 to 2007 period. While drilling activity has increased in response to the new higher price environment, it is not yet

clear whether we are entering a fourth long-run expansion phase in exploration and drilling.

Since 2000, drilling activity is up approximately 50 percent; however in the last cycle in early 1970s to early 1980s, drilling increased six fold from approximately 2,000 wells to 12,000 wells annually in only a decade. An increase in activity of similar magnitude was seen in the prior cycle beginning in the early 1940s as drilling increased eight fold, from 1,000 wells to 8,000

FIGURE 5
Total Well Completions, OK



Source: Oklahoma Corporation Commission

wells, in a decade. The evidence continues to suggest that this remains a ‘mini’ oil boom and that the states diminishing geological fundamentals make it unlikely that the recent surge in drilling signals the onset of a cycle of oil and gas exploration similar in magnitude to the last cycle beginning in the early 1970s.

2007 Well Completions:		
Gas	2,285	65.0%
Oil	941	26.7%
<u>Dry</u>	<u>291</u>	<u>8.3%</u>
Total	3,517	100.0%

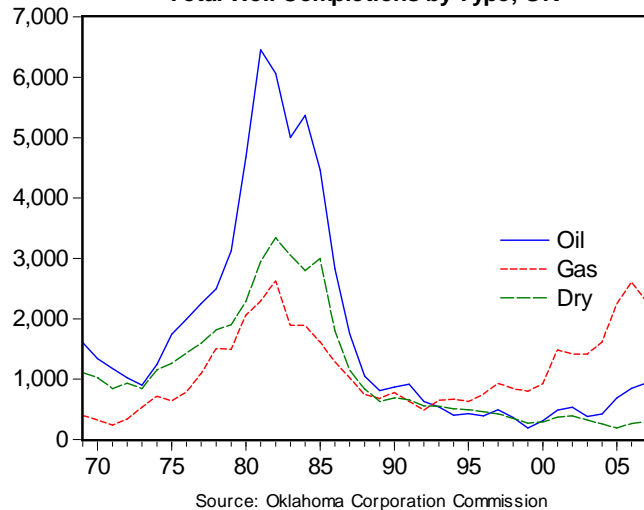
As seen in Figure 6, both gas and oil well completions have rebounded since 2000 in response to higher market prices. Prior to the early 1990s, oil wells typically outnumbered gas wells among total well completions. However, the mix of wells being drilled in Oklahoma has

Nearly 1,000 oil wells were completed in 2007, the highest number since 1991.

since shifted in favor of natural gas and continues to reflect an increasing emphasis statewide on exploration for natural gas relative to crude. However, despite the reluctance of drillers to search for oil in the 1990 to 2000 period, oil well completions have increased along with gas well completions since 2000 and have increased at a faster pace than gas completions since 2005.

Of the 3,517 wells completed across the state in 2007, 2,285 were gas wells, 941 were oil wells, and 291 were dry. This ratio of nearly 2.5 to 1 gas to oil wells is in contrast to drilling activity in 1982 when oil wells comprised more than 50 percent of total well completions. The declining share of oil drilling relative to natural gas reversed itself beginning in 2003. Oil completions increased from 379 in 2003 to 941 in 2007, a 250 percent increase, while gas completions increased from 1,417 to 2,285 in the same period, a 61 percent increase. Despite the larger percentage increase in oil drilling activity,

FIGURE 6
Total Well Completions by Type, OK



crude output has increased only one year since 2003 while natural gas output is up slightly in the period. Finally, the percentage of dry wells continues to decline as the industry posts increasingly higher success rates. Dry holes have averaged less than 10 percent since 2005, falling as low as

6.0 percent in 2005, ratios well below the historical state average of more than 30 percent dry wells since the 1950s.

Another trend in state drilling activity is the ongoing shift toward recovering deep reserves in the state's natural gas fields. Oklahoma has long played an important role in the development of deep drilling techniques for wells more than 15,000 in depth. The first well drilled below 30,000 feet for commercial production purposes was completed in Beckham County in 1972. Since 2000, nearly 1,000 deep wells have been completed in Oklahoma, with

More than 1,000 deep gas wells below 15,000 feet have been drilled in Oklahoma since 2000.

deep wells below 15,000 feet comprising 8 percent of all completions in 2007.

From an economic impact point of view, drilling a deep well is a much more significant economic event than drilling a typical shallow well. Much greater capital investment is required and deep wells tend to produce significantly greater average quantities of gas, both of which lead to greater economic impacts. From a recent study of deep drilling in Oklahoma,² most wells less than 15,000 feet deep cost less than \$1.2 million to complete, while deep wells below 15,000 feet average \$6.7 million to complete. On average, the production from a deep gas well is estimated to have an economic impact seven times that of a typical shallow well under 15,000 feet.

ECONOMIC IMPACT

The drilling and production activities of the oil and gas industry continue to have a large and pervasive effect on the Oklahoma economy. The recent upward shift in oil and gas prices has stimulated the expansion of the industry after it began to languish as recently as 1999 in response to the decline of oil prices to below \$11 per barrel. The industry has since expanded rapidly, experiencing strong hiring gains, a resurgence in drilling activity, and a substantial increase in the value of total industry output.

Oil and gas is a \$40 billion industry in Oklahoma. Total output in the industry has tripled since 1999.

The state's oil and gas sector produced an estimated \$40 billion in total output in 2007, more than three times the level at the recent bottom in 1999. Nearly 90 percent of total industry

output is generated by production, which includes professional, administrative, and technical workers. Slightly more than 10 percent of output is a result of drilling and exploration activities.

These activities create significant economic multiplier, or ripple, effects throughout the state economy. The oil and gas sector is well known to produce among the largest economic impacts of all industry sectors. The relatively large impact is the result of several factors, including the high value of output produced by the industry, the capital intensive nature of production and drilling, the large number of purchases made by oil and gas firms from other state firms, the high average wages paid to workers, and the large stream of tax revenue generated from severance taxes. The impact reaches most every geographic area of the state as well, as oil and gas workers resided in every county and the production of either oil or gas occurred in 73 of the state's 77 counties in 2007. The following sections of the report examine these impacts.

The production of either oil or gas occurred in 73 of the state's 77 counties in 2007

Linkages to Other Oklahoma Industries

Oklahoma oil and gas companies exert an important influence on the overall state economy largely because they make significant purchases of inputs from business establishments within Oklahoma. These purchases from Oklahoma businesses generate large and beneficial indirect effects on the Oklahoma economy and stimulate hiring statewide. Table 4 provides an estimate of the purchases made by Oklahoma companies engaged in oil and gas production and drilling within the state in 2007.

Total inputs purchased for both production and drilling activities by Oklahoma oil and gas companies were an estimated \$15.2 billion in 2007. Production activities required \$13 billion in inputs of goods and services while drilling firms purchased \$3.2 billion in inputs. Of the \$15.2 billion total, 73 percent or \$11.0 billion in value was transacted with Oklahoma businesses. The remaining 27 percent (\$4.2 billion) was spent on purchases from businesses located in other states or foreign countries.

Oklahoma oil and gas production generates \$11 billion in purchases of goods and services from other Oklahoma firms.

When evaluated for production (versus drilling), \$9.3 billion (78 percent) of goods and services were purchased from Oklahoma businesses versus \$2.7 billion (22 percent) from businesses outside the state. Because drilling activities produce significantly less output than production, the expenditures on inputs are proportionately smaller than for production. Drilling also requires a relatively higher proportion of inputs from outside the state. As shown in Table 4, \$1.7 billion (54 percent) was spent on inputs from Oklahoma businesses and \$1.5 billion (46 percent) from businesses outside of Oklahoma.

Direct purchases by the state's oil and gas firms reach most every industry sector of the state, including both goods- and services-producing sectors. As detailed in Table 4, production and drilling require large amounts of machinery and equipment from specialty manufacturers in the state. Chemical, petroleum, and mineral companies likewise are important suppliers to oil and gas firms. Traditional service firms such as eating and drinking establishments, food and beverage stores, and general merchandise stores receive significant purchases from the oil and gas industry.

Payments for the use of real estate also make up a significant component of in-state purchases for both production and drilling. Purchases of services from legal, financial, and medical professionals comprise a significant portion of the purchases made by the state's oil and gas firms. Transportation and warehousing firms play a key role in the ongoing activities of the industry, while utility, communications, and construction firms are also recipients of significant energy industry purchases.

Spillover Economic Impacts

The flow of business activity between Oklahoma oil and gas companies and other businesses within the state generate economic multiplier, or ripple, effects. These impacts can be described using well known measures of economic activity such as output, employment, and the components of value added shown in Table 4. The components of value added include labor income (employee compensation plus proprietor's income), other property income, and indirect business taxes. Other property income consists of payments for rents, royalties, and dividends while indirect business taxes include severance taxes, sales taxes, property taxes, and other taxes collected and remitted by the industry.

The economic impacts generated by the oil and gas industry can be described using the

following three measures:³

- direct effect - the employment and income generated directly within the Oklahoma oil and gas industry itself;
- indirect effect - the employment and income generated as a result of state oil and gas firms making purchases from other firms within the state;
- induced effect - the economic activity generated by new household spending resulting from compensation generated from the direct and indirect effects.

The three effects provide a convenient way to describe the resulting multiplier effects that occur as the oil and gas industry engages in drilling and production (direct effect), then impacts those firms that support and supply the oil and gas sector (indirect effect), and then finally affects the broader regional economy as worker's incomes and spending patterns are affected (induced effect).

Table 5 summarizes the estimated economic impact of the oil and gas industry on the broader state economy in 2007. The impacts are estimated separately for production and drilling and measured in three ways: 1) total economic impact, 2) impact per \$1 million in final output by the industry, and 3) impact per 1,000 jobs in the industry.

Each direct job in the oil and gas sector supports 3.2 additional jobs in the broader state economy.

Activity on the production side of the industry generated more than \$35 billion in direct output, resulting in multiplier effects (indirect and induced) supporting the production of an estimated \$25.3 billion in additional goods and services in other state industries. Drilling activities generated \$4.7 billion in output while simultaneously supporting the production of \$3.8 billion in indirect and induced goods and services in other industries.

In terms of direct oil and gas employment, 67,996 workers were employed in production-related activities and 8,299 in drilling. These workers supported an additional 245,826 jobs

Oklahoma's oil and gas industry supports an estimated 322,123 direct and indirect jobs statewide.

Table 4. Inputs Used in Oklahoma Oil and Gas Production and Drilling (2007)

Production			Drilling		
Oklahoma Input Demand:			Oklahoma Input Demand:		
Oil & gas extraction	\$4,964,941,316	13.7%	Petroleum and coal products	\$521,437,744	11.1%
Rental and leasing	1,327,472,419	3.7%	Management of companies & enterprises	284,112,274	6.0%
Support activities for oil & gas operations	681,714,446	1.9%	Legal services	121,133,530	2.6%
Petroleum refineries	316,252,331	0.9%	Wholesale trade	110,840,126	2.4%
Management of companies and enterprises	270,859,875	0.7%	Truck transportation	46,756,702	1.0%
Petrochemical manufacturing	219,874,626	0.6%	Other misc. chemical product manufacturing	45,059,048	1.0%
Power generation & supply	182,974,943	0.5%	Petroleum lubricating oil & grease manufacturing	35,465,118	0.8%
Wholesale trade	131,164,633	0.4%	Securities- commodity contracts- investments	33,830,643	0.7%
All other miscellaneous professional & technical	126,238,047	0.3%	Monetary authorities & depository credit intermed.	31,983,322	0.7%
Pipeline transportation	112,654,771	0.3%	Construction machinery manufacturing	29,040,035	0.6%
Legal services	98,164,768	0.3%	Advertising & related services	27,309,118	0.6%
Architectural & engineering services	71,926,357	0.2%	Oil and gas field machinery & equipment	26,948,549	0.6%
Scientific research and development services	71,865,296	0.2%	Machinery & equipment rental & leasing	24,934,700	0.5%
Monetary authorities & depository credit interme	64,112,688	0.2%	Mining machinery & equipment manufacturing	21,990,141	0.5%
Truck transportation	50,761,583	0.1%	Independent artists- writers- and performers	21,848,228	0.5%
Machinery and equipment rental and leasing	43,779,166	0.1%	Scientific research & development services	20,065,308	0.4%
Other misc. chemical product manufacturing	43,448,441	0.1%	Natural gas distribution	18,156,536	0.4%
Custom computer programming services	42,711,320	0.1%	Fitness and recreational sports centers	16,526,943	0.4%
Construction machinery manufacturing	39,735,720	0.1%	Warehousing and storage	15,784,492	0.3%
Management consulting services	30,799,072	0.1%	Real estate	13,213,937	0.3%
Securities- commodity contracts- investments	28,353,354	0.1%	Management consulting services	11,411,460	0.2%
Real estate	24,186,881	0.1%	Conveyor and conveying equipment manufacturing	11,317,277	0.2%
Oil and gas field machinery & equipment	23,851,410	0.1%	Other basic organic chemical manufacturing	11,163,193	0.2%
Industrial gas manufacturing	21,921,291	0.1%	Water- sewage and other systems	11,121,753	0.2%
Non-Depository credit intermediation & related a	16,089,459	0.0%	Other amusement- gambling- & recreation industries	10,402,314	0.2%
Petroleum lubricating oil & grease manufacturing	15,867,543	0.0%	Insurance carriers	10,326,497	0.2%
Warehousing and storage	15,094,125	0.0%	Accounting and bookkeeping services	9,086,762	0.2%
Water, sewage & other systems	14,180,294	0.0%	Telecommunications	8,165,007	0.2%
Iron and steel mills	13,118,282	0.0%	Rail transportation	8,109,704	0.2%
Conveyor & conveying equipment manufacturing	12,941,859	0.0%	Iron and steel mills	7,858,703	0.2%
Civic- social- professional & similar organizations	11,694,913	0.0%	Architectural & engineering services	7,831,558	0.2%
Plastics plumbing fixtures & all other plastics	11,520,244	0.0%	Petrochemical manufacturing	7,817,967	0.2%
Insurance carriers	10,118,487	0.0%	Non-Depository credit intermediation	6,840,301	0.1%
Metal valve manufacturing	9,622,308	0.0%	Other support services	6,119,546	0.1%
All Other Industries	176,221,311	0.5%	All Other Industries	128,181,605	2.7%
Oklahoma Input Demand	\$9,296,233,578	25.6%	Oklahoma Input Demand	\$1,722,190,142	36.6%
Imported Inputs	2,719,834,422	7.5%	Imported Inputs	1,457,409,666	30.9%
Total Input Demand	\$12,016,068,000	33.1%	Total Input Demand	\$3,179,599,808	67.5%
Value Added:			Value Added:		
Employee Compensation	3,981,008,696	11.3%	Employee Compensation	474,804,304	10.1%
Proprietor's Income	4,380,365,443	12.5%	Proprietor's Income	46,862,557	1.0%
Other Property Income	12,580,391,000	35.9%	Other Property Income	819,598,000	17.4%
Indirect Business Taxes	2,133,666,000	6.1%	Indirect Business Taxes	178,471,000	3.8%
Total Value Added	\$23,075,431,139	65.8%	Total Value Added	\$1,519,735,861	32.3%
Total Inputs and Value Added	\$35,091,499,139	100.0%	Total Inputs and Value Added	\$4,699,335,669	100.0%

Source: Bureau of Economic Analysis, IMPLAN Input-Output Model, Oklahoma State Econometric Model

statewide (sum of the indirect and induced employment). In total, an estimated 322,123 jobs statewide are provided either directly by the oil and gas sector or supported through multiplier effects generated by the industry. In other words, each direct job in the oil and gas sector supported 3.2 additional jobs in the broader state economy in 2007.

The income effects generated by the industry are substantial as well. Total direct labor income earned by both wage and salary and self employed workers in oil and gas is estimated at \$8.9 billion in 2007; \$8.4 billion for production and \$522.0 million for drilling. Through multiplier effects, an additional \$8.9 billion in labor income is supported statewide.

Oklahoma oil and gas workers earned \$8.9 billion in compensation in 2007, which supported an additional \$8.9 billion in compensation for other workers statewide through spillover effects.

In Part B of Table 5, the multiplier effects are estimated per million dollars of final output by the oil and gas industry. Each \$1 million in oil and gas production generates an additional \$720,000 of indirect and induced goods and services across Oklahoma; drilling activities generate an estimated \$810,000. There were 1.9 direct jobs for every million dollars in production activities, and 1.8 jobs in drilling. In terms of the indirect and induced effects, a total of 6.2 jobs were supported for every million dollars in direct production output, and 5.9 jobs supported by drilling activities.

For every \$1 million in final output in production, workers receive \$238,273 in direct labor income, versus a comparatively lower \$111,009 for drilling workers. The lower proportion of income for drilling reflects both the relatively more labor intensive nature of the production side of the industry and the more capital intensive nature of drilling. These payments of labor income to production and drilling employees per \$1 million in output support an estimated \$222,028 and \$226,948, respectively, in additional labor earnings to workers in other industries throughout Oklahoma.

Finally, the economic impacts are described per 1,000 production and drilling jobs in Part C of Table 5. For every 1,000 production jobs, \$516.0 million was generated in direct output, and through indirect and induced effects an additional \$371.6 million in goods and services was

generated statewide. Every 1,000 production jobs contributed to 3,210 additional jobs, while every 1,000 drilling jobs added 3,320 jobs, statewide. For every 1,000 production jobs, \$123.0

Table 5. Economic Impact of Oklahoma Oil and Gas Production and Drilling (2007)

Part A. Total Impact								
	Production				Drilling			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Output (\$ Million)	\$35,091	\$13,686	\$11,580	\$60,357	\$4,699	\$2,632	\$1,175	\$8,506
Employment (Jobs)	67,998	57,799	160,476	286,273	8,299	14,689	12,863	35,850
Value Added: (\$ Million)								
Employee Compensation	\$3,981	\$2,428	\$3,742	\$10,152	\$475	\$522	\$299	\$1,296
Proprietor's Income	4,380	1,183	438	6,001	\$47	197	48	292
Other Property Income	12,580	4,529	2,768	19,877	820	451	262	1,533
Indirect Business Taxes	2,134	661	661	3,457	178	89	71	339
Total Value Added	\$23,075	\$8,801	\$7,609	\$39,486	\$1,520	\$1,259	\$681	\$3,460

Part B. Impact Per \$1 Million in Final Output								
	Production				Drilling			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Output	\$1,000,000	\$390,000	\$330,000	\$1,720,000	\$1,000,000	\$560,000	\$250,000	\$1,810,000
Employment (Jobs)	1.9	1.6	4.6	8.2	1.8	3.1	2.7	7.6
Value Added:								
Employee Compensation	\$113,447	\$69,202	\$106,640	\$289,289	\$101,036	\$111,140	\$63,653	\$275,830
Proprietor's Income	124,827	33,703	12,483	171,013	9,972	41,883	10,271	62,127
Other Property Income	358,503	129,061	78,871	566,434	174,407	95,924	55,810	326,142
Indirect Business Taxes	60,803	18,849	18,849	98,501	37,978	18,989	15,191	72,158
Total Value Added	\$657,579	\$250,815	\$216,842	\$1,125,236	\$323,394	\$267,936	\$144,926	\$736,256

Part C. Impact Per 1,000 Jobs								
	Production				Drilling			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Output	\$516,063,519	\$201,264,772	\$170,300,961	\$887,629,252	\$566,281,177	\$317,117,459	\$141,570,294	\$1,024,968,930
Employment (Jobs)	1,000	850	2,360	4,210	1,000	1,770	1,550	4,320
Value Added:								
Employee Compensation	\$58,545,614	\$35,712,824	\$55,032,877	\$149,291,315	\$57,215,063	\$62,936,569	\$36,045,490	\$156,197,122
Proprietor's Income	64,418,644	17,393,034	6,441,864	88,253,543	5,647,051	23,717,614	5,816,463	35,181,128
Other Property Income	185,010,074	66,603,627	40,702,216	292,315,917	98,763,534	54,319,944	31,604,331	184,687,809
Indirect Business Taxes	31,378,175	9,727,234	9,727,234	50,832,643	21,506,186	10,753,093	8,602,474	40,861,753
Total Value Added	\$339,352,506	\$129,436,719	\$111,904,192	\$580,693,417	\$183,131,834	\$151,727,220	\$82,068,757	\$416,927,812

Source: Bureau of Economic Analysis, IMPLAN Input-Output Model, Oklahoma State Econometric Model

million was paid in direct employee compensation and proprietor's income; \$62.9 million for every 1,000 drilling jobs. Every 1,000 production and drilling workers support an additional \$114.6 million and \$128.5 million, respectively, in wages and salaries through indirect and induced multiplier effects.

TAX REVENUE ATTRIBUTED TO THE OIL AND GAS SECTOR

An economic byproduct of the activity in the oil and gas sector is the large amount of tax revenue generated for state and local governments. Both directly and indirectly, the state's oil and gas industry generates an estimated \$2 billion annually in total tax revenue. Currently the largest source of tax revenue generated by the industry is the gross production tax on oil and gas extraction. However, the oil and gas industry also generates significant amounts of personal and corporate income taxes and sales and use taxes. The impact of the tax revenue generated by the oil and gas industry is discussed in the following sections.

Gross Production Tax

Because the Oklahoma gross production tax is levied on the gross value of crude oil and natural gas produced, the recent rise in energy prices has produced windfall amounts of tax revenue to the state and has become an increasingly important component of the funding formula for government at the state and local levels.

Table 6 details the annual production tax revenue generated from oil and gas extraction for fiscal years 1984 to 2007. This period captures the relatively high production tax receipts at the end of the oil boom, the subsequent decline in receipts up to the recent bottom in industry activity in 1999, and the surge in receipts driven by the ongoing upward shift in energy prices. The composition of the severance tax stream has shifted from a fairly equal contribution from crude oil and natural gas during the 1980s to a much greater reliance on gas relative to crude in recent years. In the early 1990s, the share of gross production tax revenue from natural gas began to increase from just over 50 percent to its current level of approximately 75 percent of the overall total.

The oil and gas industry and its workers generated more than \$2 billion in total tax revenue for state and local governments in Oklahoma in 2007.

With the surge in energy prices, the three most recent fiscal years through 2007 have produced total severance tax receipts averaging almost \$1 billion annually. An all time high in gross production receipts was achieved in fiscal year 2006 with a total of \$1.12 billion; natural gas totaled \$859.2 million (76.7 percent) and crude oil \$260.9 million (23.3 percent). Severance tax payments totaled \$973 billion in fiscal year 2007, the second highest amount achieved. The jump in severance tax revenue has allowed the state to cut personal income tax rates in the period without jeopardizing the provision of public services.

Gross production taxes on oil and gas have averaged nearly \$1 billion annually since 2005.

Oklahoma law determines the allocation of severance tax receipts, and Table 7 shows the distribution in fiscal years 2004 to 2007. For oil, the majority of the allocation goes to support education. In total, 77.16 percent of the revenues are evenly distributed among the Common

Table 6. Oklahoma Gross Production Tax by Source

Fiscal Year	Crude Oil Tax	Crude as % of Total	Natural Gas Tax	Gas as % of Total	Total Tax
1984	\$326,893,006	47.9%	\$355,855,539	52.1%	\$682,748,545
1985	308,200,319	45.7%	366,093,122	54.3%	674,293,441
1986	236,712,824	45.0%	288,890,749	55.0%	525,603,573
1987	142,177,551	40.8%	206,020,761	59.2%	348,198,312
1988	155,779,858	41.9%	215,635,138	58.1%	371,414,996
1989	130,633,053	36.0%	232,290,970	64.0%	362,924,023
1990	142,368,628	36.4%	248,411,884	63.6%	390,780,512
1991	173,963,235	43.6%	225,212,160	56.4%	399,175,395
1992	135,814,455	39.6%	206,934,429	60.4%	342,748,884
1993	123,711,551	32.4%	258,421,295	67.6%	382,132,846
1994	93,692,790	27.0%	252,903,783	73.0%	346,596,573
1995	99,959,189	35.4%	182,466,669	64.6%	282,425,858
1996	105,087,666	33.7%	206,378,476	66.3%	311,466,142
1997	120,998,227	31.0%	269,834,041	69.0%	390,832,268
1998	89,114,322	26.0%	253,618,812	74.0%	342,733,134
1999	43,357,704	17.8%	199,886,735	82.2%	243,244,439
2000	112,017,406	29.2%	272,006,710	70.8%	384,024,116
2001	139,027,814	19.4%	577,415,242	80.6%	716,443,056
2002	103,642,265	26.7%	284,600,893	73.3%	388,243,158
2003	126,554,963	21.1%	473,352,155	78.9%	599,907,118
2004	140,043,060	20.4%	546,858,510	79.6%	686,901,570
2005	198,408,856	23.3%	654,108,534	76.7%	852,517,390
2006	260,932,294	23.3%	859,242,603	76.7%	1,120,174,897
2007	259,399,495	26.6%	714,347,122	73.4%	973,746,617

Source: Oklahoma Tax Commission, OSU Center for Applied Economic Research

Table 7. Distribution of Oklahoma Gross Production Tax Receipts

Gross Production Tax on Crude Oil					
Fund (Crude Oil Distribution)	Allocation	FY-2004	FY-2005	FY-2006	FY-2007
County Highways	7.14%	\$9,999,074	\$14,166,392	\$18,630,566	\$18,521,124
Local School Districts	7.14%	9,999,074	14,166,392	18,630,566	18,521,124
County Bridge & Road Improvement	4.28%	5,993,843	8,491,899	11,167,902	11,102,298
Rural Economic Access Plan (REAP)	4.28%	5,993,843	8,491,899	11,167,902	11,102,298
OK Student Aid Revolving Fund	25.72%	36,019,075	51,030,758	67,111,786	66,717,550
Higher Education Capital Fund	25.72%	36,019,075	51,030,758	67,111,786	66,717,550
Common Education Technology Fund	25.72%	36,019,075	51,030,758	67,111,786	66,717,550
Total - Crude Oil	100.00%	\$140,043,060	\$198,408,856	\$260,932,294	\$259,399,495

Gross Production Tax on Natural Gas					
Fund (Natural Gas Distribution)	Allocation	FY-2004	FY-2005	FY-2006	FY-2007
General Revenue Fund	85.72%	\$468,767,115	\$560,701,835	\$736,542,759	\$612,338,353
County Highways	7.14%	39,045,698	46,703,349	61,349,922	51,004,385
Local School Districts	7.14%	39,045,698	46,703,349	61,349,922	51,004,385
Total - Natural Gas	100.00%	\$546,858,510	\$654,108,534	\$859,242,603	\$714,347,122

Source: Oklahoma Tax Commission, Oklahoma Office of State Finance, OSU Center for Applied Economic Research

Education Technology Fund, Higher Education Capital Fund, and the Oklahoma Student Aid Revolving Fund. Education receives an additional 7.14 percent that is allocated to local school districts. Counties receive 7.14 percent of the revenues for highways and another 4.28 percent for bridge and road improvement. The Rural Economic Access Plan (REAP) receives the remaining 4.28 percent to stimulate growth in the rural regions of the state.

The gross production revenues from natural gas are distributed to fewer funds. The State General Revenue Fund is the largest recipient and is allocated 85.72 percent of the gross production tax revenues from natural gas. In fiscal year 2007, this amounted to more than \$612 million. The remaining \$102 million of the fiscal year 2007 allocation is shared equally by local school districts and counties for highway use, with each receiving 7.14 percent of the tax revenues, respectively.

Gross production taxes in Oklahoma are largely dedicated to education and infrastructure improvement at the local level.

Other Tax Revenue

Tax revenue generated by the oil and gas sector extends beyond the gross production tax. Estimates of the full range of taxes paid both directly and indirectly as a result of oil and gas

industry activity are shown in Table 8. While the gross production tax is the single largest source and represented nearly half of the tax revenues in fiscal year 2007, the personal income tax generated over \$664 million with its share of the total estimated at 32.3 percent.

Table 8. Oklahoma Tax Revenue Attributable to Oil and Gas Activity (FY2007)

Type of Tax	Tax Revenue	% of Total
Gross Production Tax		
Crude Oil	\$259,399,495	12.6%
Natural Gas	714,347,122	34.8%
Total Gross Production Tax	973,746,617	47.4%
Personal Income Tax	663,606,950	32.3%
Corporate Income Tax	97,630,346	4.8%
Motor Vehicle Tax	56,206,592	2.7%
Sales and Use Tax		
State	138,317,812	6.7%
Local	122,949,166	6.0%
Total Sales and Use Tax	\$261,266,978	12.7%
Total State Tax Revenue	\$2,052,457,483	100.0%

Source: Oklahoma Tax Commission, IMPLAN Input-Output Model, Oklahoma State Econometric Model, Oklahoma Office of State Finance

Another large source of tax revenue is the sales and use tax generated as a result of income payments to workers within the industry and taxable purchases by oil and gas firms. These taxes totaled an estimated \$261 million in fiscal year 2007, with \$138.3 million for state government and \$123 million for local government. Total sales and use tax collections accounted for 12.7 percent of the total tax revenues attributed to the oil and gas sector. The remaining sources of tax revenues are the corporate income tax, which brought in an estimated \$97.6 million, and the motor vehicle tax at over \$56 million. These final two sources contributed a smaller share percentage wise, yet are both sizeable in dollar amounts and important sources of revenue for funding state government.

In 2007, Oklahoma energy firms and their workers paid an estimated \$663 million in personal income taxes, \$98 million in corporate income taxes, \$261 million in sales and use taxes, and \$56 million in motor vehicle taxes.

SUMMARY

Although the state's oil and gas industry has downsized from the height of the oil boom in 1982 when the industry employed nearly 160,000 workers, the sector remains an important component of the Oklahoma economy. The ongoing upward shift in oil and gas prices has stimulated another cyclical expansion of the industry and is generating very visible economic impacts statewide. Total oil and gas employment in the state expanded by more than 40 percent between 2002 and 2007 and reached a reported 76,297 workers in 2007. Oklahoma oil and gas workers now comprise 3.5 percent of the total state workforce. Wage and salary employment is estimated at 45,445 workers, while self-employed workers total 30,852.

The state's oil and gas industry generated total labor income of \$8.9 billion in 2007; employee compensation reached \$4.4 billion while self-employed workers earned an additional \$4.5 billion in income. The oil and gas industry continues to pay high wages relative to other state industries; wage and salary workers earned an average of \$97,420 while self-employed workers earned more than \$144,424 in income in 2007.

Oklahoma's oil and gas fields remain strong relative to most other states and remain an important component of the overall U.S. energy program. Oklahoma's production totaled 60.5 million barrels of crude oil and 1.62 trillion cubic feet of natural gas. The state is the nation's fifth largest crude producer and has maintained about a 3.2 percent share of national crude output since 2000. However state crude output remains well below the 7.2 percent share in 1966 and 5 percent share in 1982 at the height of the oil boom. Oklahoma ranked third among the states in 2007 natural gas production. During the ongoing price surge, the state has maintained at least an 8 percent share of U.S. natural gas production but has slipped in the rankings behind Wyoming which has experienced faster production growth.

Drilling activity in Oklahoma has also responded to higher market prices for crude oil and natural gas. From 2000 to 2007, well completions have been on an upswing with a post-bust high of 3,722 wells completed in 2006. Well completions eased slightly to 3,517 in 2007 and have averaged 3,500 annually since 2005. The mix of wells drilled in Oklahoma remains heavily in favor of natural gas relative to crude, yet crude drilling has increased at a faster pace than gas since the surge in energy prices, especially since 2005.

The drilling and production activities of the oil and gas industry have a large and pervasive effect on the Oklahoma economy and create significant economic multiplier, or ripple,

effects. These impacts can be measured in terms of purchases of inputs from other state firms, employment and income generated, output produced, and tax revenue generated.

Total inputs purchased by Oklahoma oil and gas companies were an estimated \$15.2 billion in 2007. From this amount, 73 percent or \$11.0 billion in value was transacted with Oklahoma businesses. Direct purchases by the state's oil and gas firms reach most every industry sector of the state, including both the goods- and services-producing sectors.

In terms of the oil and gas industry's 76,297 workers, 67,998 workers were employed in production-related activities and 8,299 in drilling. These workers supported an additional 245,826 jobs statewide. In total, an estimated 322,123 jobs statewide are either provided directly by the oil and gas sector or supported through multiplier effects generated by the industry. In other words, each direct job in the oil and gas sector supported 3.2 additional jobs in the broader state economy in 2007. Total direct labor income earned by workers in oil and gas is estimated at \$8.9 billion; \$8.4 billion for production and \$522 million for drilling. Through multiplier effects, an additional \$8.9 billion in labor income is supported statewide.

The recent rise in energy prices has produced windfall amounts of tax revenue to the state. An all time high in gross production receipts was achieved in fiscal year 2006 with a total of \$1.12 billion; natural gas totaled \$859.2 million (76.7 percent) and crude oil \$260.9 million (23.3 percent). Severance taxes receipts totaled \$973.7 billion in fiscal year 2007. In fiscal years 2005 through 2007, total severance taxes have averaged nearly \$1 billion annually. The personal income tax generated an estimated \$663.6 million, the corporate income tax brought in \$97.6 million, and the motor vehicle tax totaled \$56.2 million. The industry directly and indirectly generated over \$138 million in sales and use tax for state government and around \$123 million for local government in fiscal year 2007.

NOTES

¹ For an analysis of the economic impact of the oil and gas industry at the local level, see Mark C. Snead, “The Local Impact of Oil and Gas Production and Drilling in Oklahoma.” Sep. 2008. Center for Applied Economic Research. Oklahoma State University.

² Barta, Suzette and Mark C. Snead. “The Economics of Deep Drilling in Oklahoma: Deep Drilling Update, 2000-2007.” Center for Applied Economic Research, Spears School of Business, Oklahoma State University, April 2008.

³ Caution must be exercised when using input-output multipliers to estimate the total economic activity “supported” by an existing industry or firm. Input-output multipliers are intended to predict the change in region-wide economic activity that results from an incremental change in a given industry within a regional economy.