



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

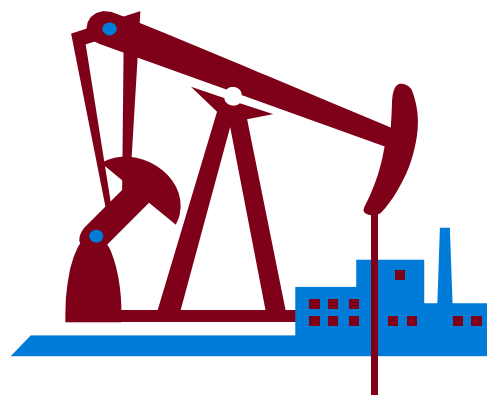
Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# Petroleum Industry's Economic Contribution to North Dakota in 2009

Dean A. Bangsund\*  
F. Larry Leistritz



North Dakota's largest basic sector industries, which include agriculture, manufacturing, and energy, provide much of the economic stimuli for the state's economy. North Dakota's energy industries can be conveniently separated into the activities that produce and distribute electricity, coal, and petroleum.

Recent upswings in oil activity, due in part to increased energy prices, the availability of improved exploration and extraction technology, and substantial potential for oil recovery from various formations in the Williston Basin, have brought new attention to the petroleum industry in North Dakota. Increase in leasing activity, more well drilling rigs operating in the state, substantial increases in severance tax collections, and other financial and economic aspects of the industry have all been discussed in the media. The purpose of this report is to document the physical and economic activity associated with the petroleum industry in North Dakota.

## BACKGROUND

The industrial organization of the petroleum industry in the United States is often divided into upstream and downstream components. The upstream components of the petroleum industry generally include exploration, development, and production of crude oil and natural gas. The downstream components include transportation, processing, distribution, marketing, and retail delivery of petroleum products.

The petroleum industry in North Dakota consists of both upstream and downstream components. For this study, the petroleum industry was limited to in-state exploration, extraction/production, transportation, and processing of crude oil and natural gas. The distribution, marketing, and retail sale of petroleum products (e.g., diesel, gasoline, propane, natural gas) was not included.

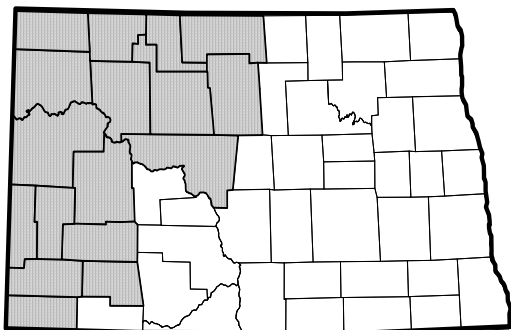
The exploration and extraction phases of the petroleum industry are not organized like other industries in the state. Firms that own producing wells (oil operators) contract much of the work of exploration and extraction of oil and gas to firms that specialize in various aspects of those processes. As a result, much of the expenditures incurred in the state for oil and gas production start with the oil operator but flow through the firms that provide support and service in the oil patch.

Oil and gas wells typically have royalty interests, owner/operator interests, and working interests. Royalty interests receive a share of the value of a well's output but do not share in the expenses associated with the well. Owner and working interests share, based on various percentages or arrangements, the remaining revenues and all of the expenses of a well. The well owner or operator is generally responsible or in charge of all operations.

---

\* Research scientist and professor, respectively, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.

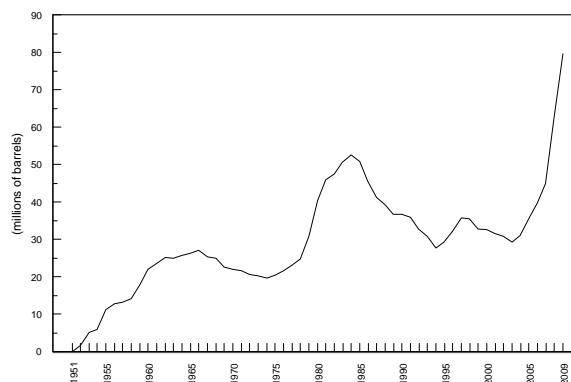
Oil and gas production is limited to the western third of North Dakota (Figure 1). Production is currently concentrated in Billings, Dunn, Bowman, McKenzie, Mountrail, and Williams Counties. Those counties accounted for 90 percent of state oil production in 2009 (North Dakota Industrial Commission 2010).



**Figure 1. Oil Producing Counties, North Dakota**

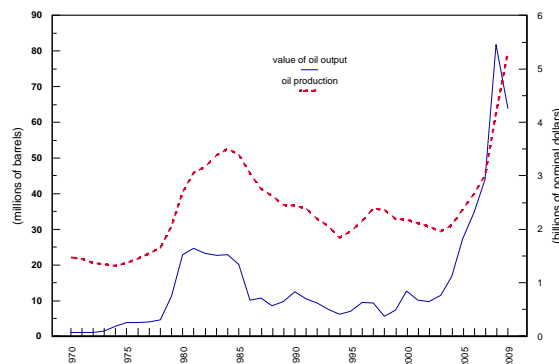
Nationally, North Dakota is ninth among oil producing states based on cumulative crude oil production from 1981 through 2009 (U.S. Department of Energy 2010). North Dakota ranked fourth nationally among oil producing states in 2009. From 1981 through 2009, North Dakota accounted for only 0.3 percent of national natural gas production and was ranked 20<sup>th</sup> among all states in 2009 (U.S. Department of Energy 2010).

Oil output in North Dakota has fluctuated substantially since commercial production began in the early 1950s (Figure 2). The first oil boom started in the early 1950s and lasted into the early 1960s. Oil production then declined until the next oil boom, which started in the mid 1970s and lasted until the mid 1980s. More recently, oil production has fluctuated between multiple years of increasing output and years of declining production. Currently, oil and gas production is increasing rapidly (Figure 2).



**Figure 2. North Dakota Crude Oil Production, 1951 through 2009**  
Source: North Dakota Industrial Commission (2010).

The annual value of oil production in North Dakota was estimated using monthly average price and production data from the North Dakota Industrial Commission (2010). The overall value of oil production in North Dakota, in nominal terms, has generally paralleled oil output despite price fluctuations over time (Figure 3).



**Figure 3. Production and Market Value of Crude Oil, North Dakota, 1974 through 2009**  
Source: North Dakota Industrial Commission (2010).

## PROCEDURES

An economic contribution analysis, as defined in this study, represents an estimate of all relevant in-state expenditures and returns associated with an industry. The economic contribution approach has been used for several

other industries in North Dakota (Bangsund and Leistriz 2004, 2005; Coon and Leistriz 2010).

### **Industry Surveys**

Firms that own or operate oil wells in the state were surveyed to obtain information on expenses for oil and gas exploration and extraction/production, general business expenses in the state, employment, measures of oil and gas production, and leasing and drilling activity. The survey of oil operators resulted in useable information from 13 firms. The firms' production from owned/operated wells represented about 43 percent of the state's 2009 production of crude oil and natural gas.

Another survey was conducted for firms engaged in pipeline transportation of crude oil and unprocessed natural gas in North Dakota and included firms that process crude oil and natural gas in North Dakota. The processor/pipeline survey provided estimates of the amount and type of expenditures made in North Dakota and in-state employment by those firms. Firms operating pipelines for the transport of refined or processed petroleum products were not included in the study.

A third survey was conducted for firms that provide service and products to oil operators in the state. A fourth survey of companies providing leasing/brokerage services to petroleum sector firms was conducted to obtain information on oil leasing activities in North Dakota.

### **Estimation Techniques**

The survey oil operators, processing firms, and oil field companies provided data to set the level of spending and to determine the type and distribution of spending among sectors of the North Dakota economy. Benchmark expenses for extraction/production, transportation, and administrative expenses were estimated per barrel of oil equivalent (BOE). Total state production in 2009, expressed in BOE, was then used with survey estimates of in-state expenditures per BOE to generate state-level estimates for extraction/production, transportation, and administrative spending. In-state employment by oil operators was estimated in the same manner. Benchmark expenses for exploration were estimated per well drilled and were used with data

on the number of wells drilled in North Dakota in 2009. Data from the survey of leasing/brokerage firms was used with secondary data from state agencies to estimate private lease bonuses paid to North Dakota residents.

Other in-state expenditures, such as severance taxes, public lease bonuses, and royalty payments represented a combination of survey data, state-level statistics, and information obtained from various state and federal governmental agencies.

### **Input-Output Analysis**

Economic activity from a project, program, policy, or activity can be categorized into direct and secondary impacts. Direct impacts are those changes in output, employment, or income that represent the initial or first-round effects of the project, program, policy, or activity. Secondary impacts (sometimes further categorized into indirect and induced effects) result from subsequent rounds of spending and respending within the economy. Input-output (I-O) analysis traces linkages (i.e., the amount of spending and respending) among sectors of an economy and calculates the total business activity resulting from a direct impact in a basic sector (Coon et al. 1985).

This process of spending and respending can be explained by using an example. A single dollar from a North Dakota wheat producer (*Households* sector) may be spent for a loaf of bread at the local store (*Retail Trade* sector); the store uses part of that dollar to pay for the next shipment of bread (*Transportation* and *Agricultural Processing* sectors) and part to pay the store employee (*Households* sector) who shelved or sold the bread; the bread supplier uses part of that dollar to pay for the grain used to make the bread (*Agriculture-Crops* sector) ... and so on.

## **RESULTS**

The economic contribution of the petroleum industry was primarily based on estimates of in-state expenditures from exploration, extraction/production, transportation, and processing of crude oil and natural gas. Estimates of in-state expenditures were combined with estimates of oil and gas royalties, state severance taxes, and lease bonuses to determine

total direct impacts. Subsequently, the direct impacts were applied to the North Dakota Input-Output Model to estimate the secondary impacts.

### **Direct Economic Impacts**

The direct impacts from the petroleum industry in North Dakota included expenditures for exploration, extraction/production, transportation, and processing of crude oil and natural gas in North Dakota. Direct impacts also included various revenue streams originating from either oil and gas exploration, such as lease bonuses, or oil and gas production, such as severance taxes and royalty payments.

#### **Exploration**

The economic effects of exploration come from expenditures within North Dakota for activities such as seismic testing, geological research, lease expenses, environmental research, land survey work, excavation, road building, construction of drill site, delivery of electricity, pipeline development, and actual drilling of oil and/or gas wells.

In-state expenditures for exploration and drilling were estimated at about \$4.7 million per well drilled. The petroleum industry drilled 522 wells in North Dakota in 2009, yielding about \$2.4 billion in direct impacts. Lease bonuses in North Dakota were estimated at over \$357 million in 2009, which included \$103 million for state leases, \$48 million for federal leases (Office of Natural Resources Revenue 2010), and about \$206 million for private mineral leases. The \$48 million in federal lease bonuses represented the portion returned to North Dakota. The combination of exploration expenses and lease bonuses resulted in \$2.8 billion in direct impacts in 2009.

#### **Production**

The economic effects of oil and gas production come from expenditures for removing crude oil and natural gas from the ground, maintenance and inspections of equipment, and all other production related activities, such as well work overs, well idling, shutdown, and abandonment activities. Also included were the general business expenditures incurred in North Dakota by oil operators. Royalty revenues, both

private and public, as well as state collections from the gross production tax and extraction tax (severance taxes), were included as direct impacts.

Estimates of total in-state expenditures in 2009 for extraction/production and general business expenses were derived from the survey of oil operators and estimated on a BOE basis. North Dakota produced 79,706,495 barrels of oil and 92,491,011 mcf of natural gas in 2009. Those volumes of oil and gas resulted in an estimated \$598 million for in-state expenditures for extraction and \$386 million for general business expenses. State royalties were about \$56 million (North Dakota State Land Department 2010). Total federal royalties returned to North Dakota were about \$13 million (Office of Natural Resources Revenue 2010).

Total royalties reported by oil operators were estimated at 16.6 percent and 16.7 percent of well output for oil and gas, respectively. Private royalties were estimated by subtracting state and gross federal royalties from estimated total royalties. Total private royalties from oil and gas production in North Dakota in 2009 were estimated at \$649 million. However, data from the survey of leasing/brokerage firms revealed an in-state mineral ownership ratio of 54.4 percent. Applying the in-state mineral ownership ratio to the total private royalties generated an estimate of \$353 million in payments to North Dakota residents. Total collections from the gross production tax and extraction tax in calendar year 2009 were about \$203 million and \$190 million, respectively (Office of State Tax Commissioner 2010). Total direct impacts in the extraction/production segment of the industry were estimated at \$1.8 billion.

#### **Processing**

The processing segment of the industry included transportation of crude oil and natural gas by truck and pipeline to collection points and processing centers, natural gas processing, and crude oil refining. Estimates of in-state expenditures for natural gas pipeline operation, crude oil pipeline operation, natural gas processing, and crude oil refining were obtained from the survey of processors. Direct impacts included \$69 million in transportation expenses paid to in-state entities by oil operators.

Processing activities, which included pipeline transportation of unprocessed natural gas and crude oil, natural gas processing, and crude oil refining were estimated to have in-state expenditures of \$242 million. Total direct impacts were estimated at \$311 million. To avoid double counting of potential impacts, in-state purchases of crude oil and unprocessed natural gas by processors were excluded in the study.

### Secondary Economic Impacts

Secondary economic impacts were estimated for exploration, extraction, and processing components of the industry. Results from the North Dakota Input-Output Model revealed that secondary economic impacts from exploration in North Dakota in 2009 would be nearly \$4.7 billion. The \$1.8 billion in direct impacts for oil and gas production activities produced an estimated \$2.5 billion in secondary economic impacts. Finally, the transportation and processing segment was responsible for \$566 million in secondary economic impacts. Total secondary economic impacts from all components of the petroleum industry were estimated at \$7.7 billion. Across all industry segments, considerable secondary impacts were generated in the *retail trade* (\$2.5 billion), *households* (\$2.4 billion), *finance, insurance, and real estate* (\$558 million), *communications and public utilities* (\$385 million), and *government* (\$381 million) sectors.

### Government Revenues

Governmental revenues, usually based on tax collections, are another important measure of the economic effect of an industry on an economy. The petroleum industry is unlike many other industries in North Dakota in that severance taxes (taxes placed on the value of oil and gas removed from the ground) are based on gross revenues produced by the industry. In contrast, taxation for most other industries is more traditional and usually limited to real property and net income. Another distinction that makes the petroleum industry different from most industries is that governments can hold mineral leases and receive royalties and lease bonuses. Of course, the petroleum industry also generates revenues from traditional sources, such as personal income, corporate income, sales and use, and property tax collections.

Severance taxes, sales and use taxes, personal income taxes, corporate income taxes, property taxes, royalties, lease bonuses, charitable donations, and licenses, fees, and permits combined for \$822 million in government revenues that were directly attributable to the petroleum industry in North Dakota in 2009 (Table 1). Exploration, extraction/production, and processing segments of the industry were responsible for about 30, 68, and 2 percent, respectively, of the total government revenues from the petroleum industry in North Dakota.

**Table 1. State and Local Government Revenues, Petroleum Industry, North Dakota, 2009**

Revenue Type	Included as direct impacts	Estimated from secondary impacts
	-----	000s \$ -----
Severance Taxes	392,971	not applicable
Property Taxes	86,499	not applicable
Royalties	69,547	not applicable
Licenses, Permits, Fees	15,609	not available
Corporate Income	3,585	not available
Lease Bonuses	151,320	not applicable
Personal Income Taxes	6,361	72,948
Sales and Use Taxes	22,946	115,397
Charitable Donations	455	not available
Undetermined Taxes <sup>a</sup>	72,474	not applicable
<b>Total</b>	<b>821,767</b>	<b>188,345</b>

<sup>a</sup> Represents general in-state taxes paid that were not specifically identified by survey respondents.

## **Gross Business Volume**

The total economic effect of an industry on a local, state, or regional economy can be measured by estimating the total amount of business activity generated by that industry. Total business activity, sometimes called gross business volume, is generally defined as a combination of direct and secondary economic impacts.

The in-state gross business volume (direct and secondary impacts) of oil and gas exploration was estimated at \$7.53 billion in 2009. Extraction of oil and gas generated a gross business volume of \$4.26 billion in 2009. The processing component of the petroleum industry in 2009 was estimated to generate a gross business volume of about \$877 million (Table 2).

Industry-wide direct impacts from the petroleum industry were estimated at \$4.9 billion in 2009. Total secondary economic impacts associated with the industry were estimated at \$7.75 billion. The gross business volume for the petroleum industry in North Dakota in 2009 was estimated at \$12.7 billion (Table 2).

## **Employment**

Estimates of direct employment within the petroleum industry were generated from the surveys of oil operators, service and support firms, and processors. Two additional estimates were derived from data obtained from Job Service North Dakota (2010) and Office of Workforce Safety and Insurance (2010).

Employment in North Dakota by oil operators in 2009 was estimated at 1,668 full-time equivalent (FTE) positions. Employment in the processing segment of the industry, which included some pipeline employment, was estimated at 748 FTE jobs. Total employment in the oil field for contract work, which includes exploration and extraction segments of the industry, was estimated at 15,911 FTE jobs. The petroleum industry, as defined and evaluated in this study, was estimated to create and support 18,328 FTE positions in North Dakota in 2009.

Employment in the petroleum sector ranged from over 5,312 FTE to less than 19,872 FTE according to estimates from Job Service

North Dakota (2010). Workforce Safety and Insurance measures the number of individuals working in the petroleum industry, but does not measure the number of FTEs. Data from Workforce Safety and Insurance (2010) placed the number of individuals working in the petroleum sector in North Dakota at 18,426. Both Job Service North Dakota and Workforce Safety and Insurance do not capture all employment as some sole proprietors and self-employed individuals are not counted.

Secondary employment is a term used to describe jobs that are created and supported by the volume of business activity generated by an industry, but does not include jobs that are part of the industry. The petroleum industry in North Dakota was estimated to generate \$7.75 billion in secondary business activity, which was sufficient to support 46,800 FTE jobs in North Dakota.

## **COMPARISON TO PREVIOUS INDUSTRY ASSESSMENTS**

The first comprehensive economic evaluation of the petroleum industry in North Dakota was conducted in 2006 and was reflective of conditions present in the industry in calendar year 2005 (Bangsund and Leistritz 2007). A second assessment was conducted in 2008 and was reflective of conditions in calendar year 2007 (Bangsund and Leistritz 2009). The results reported in this study were based on conditions present in the industry in calendar year 2009.

While energy prices were not directly used to generate estimates of industry activity, prices directly influence some measures of industry output, such as tax collections and royalties. Oil prices, adjusted for inflation using the Gross Domestic Product Implicit Price Deflator, were similar in 2005 and 2009, but both average annual prices were lower than received in 2007. Gas prices decreased substantially in real terms over the three periods. Oil production increased from 35 million barrels to nearly 80 million barrels over the five-year period. Gas production jumped from 58 million mcf in 2005 to over 92 million mcf in 2009 (Table 3).

**Table 2. Direct and Secondary Economic Impacts, Petroleum Industry, North Dakota, 2009**

Economic Sector	Industry Component			
	Exploration	Production	Processing	Totals
	----- 000s \$ -----			
Construction	188,575	144,748	68,536	401,859
Transportation	25,315	12,694	77,333	115,342
Communications and Public Utilities	305,811	138,243	74,124	518,178
Ag Processing and Misc Manufacturing	109,564	149,662	29,461	288,687
Retail Trade	2,181,788	981,179	163,924	3,326,891
Finance, Insurance, and Real Estate	472,332	240,462	46,102	758,896
Business and Personal Services	208,936	100,641	46,827	356,404
Professional and Social Services	237,983	110,023	19,276	367,282
Households (personal income)	3,062,014	1,536,491	264,718	4,863,223
Government	474,932	673,126	54,977	1,203,035
Other sectors <sup>a</sup>	263,311	167,771	31,906	462,988
Gross Business Volume	7,530,561	4,255,040	877,184	12,662,785

<sup>a</sup> Includes various agricultural and mining sectors.

The number of wells drilled increased from 240 in 2005 to 522 in 2009. The average cost to drill a well in the state increased in real terms from \$1.6 million in 2005 to nearly \$4.7 million in 2009. The result of those changes increased exploration expenditures in the state by about 480 percent from 2005 to 2009.

An increase in oil and gas output has contributed to higher expenditures for the production segment of the industry. From 2005 to 2009, royalty payments and collections of severance taxes both increased reflecting an increase in the overall value of oil and gas production in the state. From 2005 to 2009, total direct expenditures for oil and gas production increased by about 83 percent in real terms.

The change in direct expenditures in the processing and transportation segment of the industry reflected an increase in processing and transporting volumes, one-time construction expenditures associated infrastructure expansion,

and an increase in transportation expenses. Direct impacts in this segment of the industry increased in real terms from 2005 to 2009 by 117 percent.

From 2005 to 2009, state and local governmental revenues from the petroleum industry increased by over \$646 million or 178 percent in real terms (Table 4).

Employment in the industry also showed substantial change from 2005 through 2009. Overall, total direct employment within the industry was estimated to increase by 13,277 FTE jobs from 2005 to 2009 (Table 5).

All segments of the industry showed substantial gains, in real terms, in direct and secondary economic impacts from 2005 to 2009. The difference in gross business volume for extraction in 2005 and 2009 was nearly \$6.3 billion. The gross business volume for extraction/production segment of the industry increased by \$1.7 billion or by 70 percent.



**Table 3. Oil and Gas Production Statistics, North Dakota, 2005, 2007, and 2009**

Measures of Industry Output	Calendar Year 2005	Calendar Year 2007	Calendar Year 2009	Percent Change	
				2005- 2009	2007- 2009
Crude oil (barrels)	35,659,583	45,057,874	79,706,495	123.5	76.9
Natural gas produced (mcf)	57,970,459	70,799,663	92,491,011	59.5	30.6
Natural gas sold (mcf)	50,695,691	55,094,857	65,077,431	28.4	18.1
Number of operating/active wells (monthly avg)	3,391	3,759	4,190	23.6	11.5
Number of wells drilled	240	336	522	117.5	55.4
Average annual price per barrel of crude oil in North Dakota*	\$51.41 nominal \$55.65 real	\$65.10 nominal \$66.75 real	\$54.03 nominal \$54.03 real	5.1 -2.9	-17.0 -19.1
Average annual price per mcf of natural gas in North Dakota*	\$8.57 nominal \$9.28 real	\$6.69 nominal \$6.86 real	\$3.75 nominal \$3.75 real	-56.3 -59.6	-43.9 -45.3

\* Nominal dollars adjusted to real (2009) dollars using the Gross Domestic Product-Implicit Price Deflator.  
Source: Oil and Gas Division, North Dakota Industrial Commission (2010).

**Table 4. Estimates of State and Local Government Revenues Generated by Petroleum Industry, North Dakota, 2005, 2007, and 2009**

State and Local Government Revenues	2005*	2007*	2009	Percent Change	
				2005-2009	2007-2009
----- 000s \$ -----					
Included as Direct Impacts					
Sales and Use, Property, and Income taxes	41,600	106,300	119,400	198	12
Royalties**	41,200	57,200	69,500	69	22
Severance Taxes	165,100	256,700	393,000	138	33
Lease Bonuses (net federal and state)	18,600	9,100	151,300	715	1,554
Licenses, Fees, Permits, Donations, and undisclosed /undetermined taxes	39,400	103,800	88,500	126	-15
Totals	304,000	533,100	821,800	170	54
Estimated from Secondary					
Economic Activity	38,800	75,900	115,400	198	52
Sales and Use	21,300	47,100	72,900	243	55
Personal Income					
Direct and Secondary Estimates of State and Local Government Revenues	364,000	656,100	1,010,100	178	54

\* Nominal 2005 and 2007 dollars adjusted for inflation using Gross Domestic Product-Implicit Price Deflator and reflect 2009-equivalent dollars.

\*\*Net federal and state royalties from oil and gas production, and included royalties from processing activities returned to North Dakota entities by the Office of Natural Resources Revenue (2010).

Economic activity associated with processing and transportation increased by over \$476 million. The gross business volume for the entire industry tripled from 2005 to 2009 from \$4.2 billion in 2005 to \$12.7 billion in 2009 (Table 5).

## SUMMARY

The purpose of this study was to estimate the economic contribution of crude oil and natural gas exploration, extraction, transportation, and processing in North Dakota in 2009. Data for the study came from a survey of oil operators (i.e., firms that own or operate oil wells), a survey of pipeline and processing firms, a survey of firms provide service, support, and equipment in the oil patch, and a survey of lease/brokerage firms. Additional information was obtained from various governmental agencies.

The economic effects of the industry were defined by first estimating industry expenditures and other revenue streams associated with oil and gas exploration, production, transportation, and processing. Industry expenditures and government revenues were allocated to the North Dakota Input-Output Model to estimate the secondary economic effects that result from spending and re-spending of the direct expenditures within the economy. Gross business volume is a combination of direct and secondary economic effects.

Industry-wide direct and secondary economic impacts from the petroleum industry were estimated at \$4.9 billion and \$7.7 billion, respectively. The gross business volume for the entire industry in North Dakota in 2009 was estimated at \$12.7 billion. A gross business volume of \$12.7 billion translates to about \$133 per BOE. Based on active wells in the state, the overall economic effect (direct and secondary impacts from all segments of the industry) would

be about \$3 million annually per active well.

Other notable economic measures included 18,328 full-time jobs, economy-wide personal income of \$4.9 billion, statewide retail sales of over \$3.3 billion, direct contributions to local and state government tax revenues of \$822 million, indirect contribution of \$188 million in general state tax collections, and secondary employment of over 46,800 FTE jobs.

Energy prices were not directly used in the study to generate estimates of industry activity; however, prices influence some measures of industry output, such tax collections and royalties. Oil prices were similar in 2005 and in 2009, but were higher in 2007. However, oil prices in the 2009 study remained well below the extreme price spikes observed in 2008. Gas prices, both in nominal and real terms, decreased substantially over the five-year period. Oil production increased from 35 million barrels to nearly 80 million barrels from 2005 to 2009. Gas production jumped from around 58 million mcf in 2005 to over 92 million mcf in 2009. In addition to increases in oil and gas production, exploration activities continued to increase as the number of wells drilled in the state went from 240 in 2005 to 336 in 2007 to 522 in 2009.

Gross business volume for exploration increased in real terms by over 470 percent from 2005 due to an increase in drilling activity combined with an increase in the drilling cost per well. Gross business volume associated with oil and gas production increased by \$1.7 billion or by 70 percent; changes that largely paralleled increased oil and gas production. The gross business volume for transportation and processing increased by \$476 million. The gross business volume for the entire industry tripled from 2005 to 2009 from \$4.2 billion to \$12.7 billion. Other notable increases included direct employment expanding by 263 percent and government revenues rising by 178 percent.

## CONCLUSIONS

Changes in energy prices, drilling activity, and oil and gas production in North Dakota have made the petroleum industry the one of largest single basic-sector industries in the state. Comparisons of the industry's economic importance in 2009 with previous estimates from 2005 and 2007 reveal the industry tripled its economic size in five years. The primary reason for the substantial increase has been due to expenditures for oil drilling/exploration activities.

The figures reported in this study are substantial, and comparisons to other basic-sector industries may be helpful in placing results from this study in context. From 2001 through 2003, the wheat industry in North Dakota was estimated to produce a gross business volume of \$4.2 billion annually (in 2009 dollars). In 2009, the lignite industry in North Dakota was estimated to

generate \$3 billion in gross business volume (Coon and Leistriz 2010). Estimates of the gross business volume for the petroleum industry were \$4.2 billion in real terms in 2005, nearly \$8.4 billion in 2007, and \$12.7 billion in 2009. Direct employment in the coal industry was estimated at 4,087 FTE positions, compared to 18,328 FTE jobs in the petroleum industry in 2009.

Economic estimates presented in this report represent a snapshot in time, and will not necessarily reflect the future economic impact of the industry. The sheer size of the industry in 2009 suggests that much of North Dakota's recent economic vitality can be linked to the expansion of petroleum exploration, production, and processing in the state. Current activity levels in the petroleum industry clearly make it one of the key forces in the North Dakota economy.

**Table 5. Key Economic Values, Petroleum Industry, North Dakota, 2005, 2007, and 2009**

Category	2005*	2007*	2009	Percent Change	
				2005-2009	2007-2009
----- 000s \$ -----					
<u>Direct Impacts</u>					
Exploration	481,800	1,575,400	2,802,700	482	78
Extraction/Production	984,600	1,341,700	1,799,400	83	34
Processing/Transportation	143,400	268,400	310,800	117	16
All Segments	1,609,800	3,185,500	4,912,900	205	54
<u>Secondary Impacts</u>					
Exploration	838,900	2,790,700	4,727,800	464	69
Extraction/Production	1,524,600	2,006,100	2,455,700	61	22
Processing/Transportation	257,800	456,800	566,300	120	24
All Segments	2,621,200	5,253,600	7,749,900	196	48
<u>Gross Business Volume</u>					
Exploration	1,321,000	4,366,000	7,530,600	470	73
Extraction/Production	2,509,000	3,348,000	4,255,000	70	27
Processing/Transportation	401,000	725,000	877,200	119	21
All Segments	4,231,000	8,439,000	12,662,800	199	50
Governmental Revenues	364,000	656,000	1,010,100	178	54
Industry-wide Employment	5,051	11,812	18,328	263	55

\* Nominal 2005 and 2007 dollars adjusted for inflation using Gross Domestic Product-Implicit Price Deflator and reflect 2009-equivalent dollars.

## REFERENCES

- Bangsund, Dean A. and F. Larry Leistritz. 2009. *Economic Contribution of the Petroleum Industry to North Dakota in 2007*. AAE Report No. 639. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 2007. *Economic Contribution of the Petroleum Industry to North Dakota*. AAE Report No. 559. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 2005. *Economic Contribution of the Wheat Industry to North Dakota*. AAE Report No. 554. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 2004. *Economic Contribution of the Sugarbeet Industry in Minnesota, North Dakota, and Eastern Montana*. AAE Report No. 532, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Coon, Randal C. and F. Larry Leistritz. 2010. *North Dakota Lignite Energy Industry's Contribution to the State Economy for 2009 and Projected for 2010*. AAE Staff Paper 10001. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Coon, Randal C., F. Larry Leistritz, Thor A. Hertsgaard, and Arlen G. Leholm. 1985. *The North Dakota Input-Output Model: A Tool for Analyzing Economic Linkages*. Agricultural Economics Report No. 187, Department of Agricultural Economics, North Dakota State University, Fargo.
- Job Service North Dakota. 2010. *North Dakota Employment and Wages: 2009 Annual Averages*. Job Service North Dakota, Bismarck, ND.
- North Dakota Industrial Commission. 2010. Unpublished data on oil and gas production, well drilling activity, and energy prices. Oil and Gas Division, Department of Mineral Resources, North Dakota Industrial Commission, Bismarck, ND.
- North Dakota State Land Department. 2010. Oil and gas lease statistics. <http://www.land.state.nd.us/> Minerals Management Division, North Dakota State Land Department, Bismarck, ND.
- Office of State Tax Commissioner. 2010. Unpublished data on state collections of gross production tax and extraction tax. Office of State Tax Commissioner, Bismarck, ND.
- Office of Natural Resources Revenue. 2010. <http://www.onrr.gov/ONRRWebStats/Home.aspx> Office of Natural Resources Revenue, U.S. Department of the Interior, Denver, CO.
- U.S. Department of Energy. 2010. <http://www.eia.doe.gov/> Energy Information Administration, U.S. Department of Energy, Washington, D.C.
- Workforce Safety and Insurance. 2010. Unpublished employee counts by job classification. Workforce Safety and Insurance, State of North Dakota, Bismarck.

## Further Information

This document is a summary of a more comprehensive report which contains additional information. Please address your inquiries regarding this publication to: Department of Agribusiness & Applied Economics, P.O. Box 6050, Fargo, ND, 58108-6050, Phone: 701-231-7334, Fax: 701-231-7400, Email: [ndsu.agribusiness@ndsu.edu](mailto:ndsu.agribusiness@ndsu.edu).

The main report and this summary document are also available electronically at the following web sites: <http://ageconsearch.umn.edu/> or <http://www.ndoil.org/> .

The study authors and study sponsors would like to thank the companies and their employees and all the other individuals who took the time to complete and return the industry questionnaires or otherwise assisted by providing information for the study.

Financial support was provided by the North Dakota Petroleum Council. We express our appreciation for their financial support and extend our appreciation to Ron Ness, President, North Dakota Petroleum Council, for his leadership and guidance throughout the study.

The authors assume responsibility for any errors of omission, logic, or otherwise. Any opinions, findings, or conclusions expressed in this publication are those of the authors and do not necessarily reflect the views of the or the NDSU Department of Agribusiness and Applied Economics.

NDSU is equal opportunity institution.

Copyright © 2010 by Bangsund and Leistritz. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided this copyright notice appears on all such copies.

