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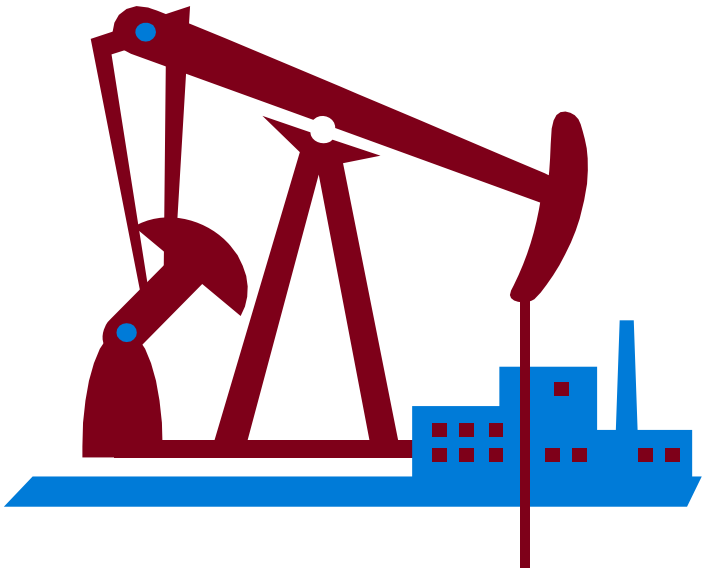
Petroleum Industry's Economic Contribution to North Dakota in 2007



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Executive 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 2007. Expenditures made in North Dakota by oil companies represented the direct impacts of the industry. Secondary economic impacts result from the spending and respending of the direct impacts and were estimated using the North Dakota Input-Output Model.

Surveys were used to collect production, expenditure, and employment data for the petroleum industry in North Dakota. Oil operators (i.e., firms that own or operate oil wells) in the state were surveyed to obtain information on in-state expenses for oil and gas exploration, expenses for oil and gas extraction/production, general business expenditures, employment, oil and gas output, and leasing and drilling activity. A similar survey was conducted for firms engaged in pipeline transportation and processing of crude oil and natural gas in North Dakota. A third survey of leasing/brokerage firms was used to develop estimates of private lease bonuses paid to in-state mineral owners. Key parameters from a previous study were used with current data to estimate employment and expenditure patterns of firms that provide service and support in the oil fields

The survey of oil operators produced financial data on about 34 percent of North Dakota's oil and natural gas production in 2007. Secondary data, obtained from government agencies, was combined with survey data to estimate royalties, lease bonuses, and severance taxes.

Total in-state expenditures in 2007 for oil and gas exploration (e.g., seismic testing, well drilling) were estimated from survey data and statewide drilling statistics. A total of 336 wells were drilled in 2007. Average expense per well for oil operators was estimated at $4.3 million. The combination of in-state expenses for exploration and lease bonuses resulted in $1.536 billion in direct impacts in 2007. The secondary economic impacts associated with exploration activities were estimated at $2.721 billion. The in-state gross business volume (direct and secondary impacts) of exploration activities was estimated at $4.257 billion in 2007.

Estimates of oil and gas extraction/production expenses, general business expenses for oil operators, private and public mineral royalties, and state severance taxes were derived from survey data and secondary information obtained from various government agencies. The state had 3,759 producing wells which combined for over 45 million barrels of oil and 70.8 million mcf of natural gas in 2007. Total direct impacts for oil and gas production were estimated at $1.308 billion in 2007. Total secondary economic impacts associated with extraction activities were estimated at $1.956 billion. The in-state gross business volume of oil and gas extraction/production was estimated at $3.264 billion in 2007.

In-state expenditures for transportation expenses for crude oil, pipeline operation expenses, natural gas processing, and crude oil refining were estimated to have a direct impact in North Dakota of $261.7 million in 2007. Total secondary economic impacts

associated with processing and transporting crude oil and natural gas were estimated at $445 million. Processing and transporting crude oil and natural gas generated a gross business volume of $707 million in 2007.

Industry-wide direct and secondary economic impacts from the petroleum industry were estimated at $3.106 billion and $5.123 billion, respectively. The gross business volume for the entire industry in North Dakota in 2007 was estimated at $8.229 billion.

Additional measures of the petroleum industry's economic importance to the state include direct employment for 7,719 full-time jobs, economy-wide personal income of $3.1 billion, statewide retail sales of $2 billion, direct contributions to local and state government tax revenues of $520 million, indirect contribution of $120 million in state government general tax collections, and secondary employment of 38,500 full-time equivalent jobs.

Comparing various production statistics between 2005 and 2007 revealed that the number of producing wells, oil and gas production, and drilling activities all increased in the state. Oil and natural gas prices between the two periods were similar after adjusting 2005 figures for inflation. From 2005 to 2007, expenditures for exploration (i.e., well drilling and leasing mineral rights) in the state increased nearly 230 percent in real terms (i.e., correcting for inflation). By comparison, expenditures for oil and natural gas production over the same period paralleled changes in oil and gas output and were estimated to increase by 36 percent in real terms. Processing and transportation activities also showed substantial growth over the period due to increased processing and transportation volumes and expansion of processing and pipeline capacity. Economic activity associated with the processing segment of the industry increased in real terms by 81 percent. Overall, the gross business volume (i.e., direct and secondary economic effects) of the industry was estimated to double in size in real terms from $4.1 billion in 2005 to $8.2 billion in 2007.

While this study is a snapshot in time, results from this study would suggest that recent increases in exploration, processing and pipeline capacity and output, and increases in crude oil and natural gas production, have translated into substantial increases in gross business volume for the state. The economic size of the industry has grown in recent years to become one of most single important basic-sector activities in the state. The industry provides substantial governmental revenues through traditional tax collections, royalty revenue, lease bonuses, and severance taxes. In addition to public sector revenues, the petroleum industry continues to act as a solidifying force in the North Dakota economy through an expansion of industry-based employment and indirectly through bolstered secondary economic activity involving nearly all sectors of the economy.

The sheer size of the industry in 2007 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.

Petroleum Industry's Economic Contribution to North Dakota in 2007

Dean A. Bangsund and F. Larry Leistritz*

Introduction

North Dakota's largest basic sector industries, which include agriculture, manufacturing, and energy, provide much of the economic stimuli for the state's economy. These large industries are generally comprised of distinct sectors or economic groups. For example, agriculture in North Dakota is often considered a combination of crop production and livestock. The energy industry in North Dakota is also comprised of several distinct sectors that are commonly treated as separate activities. North Dakota's energy industries can be conveniently separated into the activities that produce and distribute electricity, coal, and petroleum.

While separating the energy industry into similar activities is relatively straight forward, identifying the economic players within those sectors is less clear. In the case of electricity generation, a handful of firms and generating facilities exist within the state. The same situation exists with coal production–a handful of companies operate at a limited number of locations. However, the industrial organization associated with oil and natural gas production is very different. Rather than having a handful of firms and a limited number of site-specific facilities and locations, the petroleum industry involves hundreds of firms and a multitude of facilities spread out over the western third of North Dakota.

North Dakota's rank among the nation's top 10 oil producing states is common knowledge to those in the petroleum sector, and national oil production statistics are readily available to the general public (U.S. Department of Energy 2008). In 2006, the first comprehensive economic assessment of the petroleum industry in the state was conducted (Bangsund and Leistritz 2007). Since that time, much attention has been focused on the industry; however, much of the attention has less to do with a revelation of the industry's importance to the state, but rather due to substantial changes in drilling activity, oil output, tax revenues, and dramatic swings in crude oil prices.

Recent upswings in oil activity since 2005, 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, expansion of well drilling rigs operating in the state, substantial growth in severance tax collections, and other financial and economic aspects of the industry have all been discussed in the media. Despite a recently completed study of the industry in 2006, another assessment of the industry is

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warranted to track the substantial change in physical and economic activity in North Dakota's oil patch.

Ongoing and repeated assessments of key industries in North Dakota are not unprecedented. Actually, many key industries periodically re-assess their economic importance in the state. Examples include several assessments for the wheat and sugarbeet industries (Bangsund and Leistritz 2005, 2004, 1998, 1995b) and studies of the lignite industry in North Dakota (Coon and Leistritz 2008a).

Determining the economic contribution of a given industry quantifies its importance to state and local economies. Not only can the economic impacts to the state and local economies be measured, but the effects on specific economic sectors and related industries also can be identified. Also, economic studies can demonstrate the susceptibility of the North Dakota economy to fluctuations in factors affecting petroleum exploration and extraction, demonstrate the economic dependence of the state on natural resource-based industries, and indicate the economic impacts that could result from potential changes in policies which affect the petroleum industry.

Objectives

The purpose of this report is to estimate the economic contribution (direct and secondary effects) of the petroleum industry to the economy of North Dakota. Specific objectives include:

1) estimate the economic size of petroleum exploration, extraction, and processing sectors, and

2) provide estimates of industry-wide employment, tax revenues, and other key economic measures.

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.

Industry Organization

The petroleum industry in North Dakota consists of both upstream and downstream components. For this study, the petroleum industry was defined to only include in-state exploration, extraction/production, transportation, and processing of crude oil and natural gas. Exploration can be generally thought of as the process of finding mineral resources. Extraction or production is the process of developing and recovering mineral resources.

Transportation components of the industry, in this study, were limited to the movement of oil and gas from wells to collection points, and then on to processing facilities located either in-state or out-of-state. Petroleum processing in North Dakota included refining of crude oil and natural gas processing. The distribution, marketing, and retail sale of processed petroleum products (e.g., diesel, gasoline, kerosene, motor oil, lubricants, propane, natural gas) were 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 other 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 various firms engaged in providing support and service within the oil fields. While oil operators represent a mix of small to large firms, a majority of the prominent oil operators in North Dakota also have operations in other states. For many oil operators, their operations in North Dakota do not represent the majority of their oil and gas revenues. As a result of having operations and/or headquarters in other states, net revenues from North Dakota oil and gas production may leave the state for a variety of reasons. However, North Dakota is still the beneficiary of exploration and discovery expenses from firms that may have minimal operations in the state.

Oil and gas wells typically have three types of economic interests. These players are often referred to as 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. The owner arranges to have work completed for most of the necessary activities associated with the well, and charges working interests for their share of the expenses. As a result of these typical arrangements, the total number of firms receiving revenues and incurring expenses from oil and gas wells in North Dakota is unknown. However, the number of oil operators (firms that own or operate wells) is known.

For various reasons, the magnitude of economic effects of oil and gas production are not necessarily equivalent to the market value (i.e., price times quantity) of oil and gas produced. Exploration and extraction technologies use specialized inputs and services, many of which are not available in North Dakota and must be purchased from out-of-state sources. Many oil operators have operations and/or are headquartered in other states, and revenues for some firms may leave the state to be used for projects elsewhere. The same situation may exist where firms use resources obtained from out-of-state operations for oil and gas exploration in the state. In addition, oil operators headquartered out-of-state often have minimal general business expenses in the state. Similarly, firms that only have working interests in producing wells may or may not have physical operations in the state. All of these factors make it very problematic to base economic importance of the petroleum industry solely on the value of oil and gas production.

Production Statistics

Oil and gas production is limited to the western third of North Dakota (Figure 1). While crude oil has been produced in 19 western counties, only 16 counties are currently producing crude oil (North Dakota Industrial Commission 2008). Of the 16 counties producing oil, production is concentrated in Billings, Dunn, Bowman, McKenzie, Mountrail and Williams Counties. Those counties accounted for 88 percent of state oil production in 2007 (North Dakota Industrial Commission 2008). Production in key counties has fluctuated over the last 50 years as new oil deposits are found and developed in various locations in the state (Figure 2). Since 2002, major increases in oil production have occurred in Bowman, Dunn, and Mountrail Counties.

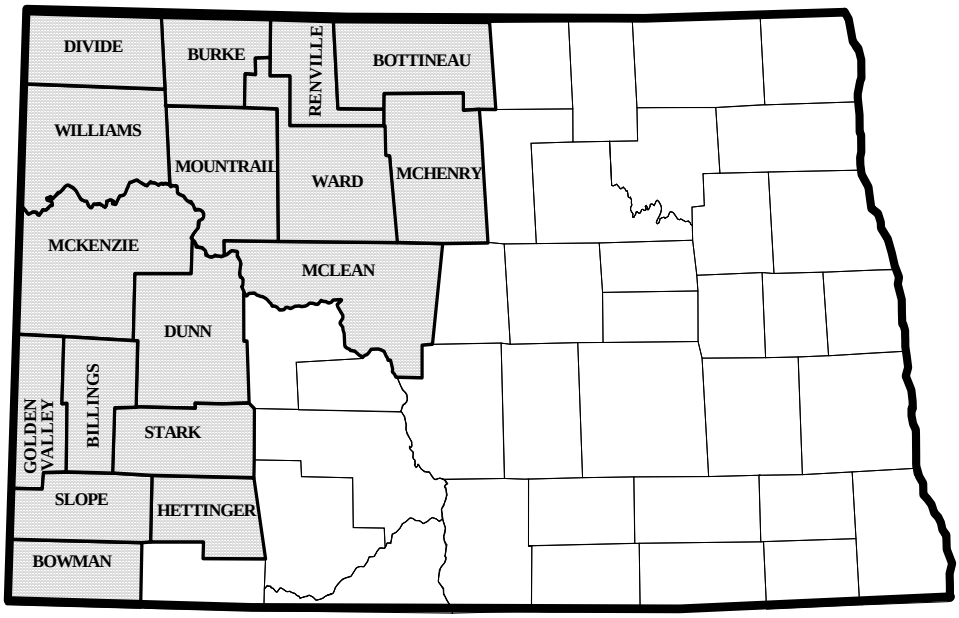


Figure 1. Oil Producing Counties, North Dakota

Nationally, North Dakota is ninth among all oil producing states based on cumulative crude oil production from 1981 through 2007 (Figure 3) (U.S. Department of Energy 2008). Based on crude oil production in 2007, North Dakota ranked eighth nationally among oil producing states. North Dakota accounted for about 3.3 percent of domestic crude oil (excluding federal off-shore) production in 2007.

North Dakota is less of a factor in domestic natural gas production. From 1981 through 2007, North Dakota accounted for only 0.33 percent of national production and was ranked 20th among all states (U.S. Department of Energy 2008). North Dakota was ranked 21st in natural gas production in 2007.

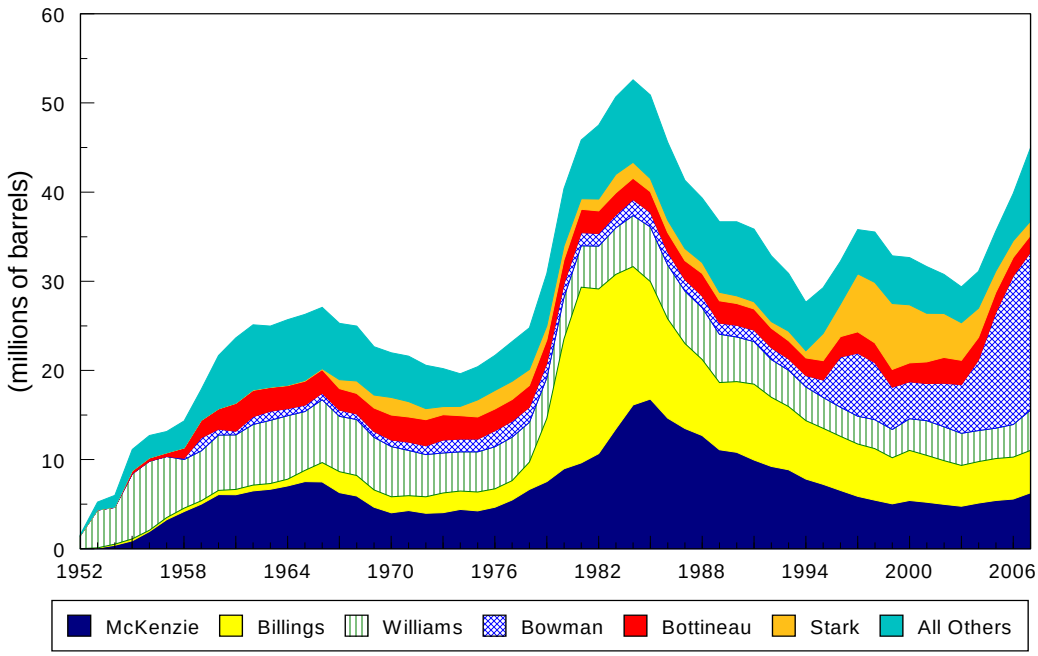


Figure 2. Historic Oil Production, Key Counties, North Dakota, 1952 through 2007
Source: North Dakota Industrial Commission (2008).

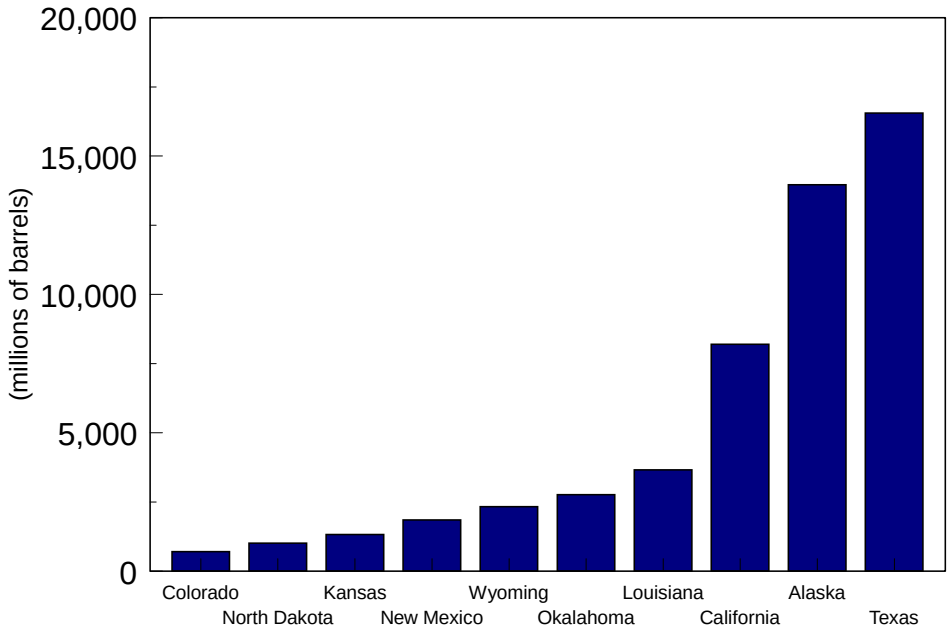


Figure 3. Top States in On-Shore Crude Oil Production, United States, 1981 through 2007
Source: U.S. Department of Energy (2008).

Oil production in North Dakota has fluctuated substantially since commercial production began in the early 1950s (Figure 4). Overall, there have been three periods of

rapid growth in oil production in North Dakota. The first period was from 1951 through 1962, the second period occurred from 1974 to 1984, and the current period which began in 2003. After historic highs in 1984, overall oil production in the state declined rapidly for 10 years. Since 1994, oil production in the state has seen two periods of expansion and one period of declining production. Crude oil production in the state is currently increasing, and crude oil production in 2007 was the highest since the early 1980s. Although state totals for 2008 were not available when this study was completed, monthly oil output for January through August of 2008 indicates that oil production in the state will reach an all time high in 2008.

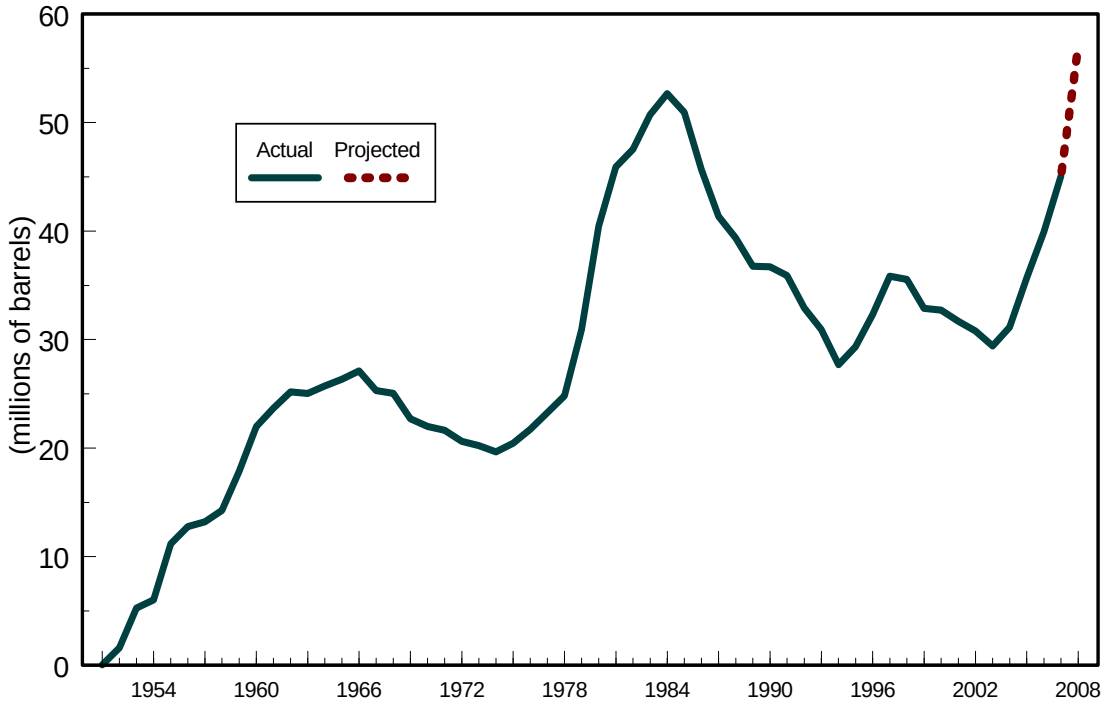


Figure 4. Crude Oil Production, North Dakota, 1951 through 2007 and Projected 2008
Source: North Dakota Industrial Commission (2008).

The annual value of oil production in North Dakota was estimated using monthly average price and production data from the North Dakota Industrial Commission (2008). The overall value of oil production in North Dakota, in nominal terms, has generally paralleled oil production despite price fluctuations over time (Figure 5). Nominal oil prices were converted to real dollars (2007) using the Gross Domestic Product-Implicit Price Deflator (U.S. Department of Commerce 2008). In real terms, from 1980 to 2000 the value of crude oil production in North Dakota largely declined (Figure 6). However, in both real terms and nominal terms, the value of crude oil production in the state has increased substantially since 2000 (Figure 6).

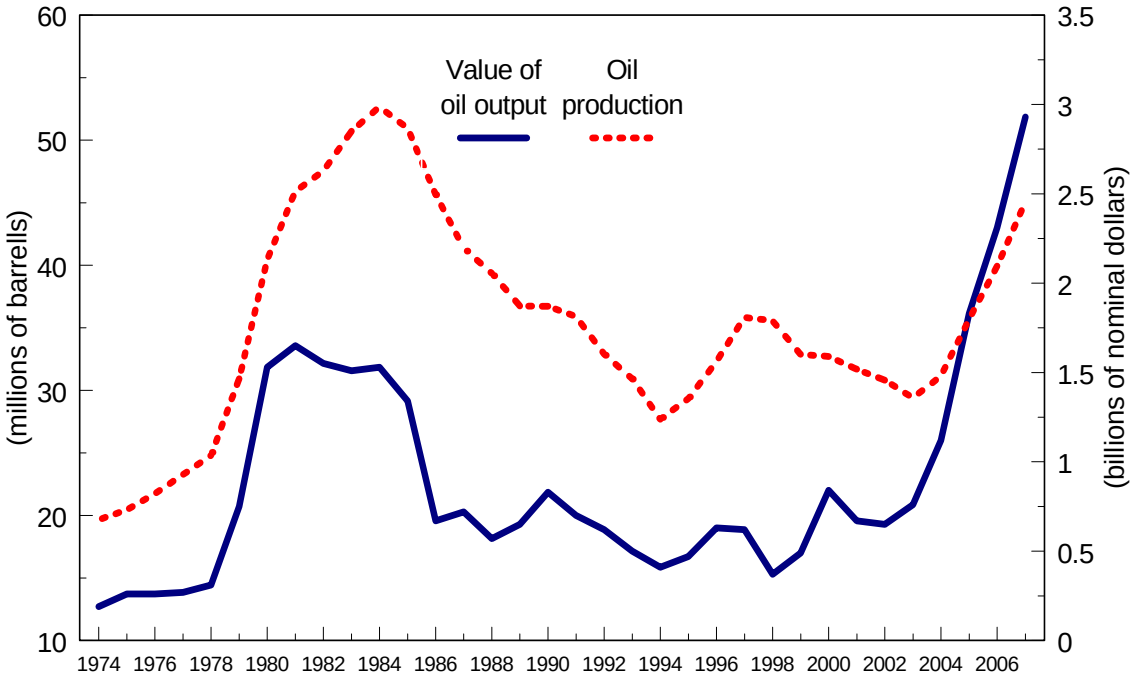


Figure 5. Production and Market Value of Crude Oil, North Dakota, 1974 through 2007
Source: North Dakota Industrial Commission (2008).

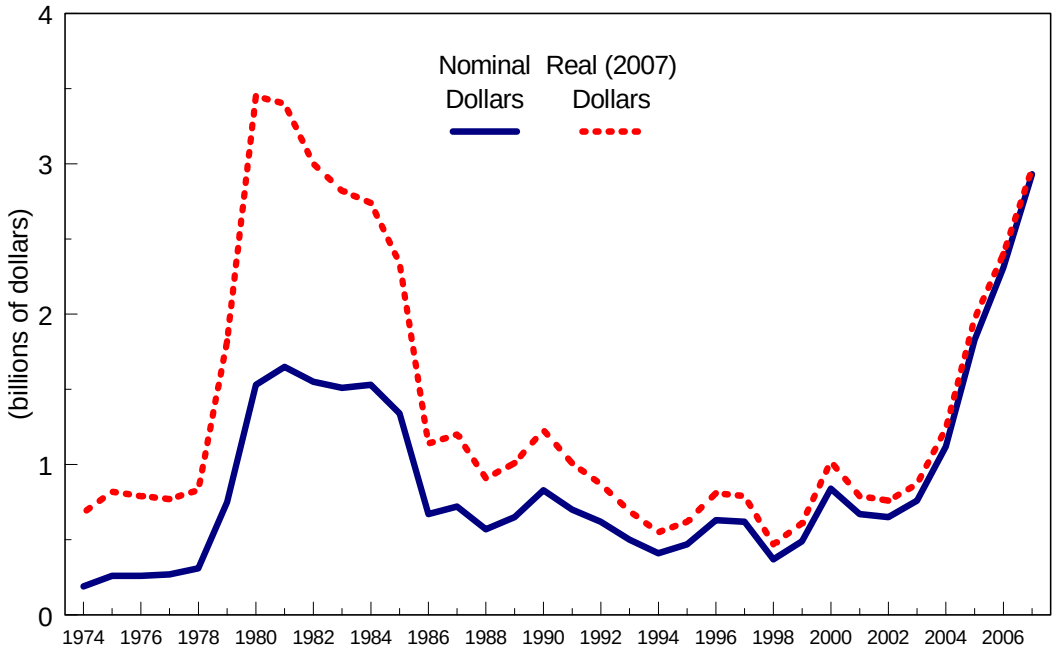


Figure 6. Value of Crude Oil Production in Nominal and Real Dollars, North Dakota, 1974 through 2007

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 to estimating economic activity has been used for several other industries in North Dakota (Bangsund and Leistritz 1995a, 1995b, 1998, 1999, 2004, 2005; Coon and Leistritz 2008a).

Data Collection

Due to the complexities of how the oil and gas industry is structured, and that in-state effects (i.e., first round spending or direct impacts) from oil and gas production in any given year may not equal the market value of oil and gas production, an expenditure-based approach to measuring the economic size of the petroleum industry was used in this study. In this approach, a sample of firms active in the petroleum industry in North Dakota were asked to provide estimates of the amount of expenditures made to entities (i.e., individuals, firms, and governments) in North Dakota. Two separate survey efforts were conducted for the study and provided the basis for most of the economic data needed to complete the study.

Oil Operators

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, physical measures of oil and gas production, and leasing and drilling activity (Appendix A). The North Dakota Petroleum Council provided names and addresses for 140 oil operators in the state. The survey process started with sending cover letters and a questionnaire to each firm on the mailing list. A second mailing was conducted for all firms that had not responded[1] to the first mailing. After two mailings, dissemination of survey materials and solicitation of industry cooperation was deferred to the study sponsor.

The combination of two mailings and personal contacts of oil operators conducted by the study sponsor resulted in useable information from 14 firms. The firms' production from owned/operated wells represented about 34 percent of the state's 2007 production of crude oil and natural gas (Table 1).

[1]Firms with non-deliverable addresses, those who responded with completed questionnaires, and those who indicated they would not or could not participate were excluded in the second mailing.

Table 1. Basic Production Statistics from Survey of Oil Operators, North Dakota, 2007

Number of firms responding with useful information	14
Number of wells owned or operated in North Dakota (14 firms)	1,897
Crude oil production in 2007 in North Dakota (14 firms)	13,503,595 barrels[a]
Natural gas production in 2007 in North Dakota (14 firms)	34,360,934 mcf[a]
Number of oil wells drilled in 2007 (9 firms)	126

[a] Output from wells operated or owned. Does not include production from working interests.

Pipelines and Processors

Another survey was conducted for firms engaged in pipeline transportation of crude oil and unprocessed natural gas produced in North Dakota and for firms involved with processing of crude oil and natural gas in North Dakota. The survey was used to obtain estimates of the amount and type of expenditures made in North Dakota and in-state employment by those firms (Appendix B). A mailing list of 10 firms operating pipelines, gas processing plants, and oil refineries were provided by the North Dakota Petroleum Council. The firms on the mailing list received two mailings, with some firms being contacted numerous times by industry representatives. A total of four firms provided useable information. While representative data for industry activities in this segment of the industry was obtained through the survey, a breakout of survey data for crude oil pipelines, natural gas processing plants and pipelines, and crude oil refineries is not possible due to confidentiality reasons. Firms operating pipelines for the transport of refined or processed petroleum products were not included in the study.

Service and Support

Information from firms that provide service and support to oil operators in the state was obtained from Bangsund and Leistritz (2007). Key parameters from the survey conducted in 2006 were used in this study. When applicable, financial coefficients from 2005 data were adjusted to correct for effects of inflation using the Gross Domestic Product-Implicit Price Deflator (U.S. Department of Commerce 2008).

Leasing and Brokerage

A survey of companies providing leasing services to petroleum sector firms was conducted to obtain information on oil leasing activities in North Dakota. A questionnaire was developed to obtain information necessary to estimate the amount of lease bonuses on private land paid to North Dakota entities (Appendix C). The study sponsor distributed the questionnaire to five firms. The survey resulted in obtaining useable financial information

from three firms. Lease bonuses for government mineral ownership were obtained by contacting the respective federal and state agencies in the state.

Estimation Techniques

The survey of oil operators and processors/pipeline operators and information from Bangsund and Leistritz (2007) provided data for two critical aspects of the study. First, data from the oil operator and processor surveys was used to set the level of spending in North Dakota. In other words, the data was used to determine the magnitude of spending within the state. Second, data from both current surveys and previous surveys (Bangsund and Leistritz 2007) was used to determine the type and distribution of spending among various sectors of the North Dakota economy.

The survey of oil operators provided financial data on about one-third of all oil and gas production in the state. In addition, survey respondents provided information on exploration expenses, wells drilled, and leasing data. Benchmark expenses for extraction/production, transportation, and operational expenses (e.g., general administrative costs) were estimated per barrel of oil equivalent (BOE). Total state production in 2007, expressed in BOE, was then used with survey estimates of in-state expenditures per BOE to generate state-level estimates for extraction, transportation, and administrative spending. In-state employment by oil operators was estimated in the same manner. Benchmark expenses for exploration were estimated on a per-well drilled basis and were used with data on the number of wells drilled in North Dakota in 2007. Data from the survey of oil lease/brokerage firms was used with data from the North Dakota State Land Department to estimate in-state bonus payments for private leases. Other economic components of the petroleum industry's direct impacts, such as severance taxes, public lease bonuses, and royalty revenues represented a combination of survey data, state-level statistics, and information obtained from various state and federal governmental agencies.

The survey of service and support firms for oil and gas production in North Dakota provided estimates of in-state spending by various types of expenses (e.g., salaries/wages, utilities, office supplies, business services) (Bangsund and Leistritz 2007). The percentage of spending in various categories, obtained from Bangsund and Leistritz (2007), was used to allocate state-level expenditures for exploration and extraction to various economic sectors of the North Dakota Input-Output Model. The amount of spending was determined using data from the survey of oil operators, while data from Bangsund and Leistritz (2007) provided insights on how those dollars impacted various sectors of the North Dakota economy.

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. This process

of spending and respending is sometimes termed the multiplier process, and the resultant secondary effects are sometimes referred to as multiplier effects (Leistritz and Murdock 1981).

Input-output (I-O) analysis is an economic tool that traces linkages among sectors of an economy and calculates the total business activity resulting from a direct impact in a basic sector (Coon et al. 1985). The North Dakota I-O Model has 17 economic sectors, is closed with respect to households (households are included in the model), and was developed from primary (survey) data from firms and households in North Dakota. Empirical testing has shown the North Dakota Input-Output Model is sufficiently accurate in estimating gross business volume, personal income, retail activity, and gross receipts in major economic sectors in North Dakota (Coon and Leistritz 2008b).

Economic Impacts

The economic contribution of the petroleum industry was primarily based on estimates of in-state expenditures from exploration, extraction, 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. Secondary impacts result from the respending of direct impacts within the economy. The following section is divided into five major parts: (1) direct impacts, (2) secondary impacts, (3) employment, (4) tax revenue, and (5) total economic impacts.

Direct Impacts

From an economic perspective, direct impacts are those changes in economic output, employment, or income that represent the initial or first-round effects of a project, program, or activity. The direct impacts from the petroleum industry in North Dakota included expenditures for (1) oil and gas exploration, (2) oil and gas extraction/production, (3) transportation of crude oil and unprocessed gas, and (4) processing crude oil and natural gas. 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. The following sections describe these direct economic impacts.

Exploration

The economic effects of exploration come from expenditures within North Dakota for a variety of activities that involve searching and discovering viable oil and gas resources. Exploration was defined to include, but not limited to, seismic testing, geological research, lease expenses, other environmental research, land survey work, excavation, road building, construction of drill site, construction and delivery of electricity, pipeline development, and all other activities associated with drilling oil and/or gas wells (Appendix A).

Estimates of total in-state expenditures in 2007 for exploration were derived from the survey of oil operators and used with drilling statistics from the Oil and Gas Division of the North Dakota Industrial Commission. In-state expenditures for exploration and drilling were estimated at about $4.3 million per well drilled. The petroleum industry drilled 336 wells in North Dakota in 2007, yielding about $1.4 billion in direct impacts. Lease bonuses retained or paid to in-state entities were estimated at $100 million in 2007, which included $6.3 million for state leases, $2.6 million for federal leases (U.S. Department of Interior 2007, U.S. Forest Service 2008), and about $91.5 million for private mineral leases. The $2.6 million in federal lease bonuses represented the portion of those leases that were returned to North Dakota. Total payments for oil leases tied to private land in North Dakota were estimated at $169.5 million; however, data from the survey of lease/brokerage firms suggest that only about 54 percent ($91.5 million) was paid to mineral owners residing in the state.

The combination of exploration expenses and lease bonuses resulted in $1.536 billion in direct impacts in 2007 (Table 2). In-state expenditures for general exploration and drilling were allocated to various economic sectors of the North Dakota Input-Output Model using information from the survey of service and support firms (Table 2). State and federal lease bonuses were allocated to the *Government* sector and private lease bonuses were allocated to the *Households* sector.

Table 2. Direct Impacts from General Exploration, Drilling Activities, and Lease Bonuses, North Dakota, 2007

Economic Sector	In-state Expenditures (000s $)
Communications and Public Utilities	26,877
Retail Trade	266,067
Finance, Insurance, and Real Estate	77,617
Business and Personal Services	99,440
Professional and Social Services	41,644
Households (personal income)	916,755
Government	107,945
Total	1,536,345

Extraction/Production

The economic effects of extraction come from expenditures within North Dakota for a variety of activities that involve bringing crude oil and natural gas from underground formations to the earth's surface. Extraction/production was defined to include, but not limited to, all activities associated with the removal of crude oil and natural gas from the ground, and maintenance and periodic inspections of equipment used to extract oil and gas, and other production related activities, such as well work overs, well idling, shutdown, and abandonment activities (Appendix A). Also included in this segment of the industry are the general business expenditures incurred by oil operators in North Dakota. Examples of these expenditures include, but are not limited to, office rent, office supplies, wages and salaries, communications, public utilities, business and professional services, insurance, and interest expenses (Appendix A). Royalty revenues, both private and public, were included as direct impacts in the extraction/production segment of the petroleum industry. Collections from state severance taxes, which include the gross production tax and extraction tax, also were included in the direct impacts.

Estimates of total in-state expenditures in 2007 for extraction/production and general business expenses were derived from the survey of oil operators and estimated on a BOE basis. North Dakota produced 45,057,874 barrels of oil and 70,799,663 mcf of natural gas in 2007. Those volumes of oil and gas production resulted in an estimated $441.5 million for in-state expenditures for extraction/production and $362.5 million for general business expenses. State oil and gas royalties were about $36.1 million (North Dakota State Land Department 2007). Total federal royalties returned to North Dakota were about $19.3 million (U.S. Department of the Interior 2008, U.S. Forest Service 2008).

Private royalties were based on data obtained from the survey of lease/brokerage firms and on production data obtained from the survey of oil operators. Total royalties reported by oil operators were estimated at 14.9 percent and 14.2 percent of well output for oil and gas, respectively. Private royalties were estimated by subtracting state and gross federal royalties from estimated total royalties. Private royalties (i.e., both in-state and out-of-state mineral owners) from oil and gas production in North Dakota in 2007 were estimated at $369.2 million. In-state payments of private royalties were estimated by applying the percentage of in-state versus out-of-state mineral owners (53.8 percent) to the estimated total private royalties ($369.2 million). In-state private royalties in 2007 were estimated at $198.7 million.

Total collections from the gross production tax and extraction tax in calendar year 2007 were $141.9 million and $108.4 million, respectively (Office of State Tax Commissioner 2008). Those tax collections were included in the extraction/production segment of the petroleum industry.

Total direct impacts in the extraction/production segment of the petroleum industry in North Dakota in 2007 were estimated at $1.3 billion (Table 3). Data from Bangsund and Leistritz (2007) was used to allocate the in-state expenditures for extraction to various sectors

of the North Dakota Input-Output Model. Direct impacts for general business expenses for oil operators, royalties, and state severance taxes were also allocated to various sectors of the North Dakota Input-Output Model (Table 3).

Table 3. Direct Impacts from Oil and Gas Extraction and Production Activities, North Dakota, 2007

Economic Sector	In-state Expenditures (000s $)
Construction	11,295
Transportation	7,962
Communications and Public Utilities	27,067
Agricultural Processing and Miscellaneous Manufacturing	106,907
Retail Trade	85,350
Finance, Insurance, and Real Estate	61,965
Business and Personal Services	96,072
Professional and Social Services	14,673
Households (personal income)	504,072
Government	393,026
Total	1,308,389

Processing

The processing segment of the petroleum 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. In-state transportation expenses paid by oil operators were estimated on a BOE equivalent. Those expenses were extrapolated based on state production statistics. 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. Results from the survey of processors were combined with state statistics to estimate state-level expenditures.

Direct impacts included $69.3 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 $192.4 million. Evaluation of expenditure data obtained from firms responding to the survey revealed in-state spending for infrastructure expansion within the state. Those one-time expenditures were included in industry totals, but were not extrapolated. Total direct impacts of $261.7 million were allocated to the North Dakota Input-Output Model (Table 4). To avoid double counting of potential impacts, in-state purchases of crude oil and unprocessed natural gas by processors were excluded in the study.

Table 4. Direct Impacts from Oil and Gas Processing, North Dakota, 2007

Economic Sector	In-state Expenditures (000s $)
Construction	74,212
Transportation	70,517
Communications and Public Utilities	35,684
Agricultural Processing and Miscellaneous Manufacturing	1,496
Retail Trade	5,033
Finance, Insurance, and Real Estate	8,663
Business and Personal Services	6,772
Professional and Social Services	827
Households (personal income)	39,629
Government	18,872
Total	261,705

Total Direct Impacts

Direct impacts are defined as the initial or first-round effects of project, program, or activity. The petroleum industry in North Dakota was divided into several segments or components for purposes of reporting study results. Total direct impacts for the petroleum industry included in-state expenditures for oil and gas exploration, oil and gas extraction/production, transportation of crude oil and unprocessed gas, and processing crude oil and natural gas, as well as lease bonuses, severance taxes, and royalty payments.

Total direct impacts from the petroleum industry in North Dakota in 2007 were estimated at $3.106 billion (Table 5). Exploration accounted for 50 percent of the industry's direct impacts and was the largest segment of the industry. Extraction/production accounted for nearly 42 percent of all direct impacts. Processing and pipeline transportation accounted for the remaining 8 percent of the industry's direct impacts.

Expenditures and revenues which constitute the petroleum industry's direct impacts were allocated to various economic sectors of the North Dakota Input-Output Model. The sectors of the North Dakota economy that received the greatest direct impacts were *households* (economy-wide personal income) ($1.46 billion), *government* (tax collections and public royalties) ($520 million), *retail trade* ($356 million), *business and personal services* ($202 million), and *finance, insurance, and real estate* ($148 million) (Table 5).

Table 5. Total Direct Impacts, Petroleum Industry, North Dakota, 2007

	Industry Component			
Economic Sector	Exploration	Extraction	Processing	Totals
	---------- 000s $ ----------			
Construction		11,295	74,212	85,507
Transportation		7,962	70,517	78,479
Communications and Public Utilities	26,877	27,067	35,684	89,628
Agricultural Processing and Miscellaneous Manufacturing		106,907	1,496	108,403
Retail Trade	266,067	85,350	5,033	356,450
Finance, Insurance, and Real Estate	77,617	61,965	8,663	148,245
Business and Personal Services	99,440	96,072	6,772	202,284
Professional and Social Services	41,644	14,673	827	57,144
Households (personal income)	916,755	504,072	39,629	1,460,456
Government	107,945	393,026	18,872	519,843
Total	1,536,345	1,308,389	261,705	3,106,439

Secondary Impacts

Secondary economic impacts result from subsequent rounds of spending and respending within an 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). An economic sector is a group of similar economic units (e.g., communications and public utilities, retail trade, construction).

This process of spending and respending can be explained by using an example. A single dollar from an in-state 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 (Hamm et al. 1993).

Secondary economic impacts were estimated separately for exploration, extraction, and processing components of the petroleum industry. Results from the North Dakota Input-Output Model revealed that secondary economic impacts from exploration in North Dakota in 2007 would be about $2.7 billion (Table 6). The $1.3 billion in direct impacts for oil and gas extraction (production) activities produced an estimated $1.96 billion in secondary economic impacts. Finally, the transportation and processing segment of the petroleum industry was responsible for $445 million in secondary economic impacts. Total secondary economic impacts from all components of the petroleum industry were estimated at $5.1 billion. Across all three major components of the petroleum industry, considerable secondary impacts were generated in the *households* (economy-wide personal income) ($1.6 billion), *retail trade* ($1.6 billion), *finance, insurance, and real estate* ($358 million), *communications and public utilities* ($251 million), and *government* ($251 million) (Table 6).

Table 6. Total Secondary Impacts, Petroleum Industry, North Dakota, 2007

Economic Sector	Industry Component			
	Exploration	Extraction	Processing	Totals
	---------- 000s $ ----------			
Construction	108,129	67,750	14,463	191,342
Transportation	14,177	9,515	2,450	26,142
Communications and Public Utilities	139,692	90,498	20,541	250,731
Agricultural Processing and Miscellaneous Manufacturing	60,226	112,271	8,130	180,627
Retail Trade	892,318	579,914	125,717	1,597,949
Finance, Insurance, and Real Estate	200,157	130,043	27,960	358,160
Business and Personal Services	74,460	49,582	10,237	134,279
Professional and Social Services	114,331	71,149	13,758	199,238
Households (personal income)	843,060	590,138	170,319	1,603,517
Government	131,856	87,024	31,753	250,633
Other sectors[a]	142,990	167,444	20,132	330,566
Total	2,721,396	1,956,328	445,460	5,123,184

[a] Includes various agricultural and mining sectors.

Employment

The petroleum industry is responsible for creating and supporting direct and secondary employment. Direct employment is a measure of the number of full-time jobs within an industry. Secondary jobs are an estimate of employment outside of an industry, but employment that is created from the industry's economy-wide economic activity.

Direct Employment

Direct employment is a term used to describe jobs that are considered to be a part of an industry. For example, workers operating an oil drilling rig would represent direct employment in the petroleum industry. Similarly, someone who works at a natural gas processing plant or crude oil refinery would be considered direct employment in the petroleum industry.

While employment figures are frequently reported by various governmental agencies and are broken into a hierarchy of categories (e.g., North American Industry Classification System), deriving specific estimates of employment for large basic-sector industries can be problematic. Much of the problem arises in defining the type of job, and attributing to which industry(s) created that employment. For example, the process of drilling an oil well typically requires developing a road and a drilling site; work that requires heavy construction with earth moving or excavating equipment. Most oil companies will contract that work to local firms that specialize in heavy construction or excavating. The individuals performing the road building and preparation of the drill site are likely to be employed with some type of construction firm, and as a result, those jobs are typically classified and reported by government agencies as construction. Government agencies (e.g., Bureau of the Census, Bureau of Labor Statistics) that track employment often base the classification of those jobs on the type of activities that generate the most revenue for a firm (primary activities). In this example, the primary activity for this firm is likely to be construction, even if the specific activities are road building and drill site preparation. However, in the case of assigning which basic-sector industry created that employment, it may be more accurate to suggest those jobs exist as a result of the petroleum industry rather than the construction industry. Yet, in other cases, the level of oil well drilling activity may be insufficient to sustain employment in heavy construction for an entire year. Those situations result in seasonal or part-time job creation. The challenge is to measure or estimate the total number of full-time jobs created and sustained by the petroleum industry, even if those jobs appear to be part of another industry or are only created for part of a year.

Estimates of direct employment were generated from the survey of oil operators and processors, and from key parameters obtained from the survey of service and support firms (Bangsund and Leistritz 2007). The survey of oil operators and processors specifically asked for the number of full-time jobs in North Dakota (Appendices A and B). Employment figures from the survey of oil operators were extrapolated to state totals based on a BOE basis, while employment data from the survey of processors was extrapolated based on state-level statistics for those operations (e.g., processing volumes). Thus, estimating full-time employment by oil operators, pipeline firms, and processors in North Dakota was relatively straightforward.

Oil operators (firms owning or operating wells) contract much of the work of exploration and extraction of oil and gas to firms that specialize in various aspects of the those processes. While some of the work in the oil fields is performed by firms located in other states, much of the work is performed by firms located in close proximity to production. One of the difficulties of estimating employment in the service and support capacities is determining those jobs that are fully supported versus those jobs that are only partially supported by the petroleum industry. An additional complexity is to only attribute full-time employment to the petroleum activities located in North Dakota. For many firms located in the oil producing region of North Dakota, the obvious possibility is that some employment by those firms could be partially or wholly supported by petroleum activities in Montana, Canada, or possibly in other states.

The questionnaire used in the service and support survey was designed to address the degree of job support from the petroleum industry and the level of job support attributable to only petroleum activities in North Dakota (Bangsund and Leistritz 2007). Data on the gross revenue needed to support one-full time position within the oil field in North Dakota was adjusted for inflation using the Gross Domestic Product-Implicit Price Deflator (U.S. Department of Commerce 2008). Total state employment for work in the oil fields was then estimated based on an adjusted level of spending per FTE job and combined with data from the oil operator survey for contract work in the areas of exploration, extraction/production, and transportation in North Dakota.

Employment in North Dakota by oil operators in 2007 was estimated at 1,808 full-time equivalent (FTE) positions. Employment in the processing segment of the industry, which included some pipeline employment, was estimated at 579 FTE jobs. Total employment in the oil field for contract work, which includes exploration and extraction segments of the industry, was estimated at 5,332 FTE jobs. The petroleum industry[2], as defined and evaluated in this study, was estimated to create and support 7,719 FTE positions in North Dakota in 2007.

Secondary Employment

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. Direct employment and secondary employment are two distinctly different measures. Productivity ratios[3] were used with estimates of business activity in various sectors of the North Dakota economy to obtain estimates of secondary employment. The petroleum industry in North Dakota was estimated to generate an additional $5.1 billion in secondary business activity, which was sufficient to support 38,500 FTE jobs.

[2] The petroleum industry in this study did not include employment associated with transportation of processed petroleum products, marketing, or retail sales. In many cases, those downstream components of the industry generate substantial employment. Unfortunately, breakout of jobs by segment of the industry previously reported are no longer available. In 2006, the petroleum industry in North Dakota was responsible for over 9,200 jobs, excluding jobs in petroleum refining activities due to non-disclosure rules (American Petroleum Institute 2007). However, industry-wide direct employment in 2006 included 507 jobs in transportation (jobs in retail distribution also were not disclosed) and 1,671 jobs in wholesale operations; two components of the petroleum industry that were only partially included in this study. The American Petroleum Institute also estimated that retail gasoline stations in the state were responsible for 4,058 jobs in 2006; employment that was considered in addition to the 5,179 jobs attributable to other segments of the petroleum industry (American Petroleum Institute 2007). While similar data for 2007 is not available, employment changes reported by the American Petroleum Institute from 2005 to 2006 are consistent with changes observed in this study from 2005 to 2007.

[3] A measure of the amount of business activity needed in an economic sector to support one full-time job.

Government Revenues

Governmental revenues, usually based on tax collections, are another important measure of the economic impact of an industry on an economy. The petroleum industry in North Dakota, specifically oil and gas production, is responsible for substantial amounts of state and local government revenues. One distinction is that unlike many other industries in North Dakota, severance taxes (taxes placed on the value of oil and gas removed from the ground) collect money 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 other industries in the state is that governments can hold oil and gas leases and receive royalties from the value of oil and gas production. 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 $519.8 million in government revenues that were directly attributable to the petroleum industry in North Dakota in 2007 (Table 7). Exploration, extraction/production, and processing segments of the industry were responsible for about 21, 76, and 3 percent, respectively, of the total government revenues from the petroleum industry in North Dakota.

Severance taxes accounted for nearly half (48 percent) of all government revenues from the petroleum industry in North Dakota in 2007. The second largest source was the most common general taxes (i.e., property, personal income, sales and use, and corporate income) at 36 percent, followed by royalties at 11 percent. The remainder of government revenues represented lease bonuses, permits/fees/licenses, miscellaneous revenues.

In addition to the government revenues that were included as direct impacts, collections from personal income and sales and use taxes were estimated based on the secondary economic activity generated by the petroleum industry. Secondary economic impacts in the *Retail Trade* sector were used to estimate revenue from sales and use taxes. Economic activity in the *Households* sector (which represents economy-wide personal income) was used to estimate personal income tax collections. Total collections of personal income and sales and use taxes arising from secondary economic activity were estimated at $119.9 million (Table 7).

Table 7. State and Local Government Revenues Attributable to the Petroleum Industry, North Dakota, 2007

Revenue Type	Revenue included as part of direct impacts	Revenue estimated from secondary economic impacts
	---------- 000s $ ----------	
Sales and Use Taxes	5,984	73,985
Property Taxes	78,957	not applicable
Personal Income Tax	7,723	45,960
Corporate Income Tax	10,982	not available
Royalties	55,744	not applicable
Severance Taxes	250,314	not applicable
Lease Bonuses	8,920	not applicable
Licenses, Permits, Fees	14,298	not available
Charitable Donations	126	not available
Undetermined Taxes[a]	86,795	not applicable
Total	519,843	119,945

[a] Represents general in-state taxes paid to local and state government that were not specifically identified by survey respondents.

Total Economic Impacts

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. Direct impacts are those changes in output, employment, or income that represent the initial or first-round effects of a project, program, policy, or activity. Secondary impacts (sometimes further categorized into indirect and induced effects) result from subsequent rounds of spending and respending within an economy. This process of spending and respending is sometimes termed the multiplier process, and the resultant secondary effects are sometimes referred to as multiplier effects. Further, additional economic measures, such as personal income, tax revenue, and employment, are often used to measure the relative size of an industry.

The petroleum industry in North Dakota was defined to include exploration, extraction/production, transportation, and processing of crude oil and natural gas. Direct impacts were based on in-state expenditures, private and public royalties, taxes, and lease bonuses. Direct impacts were allocated to various sectors of the North Dakota Input-Output Model to generate estimates of the secondary economic impacts.

The direct impact of exploration in 2007 was estimated at $1.5 billion. Total secondary economic impacts associated with exploration activities were estimated at $2.7 billion. The in-state gross business volume of exploration activities was estimated at $4.26 billion in 2007 (Table 8).

The direct impact of extraction/production in 2007 was estimated at $1.3 billion. Total secondary economic impacts associated with extraction and production activities were estimated at $1.96 billion. The in-state gross business volume of oil and gas extraction was estimated at $3.26 billion in 2007 (Table 8).

The processing component of the petroleum industry was estimated to have a direct impact in North Dakota of $262 million. Total secondary economic impacts associated with processing and transporting crude oil and natural gas were estimated at $445 million. The in-state gross business volume of processing and transporting crude oil and natural gas was estimated at $707 million in 2007 (Table 8).

Industry-wide direct impacts from the petroleum industry were estimated at $3.106 billion in 2007. Total secondary economic impacts associated with the industry were estimated at $5.123 billion. The gross business volume for the petroleum industry in North Dakota in 2007 was estimated at $8.23 billion (Table 8).

Additional measures of the petroleum industry's economic importance to the state include direct employment for 7,719 full-time jobs, economy-wide personal income of $3.06 billion, statewide retail sales of nearly $2 billion, direct contributions to local and state government revenues of $520 million, indirect contribution of $120 million in state government tax collections, and secondary employment of 38,500 full-time equivalent jobs. For every dollar spent in the state by the petroleum industry, another $1.65 in additional business activity was generated.

Some very generic or average impact figures can be produced for basic oil and gas production statistics. Based on a gross business volume of $8.23 billion for the petroleum industry, total economic effects in North Dakota would be about $145 per BOE, or if impacts were only evaluated for crude oil production, total effects would be nearly $183 per barrel. Based on active wells in the state, the overall economic effect (direct and secondary impacts from all segments of the industry) per well (averaged for all producing wells) would be about $2.19 million annually.

Table 8. Total (Direct and Secondary) Economic Impacts, Petroleum Industry, North Dakota, 2007

Economic Sector	Industry Component			
	Exploration	Extraction	Processing	Totals
	---------- 000s $ ----------			
Construction	108,129	80,045	88,675	276,849
Transportation	14,177	17,477	72,967	104,621
Communications and Public Utilities	166,569	117,565	56,225	340,359
Agricultural Processing and Miscellaneous Manufacturing	60,226	219,178	9,626	289,030
Retail Trade	1,158,385	665,264	130,750	1,954,399
Finance, Insurance, and Real Estate	277,774	192,008	36,623	506,405
Business and Personal Services	173,900	145,654	17,009	336,563
Professional and Social Services	155,975	85,822	14,585	256,382
Households (personal income)	1,759,815	1,094,210	209,948	3,063,973
Government	239,801	480,050	50,625	770,476
Other sectors[a]	142,990	167,444	20,132	330,566
Gross Business Volume	4,257,741	3,264,717	707,165	8,229,623

[a] Includes various agricultural and mining sectors.

Comparison of 2005 and 2007 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). The results reported in this study were based on conditions present in the industry in calendar year 2007.

Comparing various production statistics between 2005 and 2007 revealed that the industry increased the number of producing wells, increased oil and gas production, and increased drilling activities in the state (Table 9). Oil and natural gas prices between the two periods were similar after adjusting 2005 figures for inflation using the Gross Domestic Product-Implicit Price Deflator. The price received for crude oil increased by 20 percent in real terms while similar changes in natural gas prices revealed a price decline of 26 percent. Oil production increased from 35 million barrels to over 45 million barrels over the two-year

period. Gas production jumped from around 58 million mcf in 2005 to nearly 71 million mcf in 2007. In addition to increases in oil and gas production, exploration activities in the state continued to increase as the number of wells drilled in the state went from 240 in 2005 to 336 in 2007.

Table 9. Oil and Gas Production Statistics, North Dakota, 2005 and 2007

Measures of Industry Output	Calendar Year 2005	Calendar Year 2007	Percent Change (2005 - 2007)
Crude oil (barrels)	35,659,583	45,057,874	26.4
Natural gas produced (mcf)	57,970,459	70,799,663	22.1
Natural gas sold (mcf)	50,695,691	55,094,857	8.7
Number of operating/active wells	3,391	3,759	10.8
Number of wells drilled	240	336	40.0
Average annual price per barrel of crude oil in North Dakota*	$51.41 nominal $54.20 real	$65.10 nominal $65.10 real	26.6 20.1
Average annual price per mcf of natural gas in North Dakota*	$8.57 nominal $9.04 real	$6.69 nominal $6.69 real	-22.0 -26.0

* Nominal dollars adjusted to real (2007) dollars using the Gross Domestic Product-Implicit Price Deflator.
Source: Oil and Gas Division, North Dakota Industrial Commission (2008).

Methods and data sources between the 2005 study and this study were largely unchanged, although the 2007 study included a separate survey of lease/brokerage firms. The survey of lease/brokerage firms was conducted to help generate estimates of lease bonuses on private land in North Dakota. By comparison, lease bonuses on private land in 2005 were based on information obtained from the survey of oil operators and data on well drilling activity. Firms providing oil field services were not surveyed in this study; however, key parameters from the 2005 study were obtained from Bangsund and Leistritz (2007), corrected for inflation, and used in this study.

In 2005, the survey of oil operators resulted in obtaining information from 17 firms representing about 19 percent of oil and gas production in the state (Table 10). In 2007, the survey of oil operators obtained information from 14 firms representing about 34 percent of oil and gas production (i.e., BOE) in the state. Overall, production statistics for firms responding to the survey were similar in both studies (Table 10). The survey of processors in both studies resulted in nearly identical survey participation by industry representatives (data not presented).

Table 10. Summary of Oil Operator Surveys, North Dakota, 2005 and 2007

Description	2005	2007
Number of firms surveyed (first mailing)	135	140
Number of firms responding with useful information	19	14
Number of wells owned/operated by survey respondents	1,633	1,897
Share of state totals	49%	50%
Crude oil production by survey respondents	8,062,219	13,503,595
Share of state totals	23%	30%
Natural gas production by survey respondents	10,289,325	34,360,934
Share of state totals	18%	48%
Barrel of Oil Equivalent (BOE)	9,777,106	19,230,418
Share of state totals	22%	34%
Number of wells drilled by survey respondents	75	126
Share of state totals	29%	37%

Several notable changes were observed with oil and gas exploration between 2005 and 2007 (Table 11). The number of wells drilled increased from 240 in 2005 to 336 in 2007. The average cost to drill a well in the state increased in real terms from $1.6 million in 2005 to nearly $4.3 million in 2007. The result of both an increase in the number of wells drilled and the change in the cost to drill wells increased exploration expenditures in the state by about 275 percent from 2005 to 2007. The gross business volume (direct and secondary economic effects) associated with exploration went from around $1.3 billion in 2005 to about $4.3 billion in 2007. The amount of direct expenditures for only exploration activities in 2007 exceeded the sum of direct expenditures for all segments (i.e., exploration, production, and processing) of the industry in 2005 (see Tables 11 and 12).

Table 11. Comparison of 2005 and 2007 Economic Estimates, Exploration Component of Petroleum Industry, North Dakota

Category	2005*	2007	Percent Change
Number of wells drilled in the state	240	336	40
	---------- 000s $ ----------		
Average cost per well drilled	$1,590	$4,274	168
Lease bonuses			
Net federal and state	$18,075	$8,915	-51
Private**	$68,578	$91,505	33
Direct Impacts			
Well Drilling	$382,600	$1,435,900	275
Lease Bonuses	$86,600	$100,400	16
Total Direct	$469,300	$1,536,000	227
Secondary Impacts	$817,000	$2,721,000	233
Gross Business Volume	$1,286,000	$4,258,000	231

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

** Estimation techniques for private lease bonuses in North Dakota differed between the two studies. Private lease bonuses were not adjusted for in-state mineral ownership in the 2005 study, and were based primarily on data obtained from the survey of oil operators. Private lease bonuses represented only payments to in-state mineral owners in this study and were based primarily on a survey of oil lease/brokerage firms.

Changes in oil and gas production have implications on the gross business volume of the industry in the state. Increases in oil and gas production (26 percent increase) were one of two observable reasons for increases in expenditures associated with oil production in the state over the period (Table 12). The other reason was that reported expenses per unit of output (i.e., in-state expenditures per BOE) increased in real terms by 17 percent from 2005 to 2007. Those two increases (i.e., output and per unit expenses) contributed to increased expenditures for the production segment of the industry. Also, increases in oil value (price x quantity) contributed to increased royalty payments, which were considered a direct impact in the estimation of gross business volume. Likewise, collections of severance taxes, also considered a direct impact, increased substantially, reflecting an increase in the overall value of oil and gas production in the state. From 2005 to 2007, total direct expenditures for oil and gas production increased by about 36 percent. As expected, the gross business volume from oil production also increased by a similar percentage over the period (Table 12).

Table 12. Comparison of 2005 and 2007 Economic Estimates, Oil and Gas Extraction/Production Component of Petroleum Industry, North Dakota

Category	2005*	2007	Percent Change
Oil and gas production (BOE terms)	45,321,000	56,858,000	26
In-state Extraction/Production and General Business Expense per BOE	$13.17	$15.36	17
Royalties**			
Oil	13.0	14.9	
Gas	13.3	14.2	
	---------- 000s $ ----------		
Direct Impacts			
Production Expenditures	$320,900	$441,500	38
General Business Expenses	$230,100	$362,500	57
Royalties			
Net federal and state	$39,500	$55,400	40
Private***			
Total	$207,700	$369,200	78
In-state	na	$198,700	
Total Royalties	$247,200	$254,100	3
Severance Taxes	$160,800	$250,300	56
Total Direct Impacts	$959,000	$1,308,000	36
Secondary Impacts	$1,485,000	$1,956,000	32
Gross Business Volume	$2,444,000	$3,265,000	34

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

** Average percentage of production. Data obtained from oil operator survey and based only on owned/operated wells.

*** Direct comparisons between studies are difficult. Private royalties in the 2005 study were not adjusted for in-state versus out-of-state mineral ownership. As such, private royalties in 2005 represented a gross measure of payments. Total payments of private royalties in 2007 were adjusted for in-state mineral ownership. Applying an in-state mineral ownership ratio of 54 percent to the gross private royalty payment estimated in 2005 and comparing to the 2007 private in-state royalty payments shows that in-state payments increased by 78 percent from 2005 to 2007 ($198.7 million in 2007 to $111.8 million [$207.7 million x 53.8 percent] in 2005 in real terms).

The processing sector of the petroleum industry also showed substantial increase in expenditures over the two-year period (Table 13). Some of the increase came from expansion of pipeline capacity and expansion of natural gas processing capacity in the state. Some change in expenditures was a result of greater processing volumes and pipeline

shipments. The other change came from a substantial increase in transportation expenses reported by oil operators. Overall, the change in direct expenditures in this segment of the industry reflected an increase in processing/transporting volumes, one-time construction expenditures associated infrastructure expansion, and an increase in transportation expenses. Within this segment of the industry, an increase in transportation spending accounted for about 34 percent of change in direct expenditures, one-time construction expenditures were estimated to be responsible for 45 percent of the increase, and change in processing and pipeline operational expenditures in the state accounted for the remaining 21 percent. The gross business volume for the processing and transportation component of the petroleum industry increased by about 81 percent from 2005 through 2007.

Table 13. Comparison of 2005 and 2007 Economic Estimates, Processing Component of Petroleum Industry, North Dakota

Category	2005*	2007	Percent Change
	---------- 000s $ ----------		
Direct Impacts			
Transportation	$28,100	$69,300	146
Processing and Pipeline Activities	$111,500	$192,400	73
Total Direct Impacts	$139,700	$261,700	87
Secondary Impacts	$251,000	$445,500	77
Gross Business Volume	$390,700	$707,200	81

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

Some of the most closely monitored measures of the petroleum industry are estimates of government revenues. Government revenues attributable to the petroleum industry stem from collections of property, sales and use, personal income, and corporate income taxes. Other direct revenue sources include royalties on oil and gas production and lease bonus payments. The largest single source of government revenue in the state has been from severance taxes. Overall, not all sources of government revenues changed in equal proportion over the period; however, collectively governmental revenues from the petroleum industry increased by over $285 million or 80 percent in real terms over the period (Table 14).

Table 14. Estimates of State and Local Government Revenues Generated by Petroleum Industry, North Dakota, 2005 and 2007

State and Local Government Revenues	2005*	2007	Percent Change
	---------- 000s $ ----------		
Included as Direct Impacts			
Sales and Use, Property, and Income taxes	$39,000	$103,600	166
Royalties**	$40,100	$55,700	39
Severance Taxes	$160,800	$250,300	56
Lease Bonuses (net federal and state)	$18,100	$8,900	-51
Licenses, Fees, Permits, Donations, and undisclosed/undetermined taxes	$38,300	$101,200	164
Totals	$296,100	$519,800	75
Estimated from Secondary Economic Activity			
Sales and Use	$37,800	$73,985	96
Personal Income	$20,700	$45,960	122
Direct and Secondary Estimates of State and Local Government Revenues	$354,600	$639,800	80

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

** Net federal and state royalties associated with extraction/production segment of industry equaled $55.4 million in 2007. An additional $300,000 in federal royalties associated with oil and gas processing activities were reported as returned to North Dakota entities by the U.S. Department of Interior, Minerals Management Service (2008).

Employment in the industry also showed substantial change from 2005 through 2007. While employment by oil operators was estimated to remain relatively unchanged over the period, expansions of economic activity in the service and support of the oil patch and expansions of activity in processing and transportation led to gains in employment in those areas of the industry (Table 15). Overall, total direct employment within the industry was estimated to increase by over 2,400 FTE jobs from 2005 to 2007 (Table 15).

Table 15. Direct and Secondary Employment, Petroleum Industry, North Dakota, 2005 and 2007

Category	2005	2007	Percent Change
Direct Employment			
Oil Operators	1,794	1,808	1
Service and Support	3,001	5,332	78
Processing and Pipelines	471	579	23
Totals	5,267	7,719	47
Secondary Employment	20,650	38,500	86

All segments of the industry showed substantial gains in direct and secondary economic impacts (Table 16). The causes for those increases varied by segment of the industry. In exploration, the increase in drilling activity combined with an increase in the cost per well resulted in substantial changes in gross business volume. Gross business volume associated with extraction/production were largely similar to changes in oil and gas production. Average oil and gas prices, after correcting for inflation, were similar in the two study periods; however, oil and gas output increased by 26 percent over the period. An increase in transportation expenses, expansions of industry infrastructure (i.e., gas plants and pipeline capacities), and increased processing volumes all contributed to an increase in the gross business volume for the processing/transportation segment of the industry.

The petroleum industry in North Dakota showed real growth from 2005 through 2007. The exploration segment of the industry increased in real terms by over 230 percent, and was the primary reason for the magnitude of the increases in the industry's gross business volume. In real terms, direct impacts from exploration in 2007 nearly equaled the entire industry's direct impacts in 2005. The difference in gross business volume for exploration in 2005 and 2007 was nearly $3 billion. The gross business volume for extraction/production segment of the industry increased by $800 million or by 34 percent. Economic activity associated with the processing and transportation segment of the industry increased by over $300 million. The gross business volume for the entire industry doubled over the period from $4.1 billion in 2005 to $8.2 billion in 2007 (Table 16). Other notable increases included employment expanding by 47 percent and government revenues rising by 80 percent.

Table 16. Key Economic Values, Petroleum Industry, North Dakota, 2005 and 2007

Category	2005*	2007	Percent Change
	---------- 000s $ ----------		
Direct Impacts			
Exploration	$469,300	$1,536,000	227
Extraction/Production	$959,000	$1,308,000	36
Processing/Transportation	$139,700	$261,700	87
All Segments	$1,568,000	$3,106,000	98
Secondary Impacts			
Exploration	$817,000	$2,721,000	233
Extraction/Production	$1,485,000	$1,956,000	32
Processing/Transportation	$251,000	$445,000	77
All Segments	$2,553,000	$5,123,000	101
Gross Business Volume			
Exploration	$1,286,000	$4,258,000	231
Extraction/Production	$2,444,000	$3,265,000	34
Processing/Transportation	$391,000	$707,000	81
All Segments	$4,121,000	$8,229,000	100
Governmental Revenues	$354,600	$640,000	80
Industry-wide Employment	5,267	7,719	47

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

Summary

The purpose of this study was to estimate the economic contribution of the petroleum industry in North Dakota in 2007. The petroleum industry was defined to include exploration, extraction/production, transportation, and processing of crude oil and natural gas. Exploration is the process of finding mineral resources while extraction/production is the process of recovering mineral resources. Transportation was limited to the movement of oil and gas from wells to collection points, and then on to processing facilities located either in-state or out-of-state. Petroleum processing in North Dakota included refining of crude oil and natural gas processing.

Due to the complexities of how the oil and gas industry is structured, and that in-state effects (i.e., first round spending or direct impacts) from the petroleum industry in any given year may not equal the market value of oil and gas production, an expenditure-based approach to measuring the economic size of the petroleum industry was used in this study. In this approach, only money spent in North Dakota by companies involved in the petroleum sector

was included in the study and represented the direct impacts of the industry. In addition to in-state expenditures for exploration, production, and processing activities, private and public royalties, lease bonuses, and severance taxes were also included as direct impacts. Secondary economic impacts result from the spending and respending of the direct impacts and were estimated using the North Dakota Input-Output Model.

Three separate surveys were used to collect production, expenditure, and employment data for the petroleum industry in North Dakota. Firms that own or operate oil wells in the state were surveyed to obtain information on in-state expenses for oil and gas exploration, oil and gas extraction/production, general business expenses, employment, oil and gas production, and drilling activity. A similar survey was conducted for firms engaged in pipeline transportation of crude oil and unprocessed natural gas and included firms involved with processing of crude oil and natural gas in North Dakota. A third survey involved lease/brokerage firms and was used to obtain information on leasing activity in the state.

The survey of oil operators produced financial data on about 34 percent of North Dakota's oil and gas production in 2007. Also, financial data was collected on pipeline transportation, gas processing, and crude oil refining. The survey of lease/brokerage firms obtained information on leasing activity on private lands in the state. Secondary data, obtained from government agencies, was combined with survey data to estimate royalties, lease bonuses, and severance taxes.

Estimates of total in-state expenditures in 2007 for oil and gas exploration were derived from the survey of oil operators and used with drilling statistics from the Oil and Gas Division of the North Dakota Industrial Commission. The combination of in-state expenses for exploration and lease bonuses resulted in $1.536 billion in direct impacts in 2007. Average expense per well drilled was estimated at $4.3 million, and 336 wells were drilled in the state in 2007. The secondary economic impacts associated with exploration activities were estimated at $2.7 billion. The in-state gross business volume of exploration activities was estimated at $4.3 billion in 2007 (Figure 7).

Estimates of oil and gas extraction/production expenses, general business expenses for oil operators, private and public royalties, and state severance taxes were derived from survey data and secondary information obtained from various government agencies. The state had 3,759 producing wells in 2007 that produced over 45 million barrels of oil and over 70 million mcf of natural gas. Total direct impacts for oil and gas production were estimated at $1.308 billion in 2007. Total secondary economic impacts associated with oil and gas production were estimated at $1.96 billion. The in-state gross business volume of oil and gas extraction/production was estimated at $3.26 billion in 2007 (Figure 7).

The processing component of the petroleum industry was estimated to have a direct impact in North Dakota of $262 million. Total secondary economic impacts associated with processing and transporting crude oil and natural gas were estimated at $445 million. The in-state gross business volume of processing and transporting crude oil and natural gas was estimated at $707 million in 2007 (Figure 7).

Industry-wide direct impacts from the petroleum industry were estimated at $3.1 billion in 2007. Total secondary economic impacts associated with the industry were estimated at $5.1 billion. The gross business volume for the petroleum industry in North Dakota in 2007 was estimated at $8.23 billion (Figure 7).

Additional measures of the petroleum industry's economic importance to the state include direct employment for 7,719 full-time jobs, economy-wide personal income of $3.1 billion, statewide retail sales of nearly $2 billion, direct contributions to local and state government revenues of $520 million, indirect contribution of $120 million in state government tax collections, and secondary employment of 38,500 full-time equivalent jobs. For every dollar spent in the state by the petroleum industry, another $1.65 in additional business activity was generated.

A number of comparisons to information collected and estimated for 2005 was made to similar figures for 2007. While energy prices were not directly used in the study to generate estimates of industry activity, prices directly influence some measures of industry output, such tax collections and royalties. Oil prices increased from 2005 to 2007 in real terms by 20 percent to around $65 per barrel, but remained well below the extreme price spikes observed in 2008. Gas prices, both in nominal and real terms, decreased by 26 percent over the two-year period to about $6.70 per mcf. Oil production increased from 35 million barrels to 45 million barrels over the two-year period. Gas production jumped from around 58 million mcf in 2005 to nearly 71 million mcf in 2007. 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.

North Dakota Petroleum Industry

Key Segments of the Industry

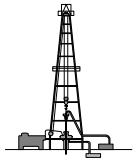
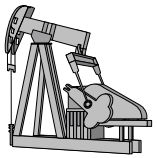
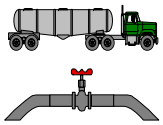
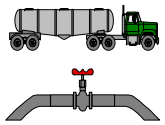
	Exploration	Extraction	Transportation	Processing	Distribution	Retail
	drilling and locating oil reserves 	bringing oil and gas to the surface 	moving oil and gas from pumps to processing centers 	oil refining and natural gas processing 	moving products from processors to retail markets 	selling petroleum products to end users
Direct Impacts	$1.536 billion	$1.308 billion	$262 million		not included	
Secondary Impacts	$2.721 billion	$1.956 billion	$445 million			
Gross Business Volume	$4.258 billion	$3.264 billion	$707 million			
Direct Employment	7,140 full-time equivalent jobs		579 full-time equivalent jobs			
Secondary Employment	38,500 full-time equivalent jobs					
Direct Government Revenues	$108 million	$393 million	$19 million			

Figure 7. Economic Effects of Key Segments of the North Dakota Petroleum Industry, 2007

All segments of the industry showed substantial gains in direct and secondary economic impacts over the period. In exploration, the increase in drilling activity combined with an increase in the cost per well resulted in substantial changes in gross business volume. Gross business volume associated with extraction/production were largely similar to changes in oil and gas production. An increase in transportation expenses, expansions of industry infrastructure (i.e., gas plants and pipeline capacities), and increased processing volumes all contributed to an increase in the gross business volume for the processing/transportation segment of the industry.

The exploration segment of the industry increased in real terms by over 230 percent, and was the primary reason for the magnitude of the increase in the overall gross business volume for the entire industry. In real terms, direct impacts from exploration in 2007 nearly equaled the entire industry's direct impacts in 2005. The difference in gross business volume for exploration in 2005 and 2007 was nearly $3 billion. The gross business volume for extraction/production segment of the industry increased by $800 million or by 34 percent. Economic activity associated with the processing and transportation segment of the industry increased by over $300 million. The gross business volume for the entire industry doubled in real terms over the period from $4.1 billion in 2005 to $8.2 billion in 2007 (Table 16). Other notable increases included direct employment expanding by 47 percent and government revenues rising by 80 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 2007 with previous estimates from 2005 reveal the industry doubled its economic size in two years. While some of that increase can be directly attributable to an increase in the number of producing wells, which has led to increased oil and gas production, the primary reason for the substantial increase has been due to expenditures for oil drilling/exploration activities.

The economic contribution of the petroleum industry was tied to activity and factors present in the industry in 2007. It is important to remember that the figures presented in this report represent a snapshot in time, and will not necessarily reflect the future economic impact of the industry. The economic importance of the industry will increase and decrease with changes in a host of factors that affect petroleum exploration, extraction/production, and processing levels. The fact that the economic importance of the industry is subject to change was readily apparent when comparisons were made between economic output in 2005 and industry figures for 2007. The gross business volume associated with exploration increased by over 230 percent in real terms over the period. A combination of a substantial increase in the number of oil wells drilled and a nearly three-fold increase in the cost per well drilled were the reasons for the change. Other comparisons between 2005 and 2007 reveal that changes in impacts from oil and gas extraction/production more closely mirrored changes in output, while increases in economic activity associated with the processing sector of the

industry were tied to both increases in state oil and gas production, but also to expanded capacity of the industry's infrastructure, and increased transportation activity.

Few other basic-sector industries in North Dakota, outside of various agricultural industries and the lignite industry, have had similar comprehensive assessments of their economic importance. 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. The wheat industry and the coal industry are two examples of basic-sector industries that have had economic assessments performed to measure their economic contribution to North Dakota's economy. From 2001 through 2003, the production, transportation, handling, and processing of wheat in North Dakota was estimated to produce a gross business volume of $3.56 billion annually. In 2007, the coal industry in North Dakota was estimated to generate $2.4 billion in gross business volume (Coon and Leistritz 2008a). Estimates of the gross business volume for the petroleum industry were $4.1 billion in real terms in 2005 and nearly $8.2 billion in 2007. Direct employment figures for the wheat industry would not be comparable to those in this study; however, direct employment in the coal industry was estimated at 3,882 FTE positions, compared to 5,267 FTE jobs in the petroleum industry in 2005 and 7,719 FTE positions in 2007.

Regardless of the economic measure used, the petroleum industry is one of the largest basic-sector industries in North Dakota. Considering that the industry's direct impacts (i.e., first round of spending) are concentrated geographically in the western portion of the state, the economic health of western North Dakota is perhaps tied more to the petroleum industry than any other single industry. Yet, despite the strong influence of the petroleum industry in western North Dakota, the magnitude of the contributions to both the state and local governments and the shear volume of secondary economic effects in nearly all sectors of the North Dakota economy would suggest that the economic effects of the industry are felt statewide. Current activity levels in the petroleum industry clearly make it one of the key forces in the North Dakota economy.

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APPENDIX A

Questionnaire, Oil Operators, North Dakota, 2005

Contribution of the Petroleum Industry to the North Dakota Economy

Survey of Oil Operators

Department of Agribusiness and Applied Economics
North Dakota State University
and
North Dakota Petroleum Council

Instructions and Guidelines for Filling Out the Questionnaire

Data provided from this survey will be used to help estimate the economic contribution of the oil industry to the North Dakota economy. The goal is to determine how much money the oil industry spends in North Dakota. All expenditure data will be synthesized in a manner that only industry-wide totals will be reported. In no way will any information presented in the study identify or be reflective of any single firm or operation.

The following is a list of general guidelines for the questionnaire.

1. Use information from 2007 or your most recently completed fiscal year.

2. Expenditures should be expressed in U.S. dollars.

3. If the actual amount of the expenditure is not easily determined or is not readily known, please provide an estimate of the expense.

4. For contractor expenditures (Part II of this questionnaire), please include all expenditures made for services provided in North Dakota, even if the office or headquarters of the contractor or service provider is not located in North Dakota.

5. For general expenditures for day-to-day operations (Part III of the questionnaire), include only how much your company paid out to entities in North Dakota.

6. If you cannot identify whether an expenditure was made in North Dakota or in another state, indicate this on the form.

7. Definitions for some expenditure items and their corresponding Standard Industrial Classification (SIC) code listing are included to help in determining allocation of expenditures.

6. Please complete the survey by **??** and mail the questionnaire in the return envelope.

7. If you have questions, please contact:

Dean Bangsund
701-231-7471
E-mail: d.bangsund@ndsu.edu

or

Larry Leistritz
701-231-7455
E-mail: f.leistri@ndsu.edu
Department of Agribusiness and Applied Economics
North Dakota State University
Fargo, ND 58105-5636

Part I - - General Information

Business Name: _____

_____

Mailing Address: _____

_____

Contact Person: _____

_____

The following questions pertain only to wells for which your company is the operator.

Number of producing oil wells in ND in 2007 for which your company was the operator _____

	Oil	**Gas**
Total production from your operated wells in 2007	_____ bbls	_____ mcf
Operator interest share of production	_____ %	_____ %
Overriding royalty interest share of production	_____ %	_____ %
Remaining working interest share of production	_____ %	_____ %

Total number of employees working in North Dakota: _____ (Full-time equivalents)

Number of jobs (FTE's) above dedicated to exploration/drilling	_____
Number of jobs (FTE's) above dedicated to general production/extraction	_____

Part II. Payments made to **Contractors**, **Sub-contractors**, and **Consultants**

The following instructions pertain to **Part II** of the Questionnaire.

1) Only report contracted expenses for wells in North Dakota for which your company serves as the operator even if your company's stake in those wells is small. Do not include expenses for wells for which your company only has a working interest share–those expenses will be reported by other oil operators.

2) Please include the total cost for the contracted service for those wells. The total cost will include your company's share of the costs as well as the costs billed to the working interest holders on the well.

3) Please indicate expenses for producing wells, wells currently being drilled, and wells that were drilled, but never used.

4) Only include contracted expenses for the last year.

5) Please include all expenditures made for services provided in North Dakota, even if the office or headquarters of the contractor or service provider is not located in North Dakota.

Part II. **Type of Contracting Work Performed**	**Payments for work done in North Dakota**
General Exploration Examples of services include lease brokerage costs (lease arrangements and landowner negotiations), landman expenses, environmental services, seismic testing and geological research	$
Drill Activities (Capital Investments) Examples of services include land survey work, excavation, road building, construction of drill site, other drill site preparations such as providing electricity, setting up storage facilities, etc., erecting derrick, mudding operations, spudding operations, wellbore casing, case perforation, logging, fracing services, wellhead placement, pipeline development and construction, and any other services provided that are associated with drilling activities This category of expenses should include all phases of drilling for both primary wells and secondary/tertiary/EOR injection wells	$
Oil and Gas Extraction and Production (Operating Expenses) Examples of services include pump, well, and storage tank maintenance and servicing; daily & weekly well visits for tank switching, periodic inspections, general monitoring, and other activities; well stimulations; well work overs; well idling, shutdown, and/or abandonment activities	$
Transportation Include expenses for truck transportation of oil from well site to pipeline collection points (terminal) and expenses for truck transportation of other products and by-products from well site to secondary locations, also include all charges for transportation of gas and oil by pipeline until products are sold to a purchaser or buyer	$
Any other services or activities provided by contracted arrangements not listed above: _____ (please specify) _____ (please specify) _____ (please specify) _____ (please specify)	 $ _____ $ _____ $ _____ $_____

Part III. The following expenses relate to your company's general business operations in North Dakota and should represent expenses paid only to North Dakota entities. These expenses should not include any payments made to oil industry contractors or consultants associated with exploration or extraction. Please refer to the accompanying sheet for definitions and clarification of what expenses should be included in the expenditure categories.

If your company had no expenses in a particular category, please enter zero.

General Business Expenses	Expenses paid to North Dakota entities
Building and equipment leases (e.g., office space, vehicles)	$
Business and personal services	$
Professional and social services	$
Communications	$
Construction	$
Public utilities	$
Employee wages and salaries	$
Employee benefits (retirement, health insurance, etc.)	$
Payroll taxes (FICA, etc.)	$
Insurance	$
Interest, finance, and banking expenses	$
Oil and gas royalties	S
Retail trade	$
Wholesale trade	$
Research and development	$
North Dakota taxes:	
Property	$
Income	$
Sales and use	$
Transportation (note: pipeline expenses should be reported in Part II)	$
Any miscellaneous payments to working interests	$
Any miscellaneous payments to royalty interests	$
Other expenses (please specify).	$

Definitions for Expenditure Categories–Part III of Questionnaire

The following definitions are derived from Standard Industrial Classification Manual (SIC codes) and have been provided to assist in allocating expenses into common categories. If needed, please refer to the following web site for additional examples of the expenses included in each category: http://www.osha.gov/pls/imis/sic_manual.html Each category has several Major Group numbers, which contain additional detail on the type of activities in each category.

Construction: Includes expenses for construction projects, such as construction (including new work, additions, alterations, remodeling, and repairs) of residential, industrial, public, office, warehouse, and other buildings and structures. (Major Groups 15, 16, and 17)

Transportation: Includes expenses for railroad, motor freight, water transportation, air transportation, and other transportation to include packing and crating services, and rental of transportation equipment. (Major Groups 40, 41, 42, 43, 44, 45, 46, and 47)

Communications: Includes expenditures for telephone, telegraph, radio, television, satellite services, Internet transactions, and other communication services. (Major Group 48)

Public Utilities: Includes expenses for natural gas, electricity, water supply, and sanitary (sewer & garbage) services. (Major Group 49)

Wholesale Trade: Expenses paid to establishments primarily engaged in selling merchandise to retailers; to industrial, commercial, institutional, or professional users; or to other wholesalers, or acting as agents in buying merchandise for or selling merchandise to such persons or companies. (Major Groups 50 and 51)

Retail Trade: Includes expenses for building materials, hardware, food, general merchandise, office supplies, automobile fuel, computers, eating and drinking establishments, work uniforms, and most other business and office-related supplies. (Major Groups 52, 53, 54, 55, 56, 57, 58, and 59)

Finance, Insurance, and Real Estate: Includes expenses for loan service, interest on loans, investment counseling, insurance, real estate transactions, brokerage fees, and any other financial service expenditures. (Major Groups 60, 61, 62, 63, 64, 65, 66, and 67)

Business and Personal Services: Examples of business and personal services include expenses for advertising, collection services, photocopying/duplication/printing services, equipment rental, computer services, computer software, security services, tax preparation, automotive/equipment/miscellaneous repairs, entertainment, janitorial services, and overnight lodging. (Major Groups 70, 72, 73, 75, 76, 78, 79, and 87)

Professional and Social Services: Includes expenses for health/pharmaceutical, medical, legal, educational, research and development, child care, vocational training, and other professional services. (Major Groups 80, 81, 82, 83, 84, 86, 88, and 89)

Part IV. Leasing and Drilling Activity in North Dakota. Please summarize your company's lease expenditures and drilling activities over the last five years. Lease expenditures and drilling activities should be for North Dakota operations only.

Leasing	**2007**
Total lease expenditures ($)	
Private leases	
State leases	
Federal leases	
Total acres leased	
Private land	
State land	
Federal land	
Drilling	**2007**
Overall number of wells drilled	
Number of wells drilled that were plugged (dry holes)	
Number of wells drilled that went into production (completed as a producer)	

Thank You for completing this questionnaire!

Please return the questionnaire in the postpaid envelope.

If you would like a copy of the study results mailed to you, make sure you have provided a mailing address in Part I of the questionnaire. Otherwise, you may contact Edie Watts in the Department of Agribusiness and Applied Economics at North Dakota State University for more information on our departmental reports. Phone 701-231 7441, fax 701-231-7400, email: ndsu.agribusiness@ndsu.edu or visit our departmental listing of research reports on the internet at http://agecon.lib.umn.edu

Study results should be available in the fall of 2008.

APPENDIX B

Questionnaire, Processors, North Dakota, 2007

Contribution of the Petroleum Industry to the North Dakota Economy

Survey of Processors

Department of Agribusiness and Applied Economics
North Dakota State University
and
North Dakota Petroleum Council

Instructions and Guidelines for Filling Out the Questionnaire

Data provided from this survey will be used to help estimate the economic contribution of the oil industry to the North Dakota economy. The goal is to determine how much money the oil industry spends in North Dakota. All expenditure data will be synthesized in a manner that only industry-wide totals will be reported. In no way will any information presented in the study identify or be reflective of any single firm or operation.

The following is a list of general guidelines for the questionnaire.

1. Use information from your most recently completed fiscal year.

2. Expenditures should be expressed in U.S. dollars.

3. If the actual amount of the expenditure is not easily determined or is not readily known, please provide an estimate of the expense.

4. Only include expenditures made to businesses, governments, or individuals in North Dakota.

5. If you cannot identify whether an expenditure was made in North Dakota or in another state, indicate this on the form.

6. Definitions for some expenditure items and their corresponding Standard Industrial Classification (SIC) code listing are included to help in determining allocation of expenditures.

7. We would prefer to have the questionnaire completed and returned by **June 4, 2008**.

   If you have questions, please contact:

Dean Bangsund
701-231-7471
E-mail: d.bangsund@ndsu.edu
or
Larry Leistritz
701-231-7455
E-mail: f.leistritz@ndsu.edu
Department of Agribusiness and Applied Economics
North Dakota State University
Fargo, ND 58105-5636

Part I - - General Information

Business Name: _____

Mailing Address: _____

Contact Person: _____

Total MCF of gas processed in the last year for operations and facilities located in North Dakota (if applicable) _____

Percent of gas processed that was from North Dakota sources _____

Percent of gas processed that was from sources in other states _____

Percent of gas processed that was from Canadian sources _____

Total MCF of gas transported in the last year for operations and facilities located in North Dakota (if applicable) _____

Percent of gas transported that was from North Dakota sources _____

Percent of gas transported that was from sources in other states _____

Percent of gas transported that was from Canadian sources _____

Number of employees in North Dakota (full-time equivalents) in 2007 _____

Annual Expenses. The following expenditures should represent expenses paid only to North Dakota entities. Please refer to the accompanying sheet for definitions and clarification of what expenses should be included in the expenditure categories.

Operating Expenses in Fiscal Year 2007	Expenses paid to North Dakota entities
Building and equipment leases (e.g., office space, vehicles)	$
Business and personal services	$
Professional and social services	$
Communications	$
Construction	$
Public Utilities	$
Employee wages and salaries	$
Employee benefits (retirement, health insurance, etc.)	$
Payroll taxes (FICA, etc.)	$
Insurance	$
Interest, finance, and banking expenses	$
Purchases of gas (from ND sources)	$
Transportation	$
Retail Trade	$
Research and Development	$
North Dakota Taxes	$
Property	$
Income	$
Sales and Use	$
Other expenses (please specify)	$
	$
	$

Definitions for Expenditure Categories

The following definitions are derived from the Standard Industrial Classification Manual (SIC codes) and have been provided to assist in allocating expenses into common categories. If needed, please refer to the following web site for additional examples of the expenses included in each category: http://www.osha.gov/pls/imis/sic_manual.html Each category has several Major Group numbers, which contain additional detail on the type of activities in each category.

Construction: Includes expenses for construction projects, such as construction (including new work, additions, alterations, remodeling, and repairs) of residential, industrial, public, office, warehouse, and other buildings and structures. (Major Groups 15, 16, and 17)

Transportation: Includes expenses for railroad, motor freight, water transportation, air transportation, pipeline transportation of petroleum, and other transportation to include packing and crating services, and rental of transportation equipment. (Major Groups 40, 41, 42, 43, 44, 45, 46, and 47)

Communications: Includes expenditures for telephone, telegraph, radio, television, satellite services, Internet transactions, and other communication services. (Major Group 48)

Public Utilities: Includes expenses for natural gas, electricity, water supply, and sanitary (sewer & garbage) services. (Major Group 49)

Wholesale Trade: Expenses paid to establishments primarily engaged in selling merchandise to retailers; to industrial, commercial, institutional, or professional users; or to other wholesalers, or acting as agents in buying merchandise for or selling merchandise to such persons or companies. (Major Groups 50 and 51)

Retail Trade: Includes expenses for building materials, hardware, food, general merchandise, office supplies, automobile fuel, computers, eating and drinking establishments, work uniforms, and most other business and office-related supplies. (Major Groups 52, 53, 54, 55, 56, 57, 58, and 59)

Finance, Insurance, and Real Estate: Includes expenses for loan service, interest on loans, investment counseling, insurance, real estate transactions, brokerage fees, and any other financial service expenditures. (Major Groups 60, 61, 62, 63, 64, 65, 66, and 67)

Business and Personal Services: Examples of business and personal services include expenses for advertising, collection services, photocopying/duplication/printing services, equipment rental, computer services, computer software, security services, tax preparation, automotive/equipment/miscellaneous repairs, entertainment, janitorial services, and overnight lodging. (Major Groups 70, 72, 73, 75, 76, 78, 79, and 87)

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Study results should be available in the fall of 2008.

APPENDIX C

Questionnaire, Leasing/Brokerage Firms,
North Dakota, 2007

Contribution of the Petroleum Industry to the North Dakota Economy

Department of Agribusiness and Applied Economics
North Dakota State University
and
North Dakota Petroleum Council

Confidential Survey of Oil Leasing Firms

Company _____
Contact Person _____

Total bonus payments paid out for oil leases in North Dakota in 2007 $_____

Of the total above, what percentage went to:
%_____ In-state residents (North Dakota addresses only)
%_____ Federal agencies
%_____ ND State agencies

Total net lease acres made by your firm in North Dakota in 2007 _____

Of the total above, what percentage was represented by:
%_____ Private acreage
%_____ Federal acreage
%_____ State acreage

Thank you for completing this questionnaire. The material you provide is kept strictly confidential and will be averaged with data from other firms.

Please mail your completed questionnaire to:

Dean Bangsund
Dept of Agribusiness and Applied Economics
North Dakota State University
NDSU Dept 7610
PO Box 6050
Fargo, ND 58108-6050

Please call or e-mail Dean Bangsund, NDSU, for any questions regarding this survey or the study of the Petroleum Industry in North Dakota.
Ph. 701-231-7471
E-mail: d.bangsund@ndsu.edu