

A Basic Analysis of the Bakken Oil Boom: Precautions and Planning

A Basic Analysis of the Bakken Oil Boom: Precautions and Planning

Table of Contents

Executive Summary	
Introduction	1
Background	1
Literature Review	2
Data Methodology and Analysis	8
Recommendations and Conclusion	15
Appendix A: Works Cited	
Appendix B: Interviewee List	
Appendix C: Acknowledgements	
Appendix D: Charts and Figures	
Appendix E: Map of Study Region	
Appendix F: Summary of Permanent Oil Trust Fund Expenditures	
Appendix G: Information on the ND Fiscal Project and the Consensus Council	

Copyright: Laura Seifert, University of Minnesota
Please do not cite or distribute paper without contacting the author.
Email: seif0056@umn.edu

Executive Summary

The oil industry began booming in northwestern North Dakota in 2006 with developments in the Bakken formation. This paper is an analysis of the boom and its impact upon the economies in a six county region identified by the high numbers of drilling and permits pulled in the region. Counties in the study region include Billings, Burke, Dunn, McKenzie, Mountrail, and Williams counties.

The boom is evidenced by 28% per annum job growth from 2005-08 in mining industry employment in the region, an increase in the share of mining jobs in the regions basic industry mix (from 28% in 2000 to 55% in 2008), and a 2008 location quotient of 10.6 for the region's mining industry relative to the state. This increased mining activity has also corresponded with average annual continuous growth in state-wide oil and gas extraction tax revenues of 33%. Nearly 25% of all oil and gas extraction tax revenue collected in the state since the institution of the tax in 1981 has happened in the 2008 and 2009 fiscal years. The increased employment and tax revenues are by and large benefits to the state, which is currently one of only a few states experiencing a budget surplus.

While these overall advantages persist, this increased economic activity is taking a toll on the study region. Through local interviews it was evident that the region is experiencing a housing shortage, a shortage of skilled and service labor, and detrimental impacts to the area's infrastructure. The increase in jobs and the demands upon the local area will continue throughout the drilling phase of the industry's development, which will last for the next 15-20 years. However, when the industry transitions from the drilling to the production phase, demand for labor in the industry will fall by 90%. It is possible that without proper planning the region will spend the next several years working to meet the demand in the region for homes, goods and services, but then by 2030, 7200 mining industry jobs will be phased out, and the impact of the loss of jobs on the economy will be exacerbated by the lower utilization of any infrastructure developments the region makes to service the temporary increase in population.

It is recommended that the region and the state organize strategic plans to address the immediate demands on the economy, while also planning for the next fifteen years, when it is expected that the mining jobs will move out of the area. It is recommended that state organizations work to promote the passage of the Legacy Fund in the 2010 election, which will secure oil and gas tax revenues for future generations. Finally, it is recommended that the state invest in repairs to the infrastructure in the study region that have resulted from increased truck traffic and well development, while the region implements a plan for financing the maintenance of the repaired infrastructure into the future.

Introduction

Recent technological developments in horizontal drilling combined with high oil prices have contributed to a recent oil boom in Northwestern North Dakota. The Bakken geological formation covers 14,000 square miles in North Dakota and is estimated to contain 300 billion barrels of oil. Beneath the Bakken formation lies another oil reserve named Three Forks, the size of which is currently unknown. With current technologies it is estimated that two to three percent of the Bakken oil reserve will be withdrawn over the next 100 years. In 2008 it was estimated by the US Geological Survey to be the largest continuous oil reserve in the lower 48 states.

This paper examines changes beginning in April of 2006 as a result of the oil activity in a six county region within the Bakken formation. Billings, Burke, Dunn, Mckenzie, Mountrail, and Williams counties (Reference Appendix E) in North Dakota combine to cover 10,903 square miles and had a total population of 38,859 people according to 2000 US Census data. The region has been dramatically impacted by the increase in oil production, and while not all aspects of this impact can be measured here, labor and housing shortages, impacts on regional infrastructure and public services, and the state's utilization of the Permanent Oil Trust fund are issues that need to be addressed. This paper will explore these major issues within the study region and the state and conclude with recommendations for policies that will alleviate some of the strains on the region and begin planning for long-term sustainable growth.

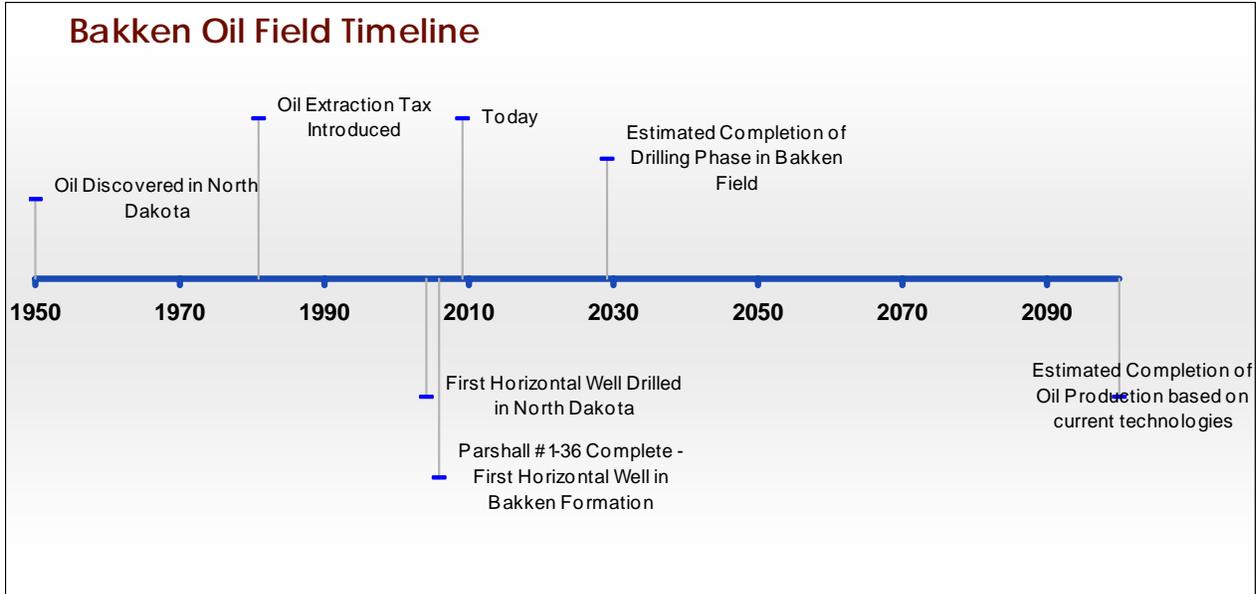
Background

Oil was discovered in North Dakota on April 4, 1951 near the town of Tioga in Williams County, and since that time almost 16,000 wells have been drilled in the state (Ness, 2009). The last time the state saw an upswing in oil production was in the 1970s and early 1980s, but

changes in the state's extraction tax in 1981 coupled with a decline in oil prices nearly eliminated oil production in the state by 1986 (Helms, 2009). Since that time oil production has increased across the state, but a period of unprecedented growth began in April 2006.

In 2004 the first horizontal well was completed in North Dakota, but expansive growth did not begin until April 2006, when the well, Parshall #1-36, was completed as a producer (Hvinden, 2009). Although production from horizontal wells is nearly twice as expensive as production using vertical wells, production in the Bakken region has continued to grow since. The high production cost makes North Dakota more sensitive to price fluctuations than other oil producing regions, but the Bakken oilfield is operating at a 99% success rate, and virtually every well is capable of producing some oil (ND Association of Oil and Gas Producing Counties). This rate of success reduces the risk to drill in the area, even though the cost of horizontal drilling is higher than the cost of the vertical drilling used in other areas.

From 2005-08 the study region saw job growth in the mining industry increase at a rate of 28% per annum (p.a.). From 2000-05 that average annual growth rate was only 8%. It is estimated by the North Dakota Division of Oil and Gas that drilling and infrastructure development (road construction, power line expansion, etc.) will continue in the Bakken region for the next 15-20 years and 10,000 additional wells will be dug during that period. Following the construction phase, oil production in the region is expected to continue for another 50-100 years. During the construction and drilling phase the oil industry will require an average of 8,000 employees, which in the study region is a flood of jobs, but during the oil production phase that demand will drop by 90%. Only 800 employees will be required to maintain the industry in its production phase (Helms, 2009).



This temporary increase in jobs and influx of population has multifaceted consequences for the area in the short- and long-term, and precautions must be taken at both the state and local level to insure sustainable economic growth in the region. Economic literature illustrates that natural resource wealth is not a guarantee for future economic success, so for the state and the region to capitalize on its current assets in the long-term, appropriate economic strategies should be implemented now.

Literature Review

The literature analyzing natural resource economies is vast. “The conventional view concerning the role of natural resources in economic development has been that the resource endowment is most critical in the early low-income states of development. ...As a population develops more skills, those skills are deployed ... to counteract any resource deficiency” (Auty, 1993). However, history has shown that natural resource wealth does not automatically translate to economic success, and the process noted above does not always come to fruition. The following will explain some of the most common detrimental impacts of natural resource

wealth, such as the theory of the natural resource curse, rentier states and Dutch Disease. However, it will also summarize some of the relevant literature on sustainable growth to illustrate how these pitfalls can be avoided.

The basis of the natural resource curse theory is that nations that are wealthy in natural resources may not only fail to benefit from their resources, but they may even perform worse economically than countries without such resources (Auty, 1993). Some resource dependent nations, such as Norway, Brunei, Argentina, Qatar, United Arab Emirates, Kuwait, and Mexico all rank relatively high on the United Nations Human Development Index, but many resource rich nations do not (Nigeria, Congo, Angola) (Humphreys, 2007). The natural resource curse theory offers three possible explanations for why a resource rich nation may under perform.

First, resource extraction is capital intensive, but it requires relatively little labor (nationally). Additionally, natural resource extraction does not always require a production component, so the industry has weak domestic linkages. Inputs for resource extraction can be produced outside of the resource wealthy region or nation, and production and processing (if necessary) are also not required to take place at the site of the resource. These two components help make this an enclave industry. Finally, if capital is from a foreign source export earnings will go back to that foreign source, and the only contribution from the resource sector to the local economy is through taxes (Auty, 1993). When these components are combined with the fact that a resource is non-renewable, it can lend to rent-seeking behavior on the part of individuals or governments (Humphreys, 2007).

Economic rent is the difference between the cost of extraction and the value of the resource (Humphreys, 2007), and a rentier economy is “an economy substantially supported by

expenditure from the state, while the state itself is supported from rent accruing abroad” (Beblawi, 1987). Rentier states are a subsystem of rentier economies and are defined by a predominance of rent situations, upon which the state relies. It can exist without a strong productive domestic sector and where few people are involved in generating the wealth. Finally, and most importantly, a rentier state is one where the government is the recipient of the external rents (Beblawi, 1987). The extractive industries lend themselves to this model, because natural resource industries do not employ large numbers of people and may not require domestic inputs or processing as mentioned above. If the natural resources are owned by the government, then the economic rents are accumulated by the government, and if enough rent is generated the government can essentially support an entire economy by subsidizing all other industries and the citizens directly.

Another example of failure of the natural resource economy is through Dutch Disease, which is defined by Humphreys, Sachs and Stiglitz (2007) as the process by which an increase in natural resource exports and appreciation in the real exchange rate result in a spending effect. This spending effect is coupled with a resource pull, where labor and materials used by the natural resource industry become too expensive for other sectors. Ultimately, when the resource pull combines with the spending effect, domestic goods cannot compete with imported good prices, and the non-resource sectors cannot afford labor or materials for production (Humphreys, et al. p. 5). The natural resource industry works against other industries, weakening the national industry-mix. As a result, the state becomes more vulnerable to price changes or changes in production in that resource, weakening the overall economy.

Government leaders democratically elected or otherwise, are in a unique position, when their nations or states have natural resource wealth. In rentier states citizens can profit simply by being citizens, which can result in a rentier mentality, where “wealth is not related to work and risk-bearing, rather to chance or situation” (Beblawi, 1987). This can be detrimental to the democratic processes, then, because, “with virtually no taxes, citizens are far less demanding in terms of political participation” (Beblawi, 1987).

Even in other resource rich states, as explained by Humphreys (2007), government officials have an incentive to finance projects in their districts or provide tax breaks to businesses and constituents in order to garner votes to maintain power, even if this means overspending. This of course can backfire if constituents are aware that government is overspending their resources, but transparency is essential for this to happen. When interest groups are in power they are also incentivized to spend resources on their own interests, because when they are out of power, the opportunity to achieve their interests may not be presented again. Here again the motivation to act may be done at the expense of overspending (Humphreys, p. 200). These issues demonstrate how even in democratic societies the immediate needs of elected officials (garnering votes and rewarding interest groups) can be in opposition to long-term economic planning for states with natural resources. Furthermore, this type of politicking can work to keep incumbents in power even when perhaps they would not be without the resource wealth. “Political incumbents in resource-abundant polities with fair and free elections manage to win by larger margins and preserve vote shares in the face of adverse circumstances in a way that politicians without access to mineral rents will not” (Goldberg, et al, 2008). All of this can be detrimental to the democratic process and can

disenfranchise citizens. As long as governments are transparent in their budgets and expenditures are not made, 'off-budget', these processes can be minimized.

Ultimately, the resource curse occurs primarily, when "revenues are used for consumption, rather than public investments" (Humphreys, et al, 2007). When a nation extracts its natural resources it is essentially expending its assets. These non-renewable resources should be converted into new assets for the state or nation, so that it can be well positioned for the time when the natural resources are gone. This conversion process is one of the greatest benefits of natural resource wealth, because it can provide resources to finance core public goods and infrastructure. Natural resource wealth can also boost real living standards by financing higher levels of public and private consumption, and it can finance high levels of investment (Humphreys, et al, p. 177). Nations and states can leverage the benefits of natural resource wealth into sustainable development practices, characterized by:

- 1) mixed economies comprised of public and private investment in diverse sectors;
 - 2) short-run macroeconomic (price) stabilization mechanisms and long-term fiscal solvency;
 - 3) public investment that does not substitute for private investment; and
 - 4) long-term fiscal planning (10 years) in the context of development plans
- (Humphreys, 2007).

Natural resources, oil in particular, due to the volatility in its price, provide unique challenges for economic development and planning, and the above standards can be difficult to achieve. The state of North Dakota is buffered from some of the potential injuries caused by the natural resource curse, since it will not experience currency fluctuation the way an

independent nation might, and because it has a transparent democratic governance structure in place. The following section illustrates the economic changes happening in the study region as a result of the boom in the oil industry there.

Data Methodology and Analysis

Although the Bakken region encompasses most of West Central North Dakota, the six county study region was selected based on suggestion from the ND Division of Oil and Gas as the areas where the most drilling has occurred and the most permits have been issued (Hvinden, 2009).

Employment data was provided by North Dakota Job Services, which utilizes the Quarterly Census of Employment and Wages (QCEW) dataset. This dataset was determined to be more accurate than the County Business Pattern (CBP) data available through the Bureau of the Census, because QCEW is a compilation of quarterly contribution reports of all employers in the county who are liable for unemployment insurance coverage of their employees and is available on a monthly basis. Moreover, North Dakota Job Services codes individual worksites with NAICS codes to guarantee capture of 'multi-site' employers, and they also contact small employers to get employment numbers. The QCEW data provided more comprehensive employment numbers than the CBP. The only employment data that was estimated from the CBP data set was that of agriculture employees. Neither the QCEW nor the CBP data set account for sole proprietorships, so the only agriculture employees reported to either data set would be hired employees. These employees represent a very small number of jobs in the region (average 36 jobs annually from 2000-2010), and through interviews conducted in the region it was learned that the mining and agriculture industries complement one another. The

drills cause very little disruption to agricultural practices, and the additional work available in the area has allowed families to supplement their farm income and sustain the family farms in the area. The number of employees in the farming industry was suppressed for confidentiality reasons due to the small numbers involved in the CBP dataset. As a result, employment was estimated by using the mid-point of each establishment size category times the number of establishments in the size category in each county. Data was calculated at the two-digit level, because the numbers of jobs in the region in any type of mining other than oil and gas extraction are negligible. The other mining industries simply are not present in this region with any kind of significance. ¹

After calculating employment data for this region, several key indicators are presented to illustrate the boom in the mining industry. Based on the April 2006 date indicated as the ‘on’ date for the Bakken oil activity by the ND Division of Oil and Gas, the time periods of 2000-05 and 2005-08 were used for comparison purposes.

Table 1:

Scope of Mining Activity in the Study Region
(all measured in average annual continuous growth)

	2000-05	2005-08
Job Growth in Mining Industry (NACIS 21)*	8.2%	27.9%
Taxable Sales and Purchases Growth**	6.6%	34.3%
Ratio of Mining Industry Jobs to Total Basic Industry Jobs*	3.2%	14.0%
Statewide Oil Production and Extraction Tax Revenue Collected**	11.0%	32.9%

*Source: ND Job Services, Quarterly Census of Employment and Wages

**Source: Office of State Tax Commissioner: www.nd.gov/tax

Table 1 summarizes the key indicators of the explosive growth in the oil industry in the study region. The rate of job growth in the industry is telling on its own (27.9% p.a. from 2005-

¹ According to both County Business Pattern data and data from the Quarterly Census of Employment and Wages the number of jobs in other mining industries, coal or sand and gravel, are negligible within the study region.

08), but the rate at which the mining industry has become a larger share of the basic industry mix in the region is a strong indicator as well. Total basic employment was estimated using an assumptions approach, whereby employment in the region in the manufacturing, mining, agriculture, leisure and hospitality, and state and federal sectors was determined. The sum of jobs in these industries was estimated to be total basic employment in the region. The ratio of mining industry jobs to total basic jobs was estimated to be 28% in 2000 and 55% in 2008. This ratio increased more quickly in 2005-08 than in earlier years, but it is important to notice that the industry mix in the region is shifting to be more dependent upon the mining industry.

In addition to these calculations the location quotient (LQ) for the region's mining

industry was calculated with the formula $LQ_i^t = \frac{e_i^t / e_T^t}{E_i^t / E_T^t}$. In 2000 the LQ for the mining

industry in the region was 7.66, and by 2008 the location quotient was 10.62. This indicates that the region is highly specialized in mining and that this specialization has increased significantly in recent years. A location quotient of 10.6 means that the region has 10.6 times more jobs in mining than would be expected from the prevalence of mining jobs in the state.

While the data in Table 1 for oil production and extraction taxes are statewide, there is evidence that the increased activity in the Bakken region would account for the bulk of the increase in this tax revenue. The state of North Dakota has collected \$ 3.2 billion in revenue since 1980 through its oil production and extraction taxes, and the extraction tax only came into existence in 1981. 24.8% of that total, or \$799 million was collected solely in the 2008 and

2009 fiscal years (Office of State Tax Commissioner, 2009), which coincides with the increased activity in the Bakken region.

Now that the growth and specialization of the mining industry in the region is clearly documented, it is important to determine how this growth is impacting other industries in the region. As is noted in Table 1 average annual growth rates in 2005-08 of 34% for taxable sales and purchases is a dramatic increase, and may be a result of the increased wealth and population in the region. Nevertheless it indicates a significant impact on the retail and service sector in the region.

To further estimate the impact of the growth of the oil industry on other industries in the region, interviews were conducted both within the study region and with state government officials. Six informal interviews with residents, local government officials, and business owners in Stanley, ND (Mountrail County) were conducted. Additionally, the Executive Director of the McKenzie County Job Development Authority and Tourism Bureau, the Director of the North Dakota Division of Oil and Gas, research analysts for Job Services and the Office of the State Tax Commission, Legal Counsel and Policy Advisor to the Governor, Deputy Tax Commissioner for the State of North Dakota, the President of the North Dakota Petroleum Council, and the Manager of Energy Business Development in the Department of Commerce were interviewed based on pre-circulated questions.

During interviews with the economic development office in McKenzie County and residents, local government officials, and business owners in Stanley, ND (Mountrail County) it was clear that the region is experiencing a labor shortage, a housing shortage, and damage to the existing infrastructure. It was cited in several interviews that specialty labor including

electricians and welders were in extremely high demand. However, due to the increases in wages paid in the mining industry other service industries were having a difficult time staying fully staffed.

The limited availability of housing and its increased cost were also regularly cited in regional interviews. While the Sales Ratio Reports from the Office of the Tax Commissioner indicated a three percent increase in the mean price of home sales from 2005-08 in the study region, interviews indicated a much more serious housing shortage. One interviewee mentioned that he purchased a home in Stanley in June 2008 for \$70,000 and sold the home six months later in December for \$84,000, a 20% increase. In Stanley, ND, three separate people quoted monthly rent costs at a particular building. One estimate was \$1200, one was \$1500, and one was \$1750/month for a two bedroom apartment. Paul Johnson, a local resident, indicated that two to three bedroom homes in the area rented at an estimated \$300-350 per month in 2005-06. Mike Hynek, Mayor of Stanley, stated that all of the mobile home parks were full and completely rented and that there were people living in campers year round in the campgrounds. McKenzie County has leveraged county revenues from federal land holdings to develop some affordable housing options by constructing small cottages (24 units, 12 of which are affordable housing units, estimated at 4-500 square feet in size). However, little has been done in that regard in Mountrail County, where Stanley is located, due to a lack of available funding according to Mayor Hynek.

The housing shortage combines with increased demand for services in the public school system in Stanley. When the school adopted its strategic plan in 2004, it was preparing to manage declining enrollment. Figures from that plan estimated the 2009-10 K-12 school

population at 325 students. The actual enrollment for the 2009-10 academic year is 420 students. Rather than downsizing the number of teachers as the strategic plan likely called for, the school has hired an additional 6-7 certified staff members and another 2-3 teachers' aides, since 2007. The interesting thing about these hires is that a teacher with a starting salary in the district cannot afford the cost of rent in the community, should a rental unit be available. To counteract this issue the school has purchased two mobile homes that it has rented back out to new teachers, so that they can afford to live in Stanley. This system is far from ideal, because it requires the schools to play the role of landlord (Koppinger, 2009). This make-shift affordable housing structure is an indication of the impact the industry growth has had in other sectors of the local economy.

In addition to labor shortages and housing shortages there has also been a negative impact on the regional water reserves and on the roads. Water is used as a key component in the mining industry – in this region water is used to fracture layers of shale during the drilling process. According to the Economic Development Office at McKenzie County and the North Dakota Association of Oil and Gas Producing Counties (NDAOGPC) some cities are selling water to the oil companies, which require 1,000,000 gallons of water per well, as a revenue generator for their communities. However, this can have negative implications for local water supplies in the long-run. Some oil companies were also withdrawing water from local aquifers, but that is also not a sustainable solution. As a result the state is now denying permits for withdrawal from the aquifers, which could impact the mining industry if another solution is not found (Veeder, 2009).

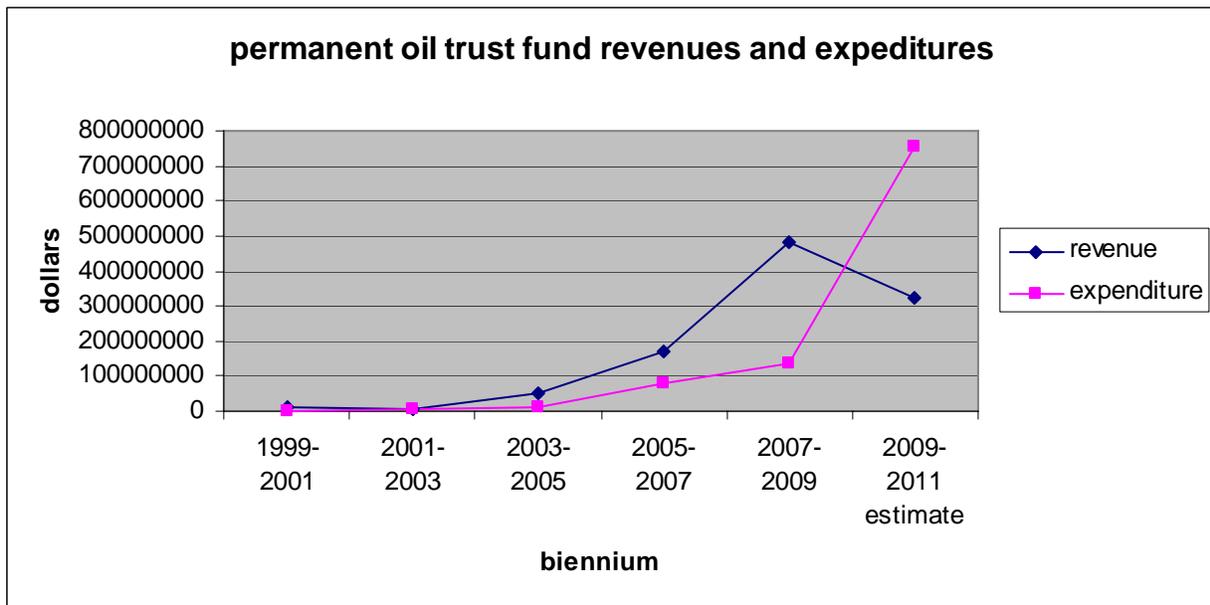
Finally, every interviewee in Stanley (seven individuals) mentioned how damaged the roads are, now. The impact on the road infrastructure due to increased semi-truck traffic, movement of major equipment, and increased commuter traffic seems to be widespread. According to the NDAOGPC 800-1000 trucks are required to service a new well, and, in November 2008, 96 new wells were being dug in the region. This would result in an increase of about 86,000 truck movements in the region. The increased traffic and damaged roads have also led to an increase in traffic accidents, which has been a struggle for the volunteer ambulance and fire departments to service, and the emergency services are also not equipped to handle the hazardous waste issues that the wells and truck traffic produce (ND Association of Oil and Gas Producing Counties).

Interviews with the Governor's Office and with officials from the Office of the Tax Commission provided information about the existing Permanent Oil Trust Fund, which began collecting revenue in the 1999 biennium, after creation by North Dakota Century Code Section 57-51.1-07.2 (1997 Senate Bill No. 2366). This

“establishes a permanent oil tax trust fund and provides that all revenues deposited in the general fund during a biennium and derived from taxes imposed on oil and gas under Chapter 57-51 (Oil and Gas Gross Production Tax) and Chapter 57-51.1 (Oil Extraction Tax) which exceed \$71 million are to be transferred into the permanent oil tax trust fund. The State Treasurer is to transfer the interest earned on the fund to the general fund at the end of each fiscal year. The principal of the permanent oil tax trust fund may only be spent upon a two-thirds vote of the members elected to each house of the Legislative Assembly”

The existence of this fund would be a key component in the long-term development planning for the state, could provide price stabilization options, and would be an example of the state saving the assets it is currently expending through the oil production process. However, as an interviewee stated, “This fund has always been available for the legislature to use. And they

have, and they have often.” (Bernstein, 2009). In North Dakota no legislature can beholden another legislature to fiscal commitments through statute, so the requirement of a two-thirds vote from each house of the legislative assembly is not actually a requirement. The fund has essentially functioned as another general fund, and expenditures have functioned as a mix of on and off-budget commitments (Strombeck, 2009). Expenditures have been made to provide property tax relief, support to higher education, and offset negative balances in the Department of Human Services, among other things (Reference Appendix F). Over the course of the fund’s existence it has had \$1,047,369,720 in revenues. The fund has a current balance of \$60,023,376 based on revenue estimates for the 2009-11 biennium. The chart below tracks the history of revenues and expenditures, since the inception of the fund.



Recommendations and Conclusion

Research on existing oil stabilization funds or savings funds has demonstrated that these funds have a mixed record. Without overall fiscal discipline any savings fund will mean little in regard to providing for future generations. It seems that even when legislation is structured so

that politicians cannot spend an oil fund, it is still possible to borrow against the resource. If spending is not controlled the fund will do little to help in long-term fiscal planning (Ossowski, 2001). However, in nations with fiscal discipline these funds can help avoid tying expenditure to revenue availability, plan for long-term fiscal outlays (ex: Norway social expenditures for an aging population), and conserve resources for future generations (Fasano, 2000). The state of North Dakota is currently fiscally sound and financial reserves exist in funds other than the Permanent Oil Trust Fund, and currently the state is not dependent upon oil revenues (oil and gas extraction only accounted for 1.4% of total GDP in 2007) (Bureau of Economic Analysis, 2009). However, there is still evidence that the state will benefit in the long-term from saving these assets and providing tighter controls on the legislature's ability to spend these funds.

It must be in this vein of future planning that legislators passed the Legacy Fund (House Bill 3045) during the 2009 legislative session. The Legacy Fund will require that 30% of total revenue from production and extraction taxes be set aside annually in a permanent fund from which no expenditures can be made until 2017. Following that time frame expenditure can be made from the principal of the fund with a two-thirds vote of the legislature with no more than 15% of the principal expended in any single legislative session. The Legacy Fund will be a change to the Constitution of North Dakota, so the timelines and majorities set forth for expenditures will have to be honored, unlike those suggested for the Permanent Oil Trust Fund (71st Legislative Assembly of ND, 2009). Constitutional amendments must be voted on by the public, and a similar, although more aggressive savings plan, put forth to voters in 2009 failed (Bernstein, 2009). It is therefore recommended that local agencies hold information sessions for voters, advertising campaigns be initiated, and general information provided about this

amendment be conveyed to the public to ensure its passage in the November 2010 general election. It is possible that the new North Dakota Fiscal Project operated by the Consensus Council would be a logical office to organize such a campaign (Reference Appendix G).

This long-term investment plan can only be one component of the strategies employed to plan for sustained growth in the region and alleviate short-term strains upon the study region. Evidence of labor and housing shortages as well as damage to existing infrastructures were found to be real problems in the study region. However, the timeline of drilling activity coupled with the nature of the mining industry make for a complex situation.

As mentioned above, the drilling and construction phase was estimated by the ND Division of Oil and Gas to continue for 15-20 years under current technologies. At that time the employees required in the study region to manage the production phase of the oil field will be 10% of that required during the construction and drilling phase. This timeline and the shift in the industry hinders any recommendations to towns to build infrastructures for homes (streets, sewer lines, power lines, etc), because most mortgages are taken for 30 years, not 15-20. The timeline is not long enough to pay off the debt incurred in building the infrastructure. In addition the drilling activity will cover a 14,000 square mile area, so the employees and the oil companies will remain relatively mobile within that area and timeframe. These two factors complicate the situation dramatically, because while 15-20 years may not be long enough to pay for a housing development it is also too long to have man camps (industry owned transportable housing kept outside of city limits where employees come to stay for 6-10 day shift periods accommodating hundreds of employees at a time) moving around the countryside.

The other issue to consider in this timeline is the dramatic loss of jobs that will happen when the oil industry moves to its production phase. This amount of time is long enough for the labor shortage in other industries to correct itself, and with the levels of economic activity seen in the last two years it seems logical that additional service industries and employees will move into the area. However, in 15-20 years that will only exacerbate the impact of 7200 jobs moving out of the region.

Moreover, the strength of the oil industry will likely deter the emergence of new manufacturing or other value added agriculture production industries in the region, due to a resource pull evident in high costs of wages, land, housing, and commodities in the area. Any new industry in the region will be in competition with the oil industry for these inputs, until it moves into the production phase, at which point it may be too late to retain those individuals who moved to the area for the oil industry in the first place.

This activity is in an area of the state, like many others in North Dakota, which has faced declining populations for the last 100 years. Considering the potential generated by the oil industry it would make sense to leverage the influx of population into other industries to retain the citizen base and rebuild these communities and the region, even after the oil industry downsizes. It is recommended that strategic sustainable development planning committees at the region and state levels be formed (and coordinated) to plan for these issues. This may mean that the state and/or the region need to develop economic incentives for other industries to counteract the impacts the oil industry has had in the region. New industries could capitalize on the infrastructure that the oil industry is putting into place. Companion industries such as wind farming may make sense, and the oil industry has also already made investments in

railways and other infrastructure developments. These might attract other industries to the area.

At the regional level it is recommended that participation from the NDAOGPC members and highly impacted cities and towns (Watford City, Stanley, Tioga, and others) collaborate to form a regional planning committee to ultimately plan for long-term sustainable development in the region, but it is recommended that initial planning steps be taken too. First, to service immediate growth needs it is recommended that the region work together with the oil industries, so that cities currently impacted can advise cities that the oil companies will be moving to in the near future on how to mitigate potential problems. Second, it is recommended that a fifteen year strategic plan be developed, so that in fifteen to twenty years, when the oil industry moves into its production phase, the region is positioned with a sustainable development plan that includes mixed industry development, long-term fiscal solvency for the cities and counties, and repaired infrastructure to support future generations. At the state level it is recommended that a position be allocated within the Department of Commerce or other comparable department that would liaise with this regional committee and work to transition the region from its current boom phase into the post oil industry expansion phase in 15-20 years that supports the overall fiscal goals of the state.

Finally, the infrastructure of roads and highways must be improved in the study region, now. While it may be argued that counties or cities should increase their mill levies to finance this, state financing should also be considered. Citizens in these high impact regions are already facing increased property tax payments, due to the inflated values of their homes, and there is a direct correlation to the damage done to the roads and the oil industry. One time payments

from the state to high impact areas to correct dangerous road and traffic situations may be necessary in the short-term, and these regions can then increase mill levies in a more gradual way in order to maintain the roads.

The wealth from the oil industry in this region has unquestionable benefits for the study region and the state. However, these benefits are coming at a cost to the local area, and investments must be made in the short and long term to mitigate these costs and to plan for future sustained growth.

Appendix A: Works Cited

Appendix B: Interviewee List

Appendix C: Acknowledgements

Appendix D: Charts and Figures

Appendix E: Map of Study Region

Appendix F: Summary of Permanent Oil Trust Fund Expenditures

Appendix G: Information on the ND Fiscal Project, housed in the Consensus Council

Appendix A: Works Cited

- Alam, M. S. (2002). The Basic Macro-economics of Oil Economies. *Journal of Development Studies, Volume 18, Issue 2*, p. 205 – 216.
- Auty, R.M. (1993). *Sustaining Development in Mineral Economies: The Resource Curse Thesis*. London: Routledge.
- Bangsrud, D., Leistritz, F.L. (2000). Petroleum Industry's Economic Contribution to North Dakota in 2007. *Agribusiness and Applied Economics Report, No. 639*, p. 1-57.
- Beblawi, H. (1987). *The Rentier State*. (Giacomo Luciani, ed). London: Croom Helm.
- Bureau of Economic Analysis. (2009). *Gross Domestic Product by State*. (Data File). Retrieved from: <http://www.bea.gov/regional/gsp/>.
- Chand, S., Levantis, T. (2000). Dutch Disease and the crime epidemic: an investigation of the mineral boom in Papua New Guinea. *The Australian Journal of Agricultural and Resource Economics, Volume 44, Issue 1*, p. 129-146.
- Chaudhry, K.A. (1994). Economic Liberalization and the Lineages of the Rentier State. *Comparative Politics, Volume 27, Issue 1*, p. 1-25.
- Davis, J., Ossowski, R., Daniel, J., Barnett, S. (2001). Oil Funds: Problems Posing as Solutions? *Finance and Development, Volume 38, No 4*, p. 1-7.
- Fasano, U. (2000). Review of the Experience with Oil Stabilization and Savings Funds in Selected Countries. *IMF Working Paper, WP/00/112*, p. 1-20.
- Goldberg, E., Wibbels, E. Mvukiyeh, E. (2008). Lessons from Strange Cases: Democracy, Development, and the Resource Curse in the US States. *Comparative Politics, Volume 41*, p. 477 – 514.
- Humphreys, M. (2007). *Escaping the Resource Curse*. (J.D. Sachs, J.E. Stiglitz, ed). New York: Columbia University Press.
- Hvinden, David. (2009). ND Division of Oil and Gas. Personal email communication.
- Legislative Assembly of North Dakota, Seventy-first. (2009) *House Concurrent Resolution No. 3054 with Conference Committee Amendments*. 93111.0300. Available on-line 11/18/2009 at <http://www.legis.nd.gov/assembly/61-2009/bill-text/JGJJ0300.pdf>
- Legislative Assembly of North Dakota, Sixty-fifth. (1997) *Senate Bill No. 2366*. ND Century Code

Section 57.51. 1-07.2. Available on-line 12/13/2009 at
<http://www.legis.nd.gov/fiscal/biennium-reports/61-2009/budget-analysis/executive/pdf/executivebudget/permanentoil.pdf>.

Ness, Ron. (2009). North Dakota Oil and Gas Industry Facts and Figures. *North Dakota Petroleum Council*.

North Dakota Association of Oil and Gas Producing Counties. *ND Oil Impact Video*. Available December 7, 2009 at:
http://ndoilgas.govoffice.com/index.asp?Type=B_EV&SEC={585807F7-A9E7-49D1-AC9C-576C1877FEC0}

North Dakota Association of Oil and Gas Producing Counties. *Town Hall Oil and Gas Frequently Asked Questions*. Available December 7, 2009 at
<http://ndoilgas.govoffice.com/vertical/Sites/%7B6517345E-F6E4-4593-A651-A1525FCA2299%7D/uploads/%7B7A989818-2480-473A-BF57-C8A4A5BBF581%7D.PDF>

North Dakota Job Services. (2009). *Quarterly Census of Employment and Wages 2000-08*. (Data Set). Personal Communication from 10/13-10/27/2009.

Office of the North Dakota State Tax Commissioner. (2000-2008) *Sales Ratio Reports*. Retrieved from: <http://www.nd.gov/tax/property/pubs/>

Office of the North Dakota State Tax Commissioner. (2009) *Sales and Use Tax Statistical Reports* (Data File). Retrieved from:
<http://www.nd.gov/tax/salesanduse/pubs/prioryears.html>

Office of the North Dakota State Tax Commissioner. (2009) *Summary of Permanent Oil Trust Fund 1999-2001 through 2009-11*. Personal Communication, 11/13/2009.

Office of the North Dakota State Tax Commissioner. (2009) *Summary of Oil and Gas Production and Extraction Tax Revenues*. Personal Communication, 11/13/2009.

Poteete, A. (2009). Is Development Path Dependent or Political? A Reinterpretation of Mineral-Dependent Development in Botswana. *Journal of Development Studies, Volume 45, Issue 4*, p. 544-571.

Rodriguez, F., Sachs, J.D. (1999). Why Do Resource-Abundant Economies Grow More Slowly? *Journal of Economic Growth, Volume 4*, p. 277-303.

Ross, Michael (2001). Does Oil Hinder Democracy? *World Politics, Volume 53*, p. 325-61.

Ross, Michael (2006). A Closer Look at Oil, Diamonds, and Civil War. *Annual Review of Political Science, Volume 9*, p. 265-302.

Sachs, J.D., Warner, A.M. (1995). Natural Resource Abundance and Economic Growth. *National Bureau of Economic Research, Working Paper 5398*, p. 1-47.

Sachs, J.D., Warner, A.M. (1999). The big push, natural resource booms and growth. *Journal of Development Economics, Volume 59*, p. 43-76.

Sachs, J.D., Warner, A.M. (2001). Natural Resources and Economic Development: The curse of natural resources. *European Economic Review, Volume 45*, p. 827-838.

U.S. Census Bureau (2000). *Fact Sheet*. Available 12/12/09 at <http://factfinder.census.gov/>.

U.S. Geological Survey. (2008). *3 to 4.3 Billion Barrels of Technically Recoverable Oil Assessed in North Dakota and Montana's Bakken Formation—25 Times More Than 1995 Estimate*. Available 12/12/09 at <http://www.usgs.gov/newsroom/article.asp?ID=1911>.

Appendix B Interviewee List

Larry Anderson, Talent Coordinator, Department of Workforce Development, ND Department of Commerce

Ryan Bernstein, Legal Counsel and Policy Advisor in the Office of the Governor

Mike Fladeland, Manager of Energy Business Development, Division of Economic Development and Finance, ND Department of Commerce

Lynn Helms, Director, Oil and Gas Division, Department of Mineral Resources, ND Industrial Commission

David Hvinden, Executive Staff Officer, Department of Mineral Resources, ND Industrial Commission

Mike Hynek, Mayor, Stanley, ND

Kelly Koppinger, Superintendent of Schools, Stanley, ND

Ron Ness, Director, Petroleum Council of North Dakota

Ryan Rauschenberger, Deputy Tax Commissioner, Office of the North Dakota State Tax Commissioner

Kathryn Strombeck, Research Analyst, Office of the North Dakota State Tax Commissioner

Gene Veeder, Executive Director of the McKenzie County Job Development Authority and Tourism Bureau

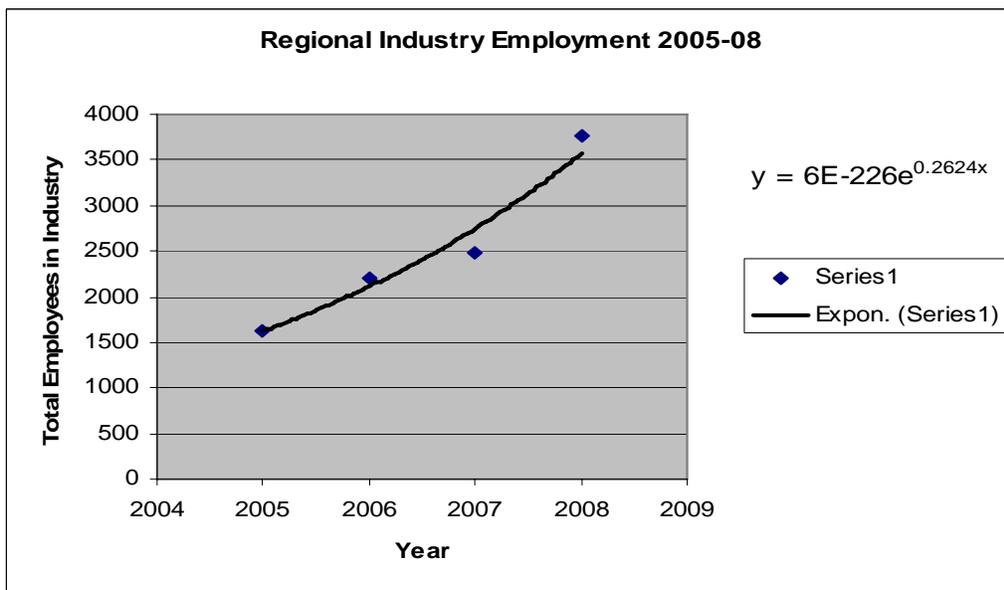
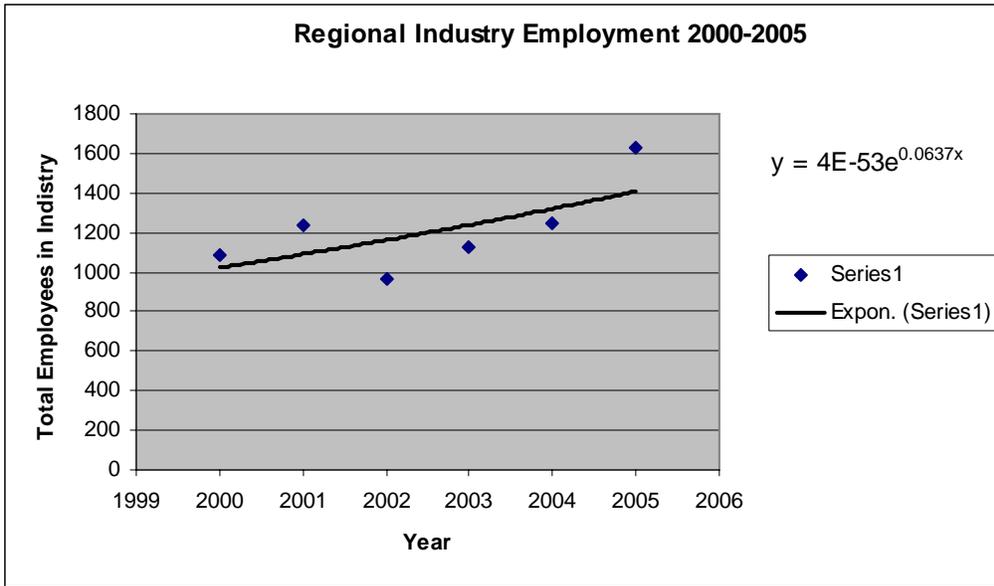
Michael Ziesch, Research Analyst, Job Service North Dakota

Five additional private citizens in Stanley, ND

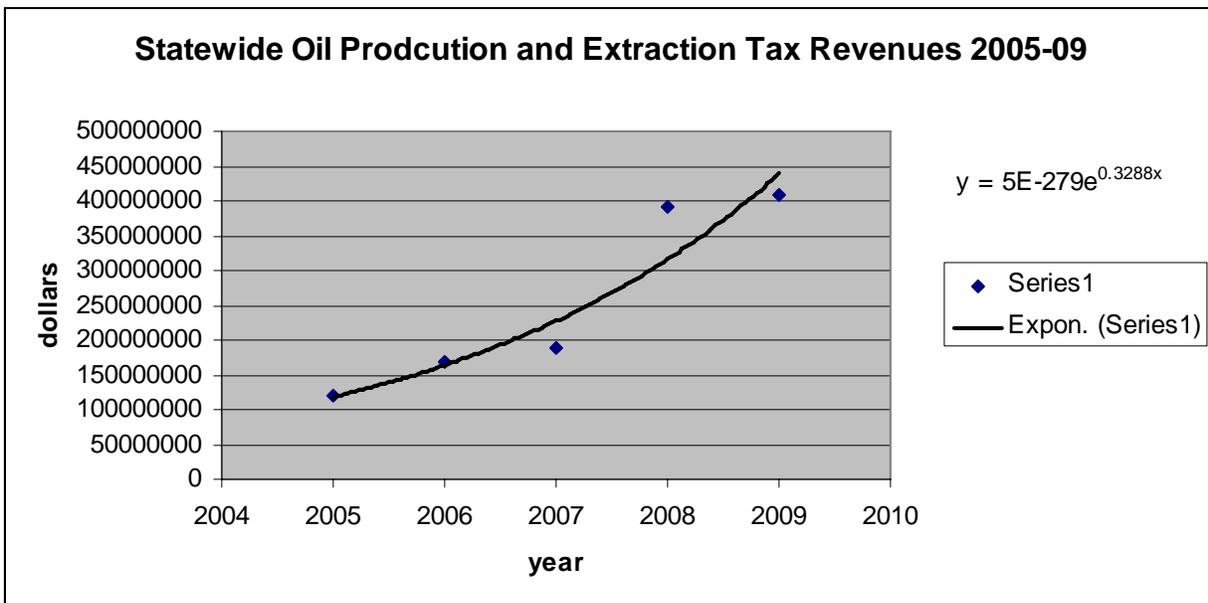
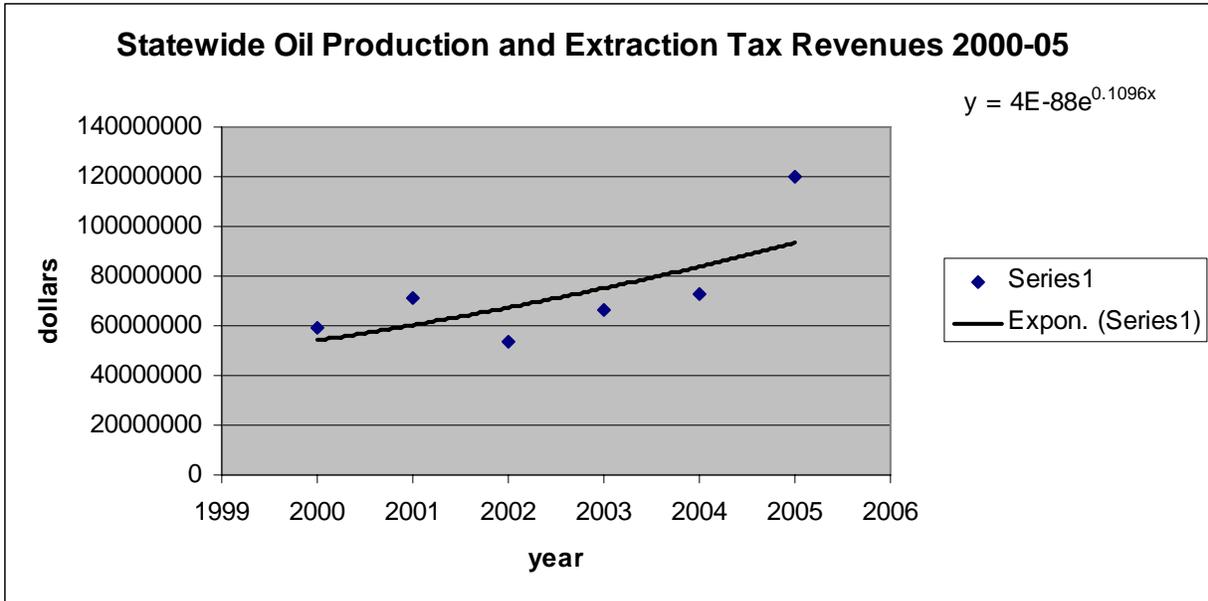
Appendix C Acknowledgements

I would like to thank David Hvinden from the North Dakota Division of Oil and Gas and Michael Ziesch from North Dakota Job Services for their general support and encouragement. I would especially like to thank Mr. Ziesch for providing the QCEW data, which greatly strengthened the analysis in this paper. I would also like to thank all of the interviewees for their time and expertise. The information they provided was invaluable to shaping the content and recommendations of this paper. I would also like to thank Dr. Ragui Assaad from the Hubert H. Humphrey Institute for Public Affairs at the University of Minnesota for supervising this paper.

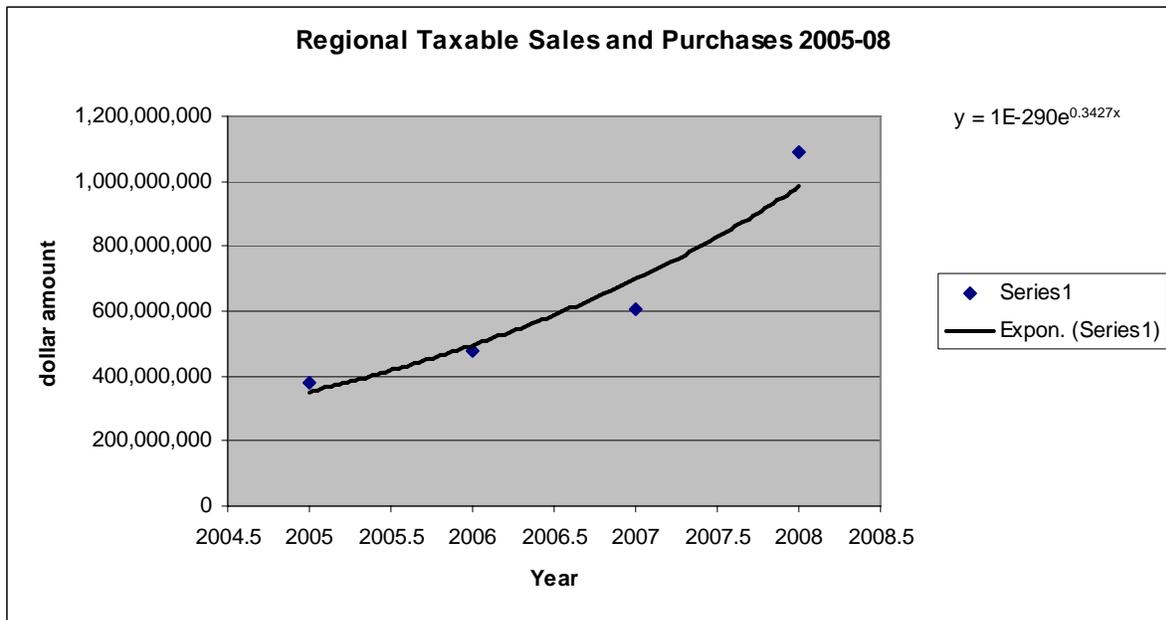
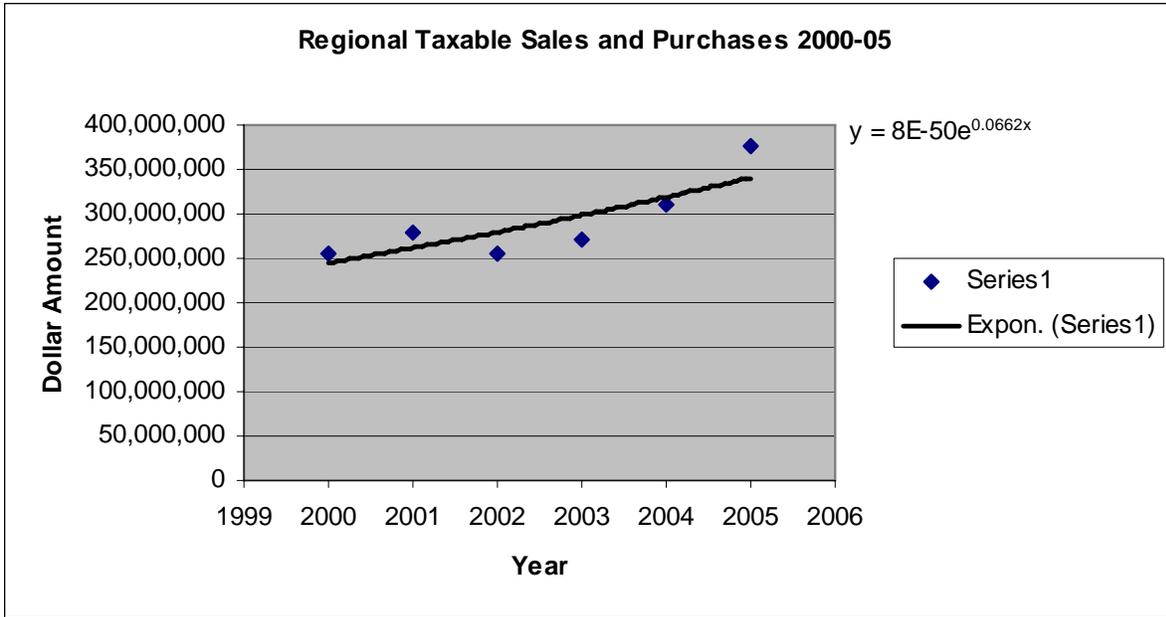
Appendix D Charts and Figures



Source: Job Service North Dakota, Labor Market Information Center, QCEW Unit

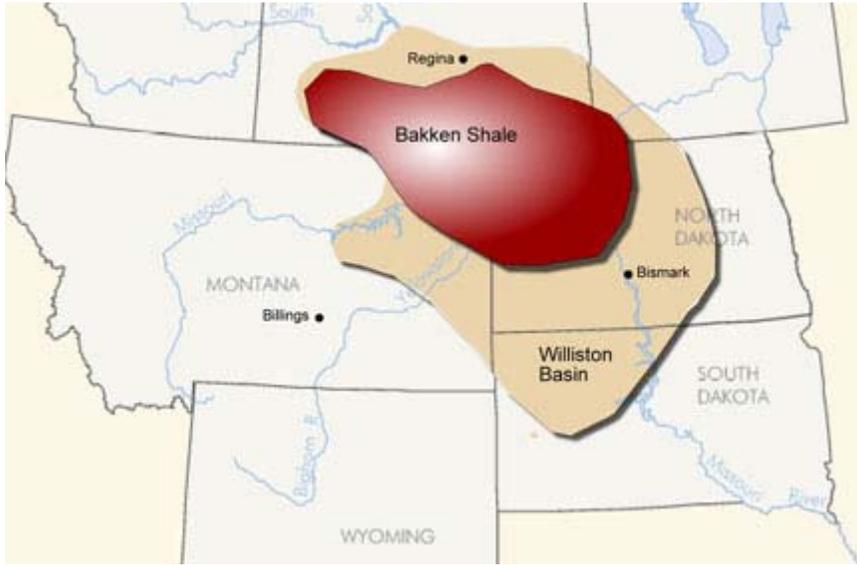


Source: ND Office of State Tax Commissioner



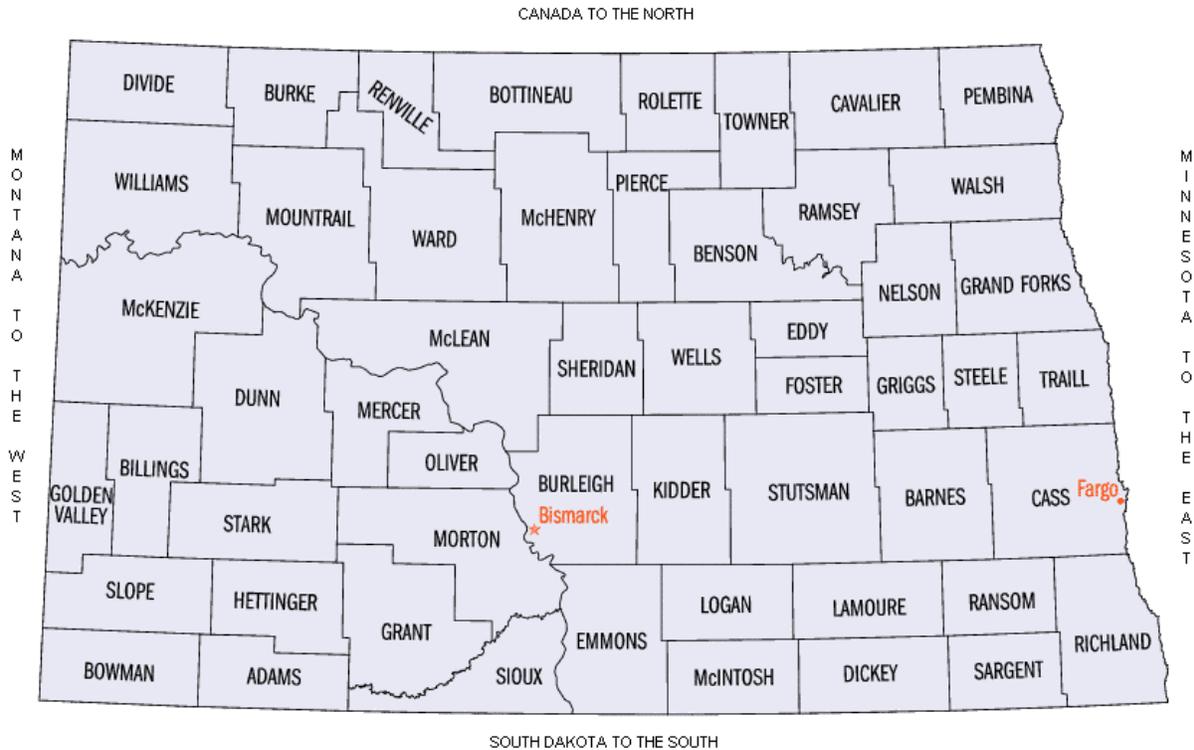
Source: ND Office of State Tax Commissioner <http://www.nd.gov/tax/>

Appendix E: Maps of Study Region



Map illustrating the entire Bakken formation.

Source: Sheridan County Times, Billings, MT http://www.sheridancountyonline.com/bakken_formation.html



Map of North Dakota. Study region includes Billings, Burke, Dunn, Mountrail, McKenzie, and Williams counties.

Source: <http://www.censusfinder.com/mapnd.htm>

Appendix F: Summary of Permanent Oil Trust Fund 1999-2001 through 2009-11

Beginning Balance – July 1, 1999		\$0
Revenues		
Oil Taxes		\$1,047,367,720
Expenditures		
Transfers to General Fund	\$322,210,000	
Property Tax Relief 2009-11	\$295,000,000	
Property Tax Relief 2011-13	\$295,000,000	
Centers of Excellence	\$35,239,035	
Higher Education	\$16,987,557	
Department of Human Services	\$8,951,426	
Veterans Home Construction Project	\$6,483,226	
Water Project Grants	\$2,792,000	
Agriculture Research and Extension	\$1,675,000	
Grants to Tribal Colleges	\$1,400,000	
Prairie Public Broadcasting	\$1,008,100	
Grant to International Music Camp	\$350,000	
Livestock Disaster Assistance	\$250,000	
Total Expenditures and Transfers	(\$987,346,344)	
Fund Balance		\$60,023,376

Source: Office of the State Tax Commissioner, 2009

Appendix G: ND Fiscal Project and the Consensus Council

Consensus Council: Founded in 1990, The Consensus Council is a non-profit organization that custom-designs processes bringing diverse viewpoints together to seek common ground from local to international levels.

Council facilitators and staff colleagues provide many services to support building public policy agreements. Under the trusteeship of the diverse Board of Directors, the Council operates with support from foundations, contracts for services and contributions.

Subject areas of consensus processes have included disaster mitigation, economic and rural development, education, environment and natural resources, government restructuring and reform, health care, human services and law. However, the possibilities are boundless. Contact us to begin building agreements to benefit the whole community.

Source: <http://www.agree.org/who/> (available December 8, 2009)

ND Fiscal Project: The North Dakota Fiscal Project will provide independent research and analysis of state budget and tax policies, as well as economic issues, with particular attention to the effects on low - and moderate – income people. The ND Fiscal Project will also produce reports on specific topics such as education, health care, economic development and tax policy.

Source: <http://www.agree.org/news/view.asp?ID=73> (available December 8, 2009)