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NORTH DAKOTA WORKFORCE RETENTION

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PREFACE

This project was initially part of a much larger Oil and Gas Industry Workforce Characteristics Study examining various dimensions relating to workforce issues in the Williston Basin in North Dakota. When the study began in 2014, majority of workforce related issues stemmed from the dramatic economic expansion of shale oil development in the region. During the rapid expansion of the petroleum industry, key issues associated with workforce shortage and turnover, wages differential, and housing emerged. Specifically, these included housing preferences and availability of housing for non-resident workers, relocation of worker families, worker residency and intentions of workers to become North Dakota residents, workforce turnover, employee poaching, general workforce shortages, wage rate escalation, crowding out of workforce availability for some economic sectors, and workforce commuting behavior and its effects on worker residency, turnover and community planning.

The crude oil price collapse in early 2015 had a dramatic effect on the pace of shale oil development in North Dakota and throughout the United States. The price collapse was largely unpredicted by industry experts, and created a completely new dynamic within the industry and the Williston Basin. The net effects of the price collapse was a substantial industry contraction, followed by elimination of thousands of jobs within a short period (few months).

These changes and macro shocks to the petroleum industry occurred as the study was soliciting information from thousands of workers. As might be expected, the reversal of economic expansion, shedding of jobs, and uncertainties associated with such an unforeseen price collapse altered the economic landscape in the Williston Basin. It also required the study to change course and dedicate more resources to completing the tasks and activities of engaging the industry's workforce. Unfortunately, it was impossible to combine data and analysis associated with the Workforce Safety and Insurance (WSI) with the study at that time due to the need to shift resources to complete other aspects of the study.

Moving forward to 2017, the petroleum industry stabilized. The state is again experiencing economic growth, albeit at a much slower rate. The interesting aspect of the dynamics that unfolded during 2015 and 2016 was that the loss of thousands of jobs did not materially change the unemployment rate, nor did it result in other employment opportunities like oil and gas workers switching jobs to other economic sectors. Most of those workers that lost jobs during the price collapse simply left the state. As a result, North Dakota continues to have workforce issues and many of the issues relating to job turnover and workforce shortages remain as relevant in 2017 as was the case in 2014. The authors hope this work will foster more evaluations of workforce issues, and help to address the concerns of industry, business owners and managers, policymakers, economic development professionals, and other stakeholders as the state attempts to resolve persistent workforce issues.

ACKNOWLEDGMENTS

Special thanks are extend to Barry Schumacher and Bryan Klipfel, North Dakota Workforce Safety and Insurance, for providing data used in the study. The data set required considerable contributions of time and resources, for which the research team is grateful to Barry and Bryan and individuals who assisted in the effort. The research team appreciates the willingness of those individuals to work with the research team to add this data to the discussion of workforce in the state.

The authors assume responsibility for any errors of omission, logic, or otherwise. Any opinions, findings, and conclusions expressed in this publication are those of the authors and do not necessarily reflect the view of the Department of Agribusiness and Applied Economics, North Dakota State University, or the study sponsors.

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EXECUTIVE SUMMARY

The North Dakota economy witnessed rapid economic expansion in the late 2000s resulting from a combination of factors. The development of shale oil in western North Dakota was central to the economic expansion. The acceleration in economic activity in North Dakota during this period was peculiar because the United States was going through the great recession starting in 2007 and officially ending in mid-2009. Nationally, the unemployment rate was about 10 percent near the end of the recession, and remained high for several years after the official end of the recession. However, in North Dakota, the unemployment rate was about one-half of the national rate, and employment opportunities were abundant, to the extent that workforce shortages became an issue in the state in the first years following the great recession.

The potential for employment in North Dakota led to a rapid influx of employees seeking employment, particularly in the *Oil and Gas* industry with high-paying jobs in the oil fields of western North Dakota. The inflow of workers, especially those seeking work in the *Oil and Gas* industry, created issues that were widely publicized in both local and national media. These concerns included housing shortages, shortage of private and public services, and workforce related concerns. Assessments of the economic importance of the Oil *and Gas* industry in North Dakota have been done periodically since the beginning of shale oil development. Despite the role of the *Oil and Gas* industry in job creation and growth in North Dakota, workforce and related issues in the state have received little empirical study.

The main objective of this study is to evaluate workforce and job turnover in the North Dakota economy and within the *Oil and Gas* industry using data from North Dakota's Workforce Safety and Insurance (WSI) program from 2003 to 2012. Specifically, the study evaluated short and long-term employee and job retention and assessed the level of job switching into the *Oil and Gas* industry from other sectors.

Results indicate that in general, employee and job retention is higher in the short-term (year-to-year) and tends to decline in the long-term (9-year interval) for all sectors. For example, on average, about 339,864 employees remained in the workforce from year-to-year between 2003 and 2012. This represents an 85% retention rate on average using year-to-year comparisons. These results suggest that employee and job turnover is low in the short-term whereas employee and job turnover increases in the long term.

The North Dakota economy witnessed a significant growth in the number of new employees in all sectors from 2003 (56,105) to 2012 (118,529). The number of workers described as North Dakota residents declined from 68 percent of the workforce in 2003 to about 50% in 2012. Employees from neighboring states, such as South Dakota and Minnesota, remained stable at 18 percent of the workforce, while employees from other states rose more than 225 percent between 2003 (50,669) and 2012 (164,803). Changes in number of workers by

residency is more noticeable in the *Oil and Gas* industry. The number of employees with residency in other states while working in the *Oil and Gas industry* in North Dakota rose from about 11 percent in 2003 (309) to about 74 percent (29,995) in 2012. This rise in employees from other states reflects observations during peak oil exploration in Bakken Shale in western North Dakota.

Incentives and higher wages in the *Oil and Gas* industry attracted workers from other sectors. Results indicated that the number of workers switching from other sectors to the *Oil and Gas* sector increased by 755 percent between 2003 (1,024) and 2012 (8,756). This increase in number of employees moving into the *Oil and Gas* industry coincided with growth in the industry over that period.

The study found that rates of job turnover increased over a period of rapid economic expansion in North Dakota. Also, further exasperating workforce issues, worker retention in the state is relatively low over longer periods of time, implying the need to recruit new workers to meet employment needs. As the state struggles to find workers, efforts to grow the workforce need to include worker recruitment and worker retention.

NORTH DAKOTA WORKFORCE RETENTION

Elvis Ndembe, Dean A. Bangsund, and Nancy M. Hodur[1]

INTRODUCTION

North Dakota recently experienced the largest economic expansion in modern times. This economic expansion resulted from a combination of factors, but the majority of the increase was due to development of shale oil in western North Dakota. Low unemployment, high workforce participation, workforce shortage, and related workforce issues were a hallmark of that economic expansion in the state.

North Dakota's economic expansion was peculiar because it occurred and accelerated during the period of the great U.S recession beginning in late 2007 and extending to mid-2009. Nationally, this period witnessed high unemployment rates. However, unemployment in North Dakota was particularly low. North Dakota was an economic anomaly and perceived to have positive economic opportunities generally not found elsewhere in the country. For example, between 2007 and 2009 (great recession), the average unemployment rate in North Dakota was 3.5 percent whereas the national average was 6.6 percent (Bureau of Labor Statistics 2016). Geographically, North Dakota grew in nearly all areas of the state's economy.

The petroleum and agriculture Industries, in particular, experienced strong revenues over the period. Manufacturing in the state also rebounded quickly from a slight downturn during the national recession. The healthy economic environment of the state's industries created low unemployment identifying North Dakota as one of the few states with employment opportunities that attracted workers throughout the United States.

In addition to relatively lower unemployment rates, workforce participation rates for all age and gender cohorts in North Dakota have been relatively high (at least above 50 percent) on average from 2000 to 2014 (Bangsund and Hodur 2017). Between 2003 and 2012, average workforce participation rate in North Dakota ranged from 70.5% in 2003 to 74.9% in 2008 (Bangsund and Hodur 2017). Higher workforce participation rate indicates that the majority of people of working age (16 years and older) in North Dakota were working or actively seeking work during that period. High workforce participation rates, coupled with low unemployment rates, meant that growth in jobs required a nearly commensurate growth in workforce. Having

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exhausted the supply of workers from the region's resident workforce, growth in employment (job vacancies) meant employers needed to recruit workers from out of state or entice employees who are already employed (poaching) to fill employment needs.

The influx of new employees from out of state raised a question on related to the potential for new employees will stay or how long they will be willing to stay in North Dakota. Two potential workforce related issues emerged. If the majority of the employees from out of state remain in North Dakota for extended periods, employee retention should be high (low turnover). Conversely, if employees come into North Dakota for brief periods, then employee retention should be low (high turnover). The latter could imply that the number of non-local employees remaining in North Dakota's workforce declined over time despite growing number of jobs assuming local workforce participation rates and local populations remained stable.

Workforce shortages associated with low employee retention created an environment where employees received incentives to switch employer frequently, either within the same industry or into another industry. These incentives were most prevalent in the *Oil and Gas Sector*. The likely job turnover created from employees switching jobs was widely viewed as a major workforce issue particularly in western North Dakota (Hodur and Bangsund 2016). Employees were leaving lower paying jobs for higher paying jobs in the *Oil and Gas* industry. Additionally, some employers in areas most affected by workforce shortages sought to meet their workforce needs by luring or "poaching" employees already in the state.

This paper was part of a 2014 larger workforce characteristics study examining a number of different dimensions relating to employment in the *Oil and Gas* Sector in North Dakota. The workforce characteristics study also had as a goal to evaluate employee retention (turnover). However, during the course of that study, petroleum prices collapsed in late 2014 resulting in the industry contracting in North Dakota. At that time (in 2014), while workforce related issues were still of concern, the industry was facing a much larger issue related to substantial and rapid loss of employment in western North Dakota. See Hodur and Bangsund (2016) for more information on the workforce characteristics study.

BACKGROUND

Oil production in North Dakota has fluctuated substantially since commercial production began in the early 1950s (Figure 1). In general, there have been four periods of rapid surge in oil production in North Dakota. The first period was from 1951 through 1962, the second period occurred from 1974 to 1984, the third period from 1994 to 1997, and the most recent period, began in 2003. After historical highs in 1984, overall oil production in the state declined rapidly the following decade. Since 1994, oil production in the state has seen two periods of expansion and one period of declining production. Crude oil production accelerated in an unprecedented

pace beginning in 2006. The boom in oil production and related activities (e.g. truck driving, construction) led to increase in the number of jobs available in Oil and Gas activities and related sectors.

The boom in oil production in North Dakota brought with it employment opportunities in the state. Between 2003 and 2012, the number of jobs and employees in the Oil and Gas sector in North Dakota grew exponentially based on data from the North Dakota Workforce Safety and Insurance (WSI). The number of employees in the *Oil and Gas* sector grew by 1,340 percent, from 3,148 in 2003 to 45,261 employees in 2013. *Oil and Gas* jobs grew by almost 1,380 percent between 2003 and 2013 from 3,448 in 2003 to 51,053 jobs in 2013. (Figure 2).

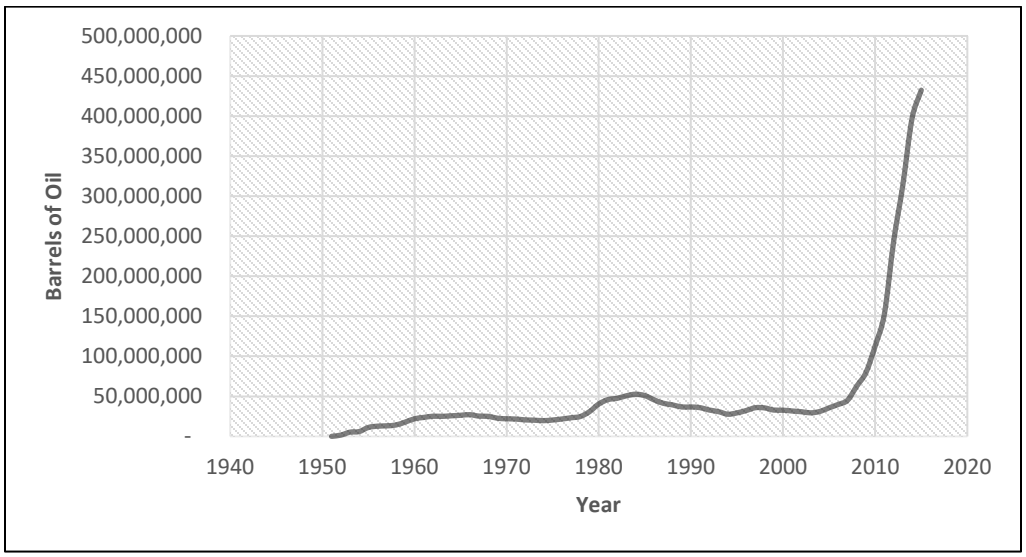

Figure 1: Trend in North Dakota Oil Production, 1951-2015

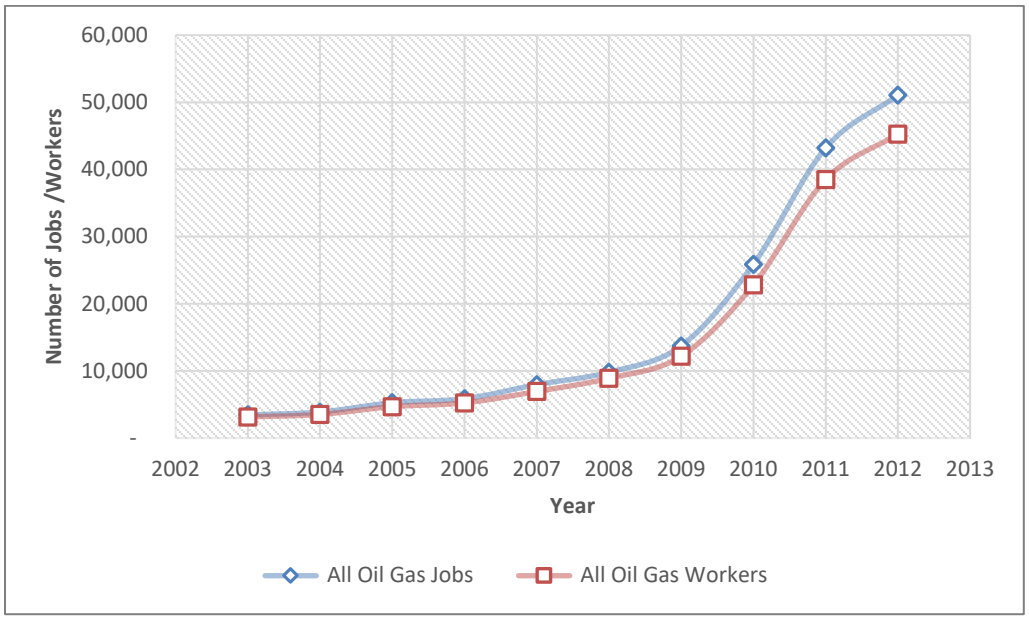

Figure 2: Trend in Jobs and Employees in Oil and Gas Sector, North Dakota, 2003-2012

Expansion of the petroleum industry generated a substantial increase in employment, which directly led to an increased need for additional employees (Figure 2). Moreover, growth in wages observed in the *Oil and Gas* sector in North Dakota might have played a role in attracting employees from other sectors of the North Dakota economy or employees moving into North Dakota from other states. For example, average weekly wages in the *Oil and Gas* sector grew by approximately 113% between 2003 ($1,017) and 2012 ($2,163) compared to an increase of 72% for all private sector jobs (excluding government) within the same period (Job Service North Dakota 2017). Figure 3 illustrates the trend in average weekly wages for *Oil and Gas* sector and that for all private sector jobs (excluding government) in North Dakota.

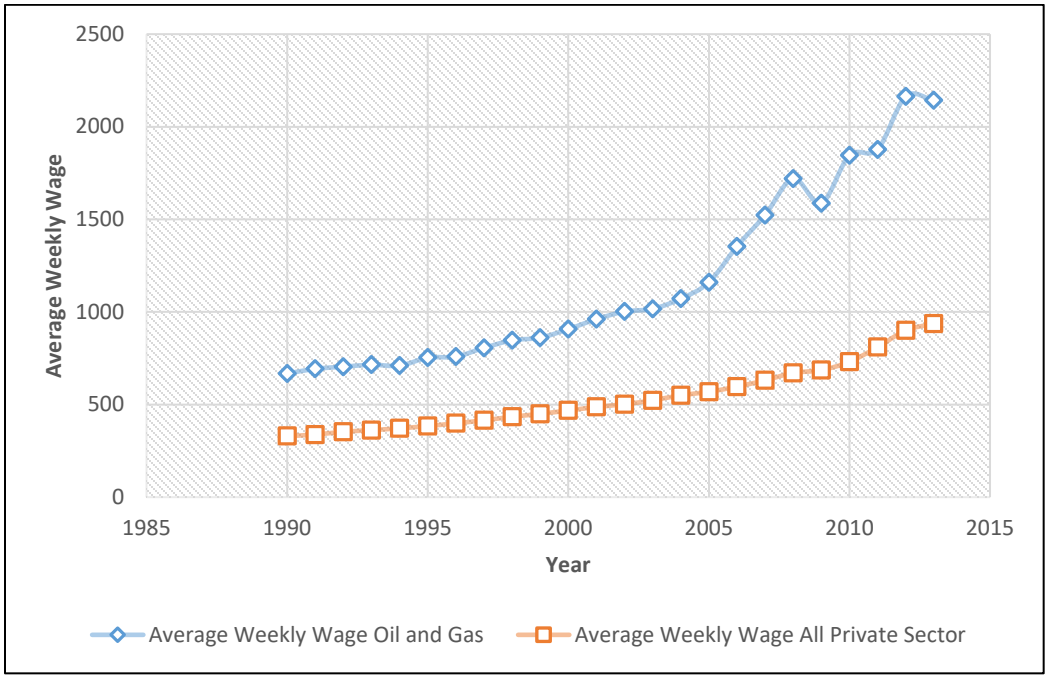

Figure 3: Oil and Gas and All Private Sector Average Weekly Wages, North Dakota, 1990-2013

Higher wages in the *Oil and Gas* sector influenced employee-job retention both within the Oil and Gas industry and from employees leaving lower paying jobs in other sectors. As employees switched jobs from other sectors *to Oil and Gas*, job vacancies increased in other sectors. The resulting labor shortage created problems in other sectors, as businesses were either unwilling or unable to compete with higher wages offered in Oil and Gas. Moreover, during the period of employee shortages, employers in non-Oil and Gas sector often could not find employees to fill vacated positions and/or unable to add positions as they attempted to expand to meet increased demand for goods and services in the Williston Basin.

Biennial economic assessments of the *Oil and Gas* sector have been conducted since 2005 (Bangsund and Leistritz 2007, Bangsund and Hodur 2017). Despite documenting job creation and growth, studies relating to employment or economic contribution of the

petroleum sector have not addressed job turnover in North Dakota as it relates to the *Oil and Gas* industry. An understanding of workforce turnover in North Dakota remains an important concern for policy makers, economic development specialists, businesses, and industry leaders despite the contraction in the petroleum sector in recent years. As the state continues to grapple with workforce issues, understanding the rate of workforce turnover may provide insights for the development of employee retention strategies.

OBJECTIVES

The purpose of this study is to assess workforce and job turnover in North Dakota. North Dakota Workforce Safety and Insurance (WSI) provided data to evaluate workforce and job turnover from 2003 to 2012. The WSI data contains information on employees (unique identifier) and job description (rate class). The specific objectives of this study include:

1) Describe annual employee and job retention (implied turnover),

2) Describe long-term employee, job retention (implied turnover) and North Dakota workforce characteristics during the 2003 to 2012 period, and

3) Assess level of job switching from other sectors into the *Oil and Gas* sector between 2003 through 2012

METHODS

The composition of available data in part guided the analytical approach used in this study. The study focused solely on using recently acquired data from North Dakota Workforce Safety and Insurance (2014) to identify employee and job turnover in North Dakota. Despite analyzing all sectors in North Dakota, emphasis is place on the Oil and Gas subsector.

DATA

North Dakota Workforce Safety and Insurance (WSI) provided data for this project. WSI is the only provider and administrator of the workers' compensation system in North Dakota. WSI is an exclusive, employer financed, no-fault insurance state fund that covers workplace injuries and deaths for all covered wage and salary employment (e.g., annual census of employment and wages). As part of managing and regulating the workers' compensation system, WSI tracks employees by job classification in North Dakota. WSI does not provide measures of full-time employment or count self-employed or sole proprietors. Sole proprietors are included if they voluntarily contribute to the workers' compensation system.

The data for this study includes 6 million observations from 2003 through 2012 that contain renewal dates (month and year), WSI rate class, and a unique employee identifier (UEI).

Policy renewal dates describe the begin date of the 12-month fiscal reporting period for the employer of record. Employee identification in the data set is comprised of a unique employee identifier (UEI) which is comprised of three digits representing the birth-state of a worker, and a randomly assigned number to assist in differentiating between unique employee records.

A closer observation of the data showed that the employee identifier in the WSI data are not necessarily unique for each employee. For example, an employee born in North Dakota may have the same three-digit identifier as one from Minnesota. However, using the coded identifier along with the state abbreviation corrects for any potential duplicate identifiers.

This new composite unique employee identifier means the WSI data can facilitate the tracking of employees over time. For example, the data can show if an employee remained in the workforce, to what extent that employee worked in the same rate class, and if that employee moved among rate classes. The ability to track employees in such a manner provides an excellent data source for identifying retention rates and workforce turnover. Adding rate class to the employee definition is the description of a job. Every record in the data represents an employee with a job.

The subtle difference between tracking a job versus an employee is that if an employee has more than one employer during the fiscal year, that individual appears more than once. Further, if an employee works at any time during the year, that individual is included within the WSI data even if the position or duration of work was temporary. Therefore, the head-count data from WSI can include temporary employees as well as duplications from those who worked for more than one employer during the year. When evaluating employee retention, multiple occurrences or duplications from employees with multiple jobs/employers are removed. Consequently, each employee counts as one for each year in the evaluation of employee retention (turnover).

Rate classes in WSI also represent job types. Rate classes follow activities in various sectors based on the degree of risk for workforce related injuries. WSI rate classes are not necessarily equivalent to other common job classifications but some overlap exists. WSI uses a classification system for defining employment that consists of 141 categories based on the type of work activity performed.

Several of the categories are specific to various activities in the petroleum sector. The classifications directly attributable to the petroleum sector include Oil and Gas Operations (code 1320), Oil Refining - Synthetic Fuels Manufacturing (code 4740), Oil and Gas Development Drilling (code 6203), Oil and Gas Well Suppliers or Equipment Dealers (code 6204), Oil Well Trucking (code 6205), Oil Well Servicing (code 6206), Oil and Gas Instrument Logging (6208), Geologists and Scouts (code 8605). Some petroleum industry employment are associated with Professional and Business Representatives (code 8747) and Clerical Office Employees (code 8805). Other employment classifications contain petroleum sector employees but are not distinguished or grouped as part of the petroleum sector.

Given that WSI rate classes are based on health and physical injury risk associated with a job, WSI places some employees in job classifications that are not attributable to the petroleum industry (e.g. Sewer-Water-Gas-Pipeline Construction: code 6301). The North American Industry Classification System codes (NAICS) facilitated the grouping of rate classes representing the *Oil and Gas* industry. Table 1 shows nine WSI rate classes corresponding to Mining, Quarrying, and Oil and Gas extraction of the North American Industry Classification System from 2003 to 2012.

Table 1: WSI Rate Class and North American Industry Classification System Code (NAICS) Correspondence	
North Dakota Workforce Safety Insurance Rate Class (WSI)	**Two Digit North American Industry Classification System (NAICS)**
1005: Coal Mining	**21: Mining, Quarrying, and Oil and Gas extraction**
1320: Oil or Gas Operations	
6203: Oil and Gas Development	
6204: Oil and Gas Well Suppliers and Equipment Dealers	
6205: Oil Well Trucking	
6206: Oil Well Servicing	
6208: Oil and Gas Instrument Logging	
7500: Gas Works	
8605: Geologist and Scouts	
Coal Mining is not considered in the Oil and Gas sector, however, it was added for consistency	

ANALYTICAL PROCESSSES

This study uses workforce and job retention to describe turnover. Employee (workforce) and job retention involves changes in the number of employees remaining in the workforce year over year and the number of rate classes associated with those workers. Workforce and job retention are described in two ways in this assessment.

Workforce retention represents the number of employees that remain in the North Dakota workforce from the preceding year to the following period. Workforce retention also represents the proportion of employees that remain in the workforce the following year to the total workforce of the preceding year. Job retention is a measure of how long an employee remains in the same rate class from the preceding year to the following. Job retention also describes the proportion of employees that remain in the same rate class from the following year to the total workforce of the preceding year. In addition, workforce and job retention

assessment is undertaken for multiple years or all intervals between 2003 and 2012 (e.g. three-year interval, 2003-2004-2005).

Changes in workforce and job retention reflect workforce and job turnover. If the number of employees or proportion of employees from the preceding year to the following year increases as well as that for similar subsequent intervals under consideration, workforce turnover diminishes. This implies that more employees remain in the North Dakota workforce for intervals under consideration. On the other hand, if the number of employees or proportion of employees from the preceding year to the following year, and for similar subsequent intervals, decreases, then workforce turnover increases. This implies that fewer employees remain in the North Dakota workforce for the intervals under consideration.

Workforce Turnover

The retention analysis calculates the number of employees that remain in the North Dakota workforce from the preceding year to the following year. The percentage retention is estimated as the proportion of employees that remained in the workforce the following year divided by the total workforce of the preceding year. The higher the number of employees or percentage retention, the lower the level of workforce (employee) turnover. Higher workforce turnover or lower employee retention rates implies some employers may struggle to find local employees to fill job vacancies or would potentially have to look for employees from outside North Dakota.

Workforce retention was estimated for different intervals, ranging from the short-term (e.g. nine 2-year intervals) to the long-term (e.g. one 9-year interval) using years between 2003 and 2012. For the nine 2-year intervals, workforce turnover is the number of employees that remained in the North Dakota workforce from the previous year to the following year. The nine 2-year consecutive intervals are 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, and 2011-2012.

The longest workforce retention interval is the one 9-year interval from 2003 to 2011 that represents the number of employees in 2003 who remained in the North Dakota workforce in 2012. The number of employees between 2003 and 2011 who remained in the workforce in 2012 divided by the total number of employees in the workforce from 2003 to 2012 expressed in percentage also shows workforce turnover. Other intervals include seven 3-year, six 4-year, five 5-year, four 6-year, three 7-year, and two 8-year intervals.

An example will better illustrate how workforce retention is calculated. Considering a two-year interval, if the North Dakota workforce has 10 employees in 2003 and only 9 employees in 2004 9 employees or 90 percent of the workforce is retained in North Dakota between 2003 and 2004. If 80 percent of employees remain in the workforce for the next consecutive period, 2004-2005, then the level of employee retention is declining (i.e., going from 90 to 80 percent). This decline in employee retention means workforce turnover is

increasing among that group of workers. Using the same example above, the longest workforce retention (e.g. one 9-year interval) shows that if North Dakota has a total of 10 employees in 2003 and only 1 remained in the workforce in 2012, then workforce retention over the 2003 to 2012 interval is 10 percent.

As the examples illustrate, workforce retention (turnover) or the number of employees that remain in the workforce for different intervals in North Dakota is likely to change over time for a host of reasons including personal (e.g. retirement, injury, disease, death, become self-employed), family (e.g. start a family), and job related reasons (e.g. take job in another state). For example, it is widely known that the number of people 65 years and older or those commonly described as "baby boomers" will make up a considerable percentage of the U.S population. Most people in this age cohort will be retiring. If the North Dakota workforce has a large proportion of employees in this age group, lower levels of retention (high workforce turnover) would be expected as more employees retire.

Job Retention

Job retention (employee-job) estimation and workforce retention are similar. However, an individual employee is identified with a UEI whereas, when that UEI is linked to a job, it can be classified as an "employee-job" or an employee with a job. Job retention, therefore, considers employees under any number of rate classes (more than one). Accordingly, employee-job retention has an intra-year component in addition to the year-over-year comparison.

If the UEI shows up twice in one year, then that employee switched jobs (because each employer is required to submit employee payroll report annually). The rate class can be the same (new job is in the same rate class as previous job) or the rate class can be different (new job is in a different rate class from previous job).Using this approach, the data can be used to evaluate job retention or how often an employee remains in the same rate class. It is possible that an employee could switch jobs at the end of the year and remain in the same rate class. In those situations, the data would consider the individual to have retained the same job, when the employee did not.

Job retention assessment ranges from short-term (e.g. nine 2-year intervals) and long-term (e.g. one 9-year interval) using years between 2003 and 2012. For example, assume there 10 employee-jobs in North Dakota in 2003, and in the following years, 3 of those 10 unique employees are still in the workforce but have a different rate class. The analysis would indicate that 30% of the workforce switched jobs or, alternatively, 70% of the employee-jobs were retained over that period. Higher employee-job retention implies lower level of employee-job turnover and vice versa. Higher employee-job retention in the short term will suggest a stable economy while in the long term, it might portray an economy that is not adding new jobs (same jobs over a longer period).

RESULTS

Results are organized into three main groups with representative sections. The first group including Section I and II provides employee and job retention (turnover) results for all sectors. The second group of Results comprising Sections III and IV, specifically deals with employee and job retention (turnover) within the *Oil and Gas* sector. The last group of results describe North Dakota workforce characteristics present in the WSI data (e.g. jobs per employees, employee state of residency).

Number of Employees and Jobs in All Sectors

Table 2 shows results for the number of employees and employee-jobs in all sectors of the North Dakota economy. Employees represent individual reported employees whether they appear in several rate classes in any given year. Employee-jobs represent employees employed in different rates classes. An individual working in different rate classes represent different jobs. The example below illustrates changes in employees and jobs (the **Methods** section has a more detailed explanation).

2002	Employee A job class 1
	Employee B job class 1
	Employee A job class 2
2003	Employee B job class 1
	Employee A job class 2

In the example above, employee B does not necessarily represent another job—that employee could have simply replaced the job held by Employee A in rate class 1. A general observation is that the number of employees and jobs have increased between 2003 and 2012. Number of employees and jobs in all sectors both increased by approximately 43% from 2003 to 2012. About 6 million employee-jobs existed in North Dakota between 2003 and 2012.

Apart from jobs with unidentified classification (about 1.5 million observations), *Administration* was the largest rate class in terms of the number jobs (about 826,000) among the 19 NAICS job classifications between 2003 and 2012. Overall, employees held an average of 1.5 jobs in all sectors. This is an indication that a substantial proportion of employees in North Dakota held more than one job between 2003 and 2012.

Table 2: Employees and Employee-Jobs All Sectors, North Dakota, 2003-2012		
Year	All Sector Employees	All Sector Jobs
2003	360,276	522,850
2004	366,741	541,310
2005	374,626	560,822
2006	382,081	567,727
2007	391,470	588,651
2008	398,023	584,902
2009	404,429	575,292
2010	431,066	616,331
2011	482,592	696,583
2012	514,668	745,978

ALL WORKFORCE SAFETY AND INSURANCE (WSI) RATE CLASSES

Workforce retention and job retention were evaluated for 141 rate classes or job categories for all industries. These evaluations included year-to-year and multi-year periods.

Workforce Retention Year-to-Year

The change in number of employees and percentage of employees retained in North Dakota from the previous year to the following year across all WSI rate classes were evaluated (**Table 3**). Figure 4 represents the percentage change. Results indicate that a large percentage of employees employed in North Dakota from the previous year to the following period remained working in the state when examining year-to-year changes between 2003 and 2012. The level of workforce turnover was low for the two-year periods extending from 2003 to 2012.

On average about 339,864 employees remained in the workforce between 2003 and 2012 when measuring only previous year's workforce. The periods from 2003 to 2004 and 2004 to 2005 had had the largest proportion of employees retained in North Dakota.

Table 3: Employees and Percentage Retained, All Sectors, North Dakota, 2003-2012		
Period	**Employees Retained**	**Employee Retention (%)**
2003 to 2004	310,636	86.2
2004 to 2005	316,128	86.2
2005 to 2006	321,463	85.8
2006 to 2007	328,719	86.0
2007 to 2008	335,525	85.7
2008 to 2009	339,524	85.3
2009 to 2010	346,489	85.7
2010 to 2011	364,153	84.5
2011 to 2012	396,139	82.1

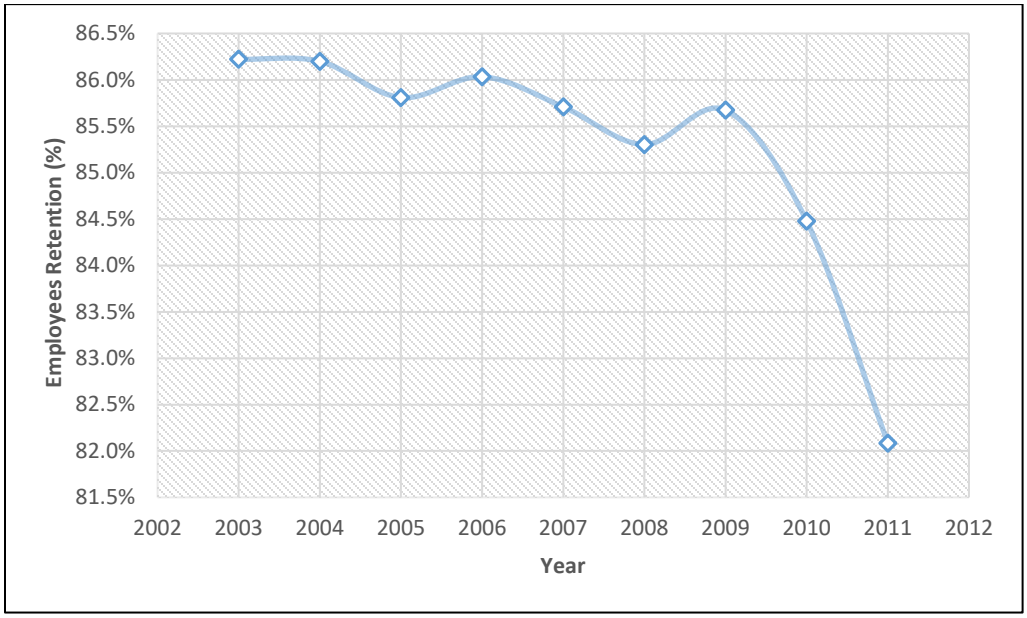

Figure 4: Employee Retention Percentage, All Sectors, North Dakota, 2003-2012

Job Retention Year-to-Year

The number and percentage change in job retention (job turnover) from year-to-year for all sectors, across all WSI rate classes are summarized (Table 4). Figure 5 represents the percentage change. Results show that the number of jobs from previous year to the following year trended upwards for consecutive two-year periods between 2003 and 2012. On average, 423,597 jobs from the previous year remained in North Dakota the following year. The most number of jobs from the previous year to the following (485,856) was observed in the 2011 to 2012 interval.

Table 4: Jobs and Percentage of Jobs Retained, All Sectors, North Dakota, 2003-2012		
Period	**Number of Jobs Retained**	**Job Retention (%)**
2003 to 2004	386,578	73.9
2004 to 2005	395,492	73.1
2005 to 2006	405,858	72.4
2006 to 2007	414,902	73.1
2007 to 2008	423,170	71.9
2008 to 2009	423,283	72.4
2009 to 2010	427,766	74.4
2010 to 2011	449,467	72.9
2011 to 2012	485,856	69.7

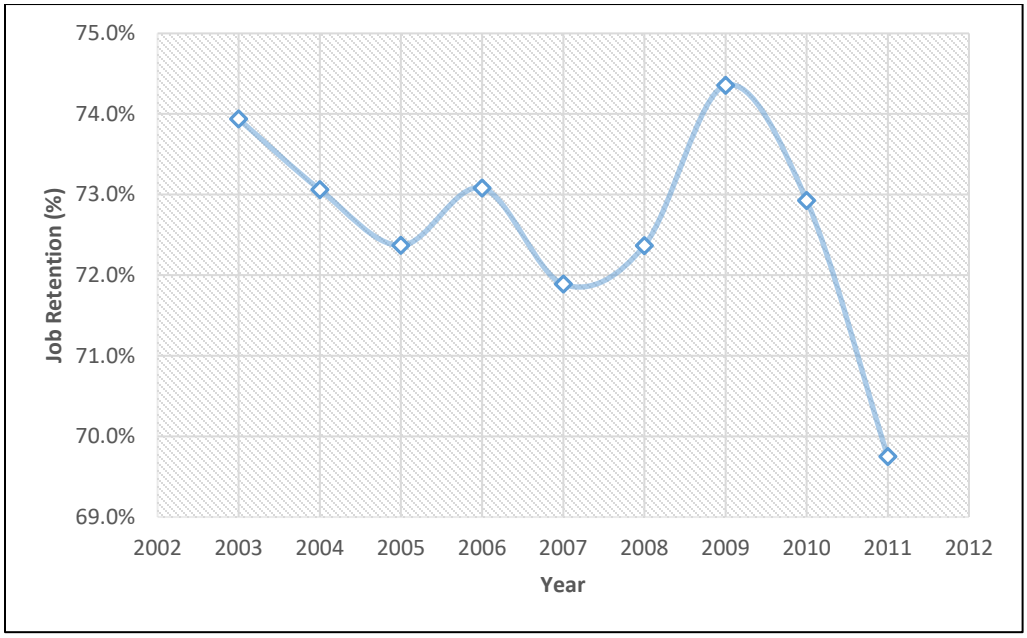

Figure 5: Job Retention Percentage All Sectors, North Dakota, 2003-2012

The 2011 to 2012 period also represents the lowest percentage of jobs retained. Several reasons, most of which are beyond the scope of this study, might be causing the changes observed in Table 4 and Figure 5. One likely reason is the increasing number of jobs in North Dakota over the period (see Table 2).

Employee Retention All Intervals

The number and percentage of employees retained in North Dakota for all sectors over the 2003 and 2012 period were examined (Figure 6 and Table 5). These results provide perspective of changes occurring in North Dakota over time. For example, for the one 9-year interval (traces the number of employees between 2003 and 2011 that remained in North Dakota in 2012), about 21 percent of employees who worked in North Dakota in 2002 remained working in North Dakota in 2012. That proportion doubles for shorter periods. For example, for the 5-year period beginning in 2008, 40 percent of employees remained employed in North Dakota in 2012.

This suggests that potential employee retention declines with time, or turnover increases with time despite the general increase in the number of jobs in all sectors in the state between 2003 and 2012. These results are counterintuitive. One would expect the retention rates to increase (turnover to decrease) with increasing number of jobs. As employees in the state and those from other states are exposed with more job opportunities in North Dakota, one would expect them to remain in the state or perhaps indicate movement to more lucrative opportunities (e.g. higher wages). Results seem to confirm observations about workforce shortages observed in North Dakota during this period.

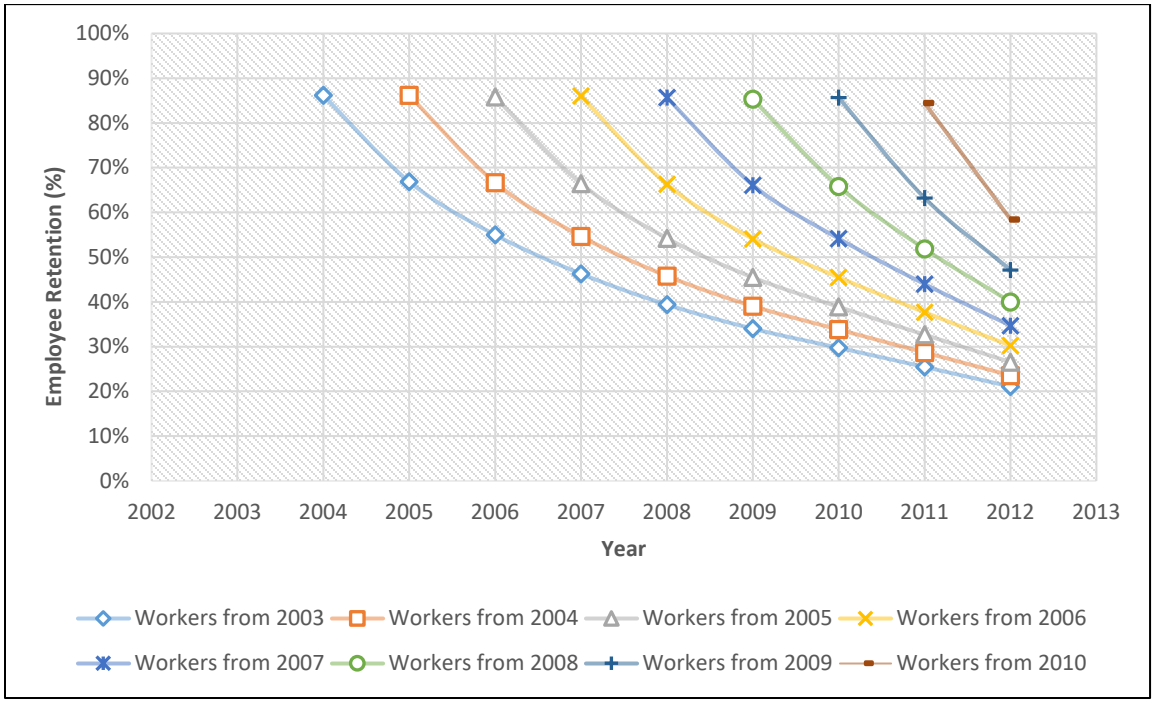

Figure 6: Employee Retention Percentages All Intervals, All Sectors North Dakota, 2003-2012

Table 5: Employees, Percentage Employee Retention Different Intervals, All Sectors North Dakota, 2003-2012									
Employees from 2003									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
170,804 21.1%	181,832 25.5%	193,492 29.7%	205,343 34%	219,506 39.4%	236,415 46.3%	255,886 55%	278,433 66.9%	310,636 86.2%	X
Employees from 2004									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
183,934 23.6%	196,246 28.7%	209,406 33.8%	223,127 39%	239,792 45.8%	259,829 54.7%	283,413 66.6%	316,128 86.2%	X	X
Employee from 2005									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
198,923 26.5%	212,912 32.7%	228,055 38.9%	244,321 45.5%	264,474 54.2%	289,243 66.5%	321,463 85.8%	X	X	X
Employees from 2006									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
216,129 30.2%	232,201 37.7%	249,937 45.5%	269,647 54.1%	294,833 66.3%	328,719 86%	X	X	X	X
Employees from 2007									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
235,236 34.7%	254,029 44%	275,387 54.2%	300,187 66.1%	335,525 85.7%	X	X	X	X	X
Employees from 2008									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
255.726 40%	277,994 51.9%	304,655 65.8%	339,524 85.3%	X	X	X	X	X	X
Employees from 2009									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
281,315 47.2%	309,224 63.2%	346,489 85.7%	X	X	X	X	X	X	X
Employees from 2010									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
321,203 58.5%	364,153 84.5%	X	X	X	X	X	X	X	X
Employees from 2011									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
396,139 82.1%	X	X	X	X	X	X	X	X	X

Job Retention All Intervals

Figure 7 and Table 6 show the number and percentage of employee-jobs remaining in North Dakota for all intervals and all sectors between 2003 and 2012. Overall results show a similar pattern to the changes observed with employees (Figure 7 and Table 6). Employee-job retention tends to decrease over time for different intervals between 2003 and 2012, suggesting increasing turnover for different intervals over the study period. For example, about 6% of employee-jobs in North Dakota between 2003 and 2011 still existed in 2012 whereas about three times more employee-jobs between 2007 and 2011 existed in 2012. This similarity in results likely arises from the fact that a job is described as employee-job; accordingly, as worker retention declines (shown in previous section) so does job retention over time. Another reason for this observation is that while some jobs are lost, the state added jobs over most of the period.

Figure 7: Job Retention Percentages All Intervals, All Sectors, North Dakota, 2003-2012

Table 6: Number, Percentage Job Retention All Intervals, All Sectors North Dakota, 2003-2012									
Jobs from 2003									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
131,434	145,161	160,065	176,043	197,695	225,155	260,014	308,491	386,578	X
6.4%	8.1%	9.9%	12.1%	15.4%	20.6%	28.5%	42.8%	73.9%	
Jobs from 2004									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
145,552	161,853	179,862	199,874	227,668	264,506	314,290	395,492	X	X
7.6%	9.7%	12.2%	15.2%	20.1%	28.1%	41.8%	73.1%		
Jobs from 2005									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
164,191	184,130	206,600	232,333	269,918	322,546	405,858	X	X	X
9.3%	12.2%	15.7%	20.1%	27.8%	41.9%	72.4%			
Jobs from 2006									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
185,608	210,126	238,874	273,565	326,869	414,902	X	X	X	X
11.6%	15.6%	20.7%	27.8%	41.4%	73.1%				
Jobs from 2007									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
213,447	245,139	283,772	333,951	423,170	X	X	X	X	X
14.8%	20.8%	29%	41.8%	71.9%					
Jobs from 2008									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
245,346	286,637	340,908	423,283	X	X	X	X	X	X
19.4%	28.8%	43.6%	72.4%						
Jobs from 2009									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
285,273	341,553	427,766	X	X	X	X	X	X	X
26.2%	42.2%	74.4%							
Jobs from 2010									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
351,167	449,467	X	X	X	X	X	X	X	X
38.4%	72.9%								
Jobs from 2011									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
485,856	X	X	X	X	X	X	X	X	X
69.7%									

OIL AND GAS WORKFORCE SAFETY AND INSURANCE (WSI) RATE CLASSES

The *Oil and Gas* industry witnessed significant growth the last decade and became the largest sector of the North Dakota economy in terms of contribution to the state' gross domestic product. Another part of the growth is the increasing number of jobs, and employees seeking employment in *Oil and Gas* activities and related sectors. The Oil and Gas industry was the largest contributor of employment growth in the state, thereby providing the impetus to assess worker and job retention within those sectors.

Number of Employees and Jobs

Table 7 present results for the number of employees and jobs in the *Oil and Gas* sector. Overall, the number of employees increased between 2003 and 2012. Number of employees and jobs increased respectively by 1340% and 1380% between 2003 and 2012. The substantial growth in number of employees and jobs reflects the potential of the *Oil and Gas* sector to pull employees from other sectors within the state and attract workers outside of North Dakota. The *Oil and Gas* sector was the ninth largest sector in terms of number of employee-jobs across years from 2003 to 2012 (170,000 jobs) among the 19 NAICS job classifications of all rate classes in the WSI dataset including missing rate classes. On average, 15,115 employees worked in the *Oil and Gas* sector between 2003 and 2012. Employees in the *Oil and Gas* sector held 1.1 jobs on average between 2003 and 2012. The average number of jobs held by workers in *Oil and Gas Industry* over the period was substantially less (1.1 to 1.5) than that for all sector workers.

Table 7: Number of Employees and Jobs in Oil and Gas Industry, 2003-2012

Year	Number of Employees	Number of Jobs
2003	3,148	3,448
2004	3,513	3,874
2005	4,675	5,266
2006	5,232	5,858
2007	6,937	7,951
2008	8,898	9,805
2009	12,189	13,722
2010	22,794	25,883
2011	38,507	43,204
2012	45,261	51,053

Employee Retention Year-to-Year

Table 8 shows changes in the number of employees and percentage of employees retained in the *Oil and Gas* sector in North Dakota from the previous year to the following year (year-to-year). Figure 8 illustrates the percentage of employees retained from year-to-year. The number of employees from previous year to the following year grew by about 885% from 2,429 for the 2003 to 2004 interval to 23,920 for 2011 to 2012 interval. On average, about 7,956 employees remained employed in the North Dakota *Oil and Gas* sector from one year to the next over the 2003 and 2012 period.

Results indicate variability in worker retention from 2003 to 2012 as the total number of employees in the sector increases. In general, more than half *Oil and Gas* industry workers were retained for each of the nine 2-year intervals in Table 8 and Figure 8. Because of the growth in the industry, percentage of employee retention is perhaps a better measure. Prior to shale development, the *Oil and Gas* Industry was retaining nearly 80 percent of its workforce in year-over-year comparisons. During the latter periods of the data, that rate had dropped to the mid- to low-60 percentiles (Table 8).

Table 8: Oil and Gas Industry Employees and Percentage of Employees Retained in North Dakota Year-to-Year, 2003-2012

Period	Employees Retained	Employee Retention (%)
2003 to 2004	2,429	77.2
2004 to 2005	2,767	78.8
2005 to 2006	3,535	75.6
2006 to 2007	4,022	76.9
2007 to 2008	5,028	72.5
2008 to 2009	6,204	69.7
2009 to 2010	8,717	71.5
2010 to 2011	14,984	65.7
2011 to 2012	23,920	62.1

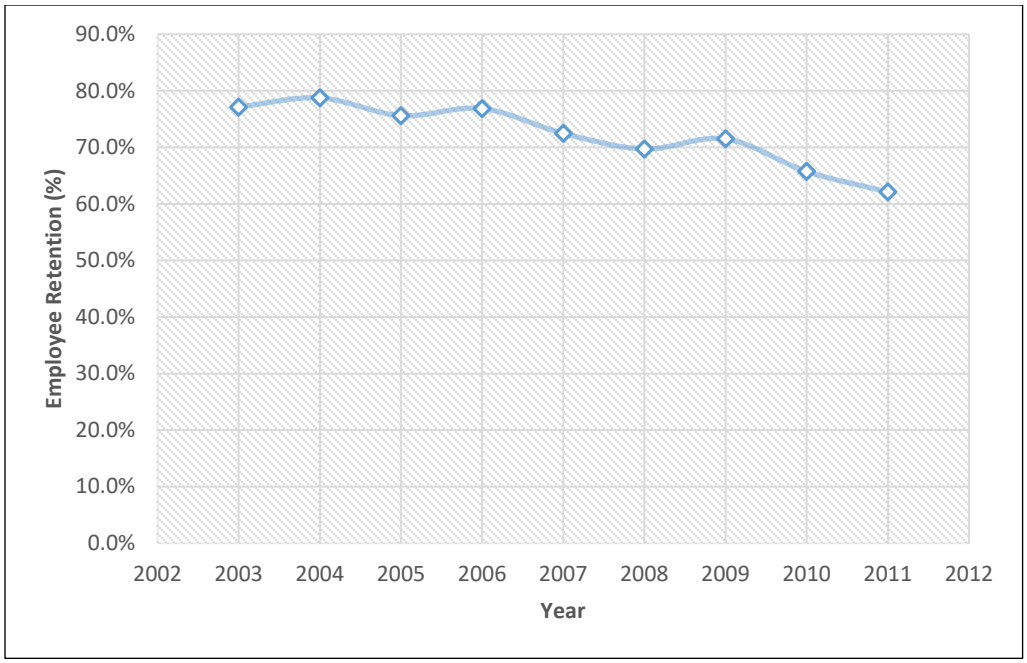

Figure 8: Employees Retained Year-to-Year, Oil and Gas Industry North Dakota, 2003-2012

Job Retention Year-to-Year

Recall, job retention is the number of workers that stayed in the same job from year-to-year and other intervals under consideration. Also, recall that a job describes and employee-job (combination of UEI and rate class). Table 9 summarizes the number and percentage of employee-jobs retained from the previous year to the following year for consecutive two-year periods for the *Oil and Gas* industry. Figure 9 represents the percentage change in the number of jobs retained from 2003 to 2012. Close to 8,879 employee-jobs remained in the *Oil and Gas* sector for two consecutive years between 2003 and 2012 on average. More than half of the jobs were in the *Oil and Gas* sector for each of the nine 2-year intervals from 2003 to 2012. The high percentage of jobs retained in the *Oil and Gas* sector coincides with the increase in oil production (Figure 1). The surge in oil production and the need for workers coupled with favorable crude oil prices and incentives provided to workers (high pay) increased the pace of job creation and retention.

Table 9: Oil and Gas Industry Jobs and Percentage of Jobs Retained Year-to-Year, North Dakota, 2003-2012		
Period	Jobs Retained	Job Retention (%)
2003 to 2004	**2,654**	**77.0**
2004 to 2005	**3,066**	**79.1**
2005 to 2006	**4,025**	**76.4**
2006 to 2007	**4,651**	**79.4**
2007 to 2008	**5,715**	**71.9**
2008 to 2009	**7,008**	**71.5**
2009 to 2010	**10,121**	**73.8**
2010 to 2011	**16,876**	**65.2**
2011 to 2012	**25,795**	**59.7**

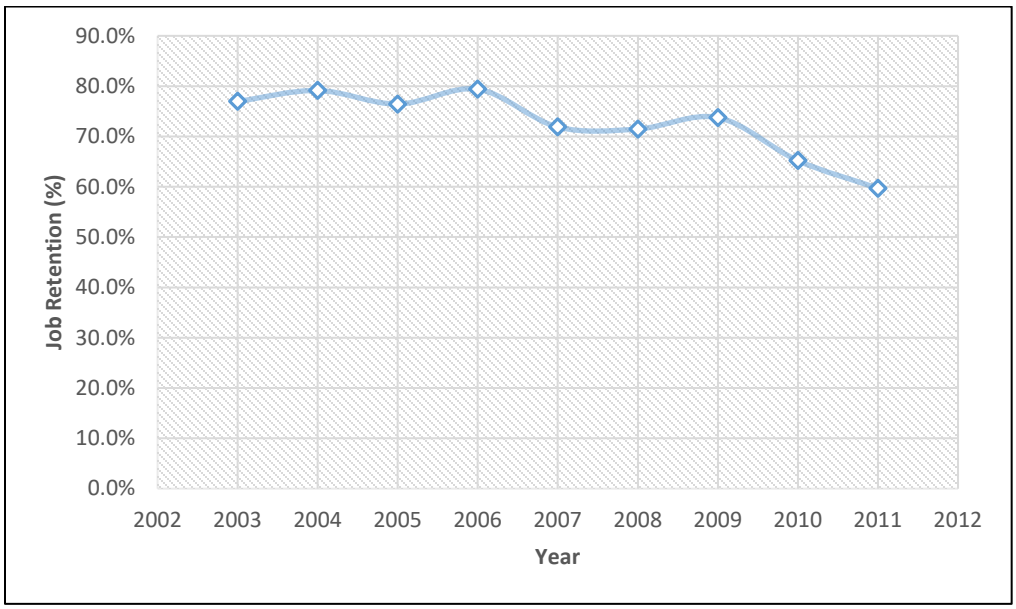

Figure 9: Job Retention Year-to-Year, Oil and Gas Industry North Dakota, 2003-2012

Job Switching by Year from Other Sectors to Oil and Gas

Table 10 shows the number of employees switching jobs to the *Oil and Gas* sector from all other sectors over several one-year periods from 2003 to 2012. Job switching represents the number of employees that appear in the *Oil and Gas* industry and all other sectors excluding the *Oil and Gas* industry. This implies that observed switching could also represent switching from *Oil and Gas* to other sectors. Also shown is the percentage composition of employees switching jobs to the total workforce of the *Oil and Gas* industry. Figure 10 depicts the trend in the number of employees switching to the *Oil and Gas* sector between 2003 and 2012.

Table 10: All Other Sectors to Oil and Gas Industry Job Switching, North Dakota, 2003-2012		
Year	Employees Switching Jobs	Percent of Oil Gas Workforce (%)
2003	**1,024**	**32.5**
2004	**1,199**	**34.1**
2005	**1,698**	**36.3**
2006	**1,726**	**33.0**
2007	**2,300**	**33.2**
2008	**2,752**	**30.9**
2009	**3,253**	**26.7**
2010	**4,939**	**21.7**
2011	**7,566**	**19.6**
2012	**8,756**	**19.3**

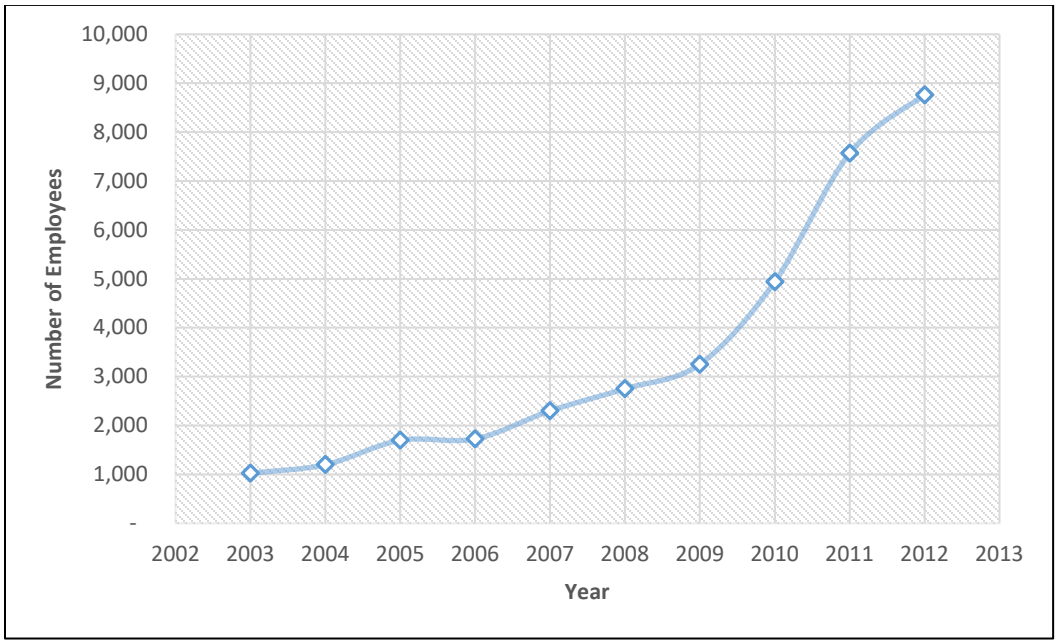

Figure 10: Employees Switching to Oil and Gas Industry, North Dakota, 2003-2012

The number of employees moving from other sectors into the *Oil and Gas* sector (or Oil and Gas into all other sectors)increased by 755% from 1,024 employees in 2003 to 8,756 in 2012. Results show that on average 3,521 employees moved into the *Oil and Gas* sector or vice versa between 2003 and 2012. The increase in number of employees moving into the *Oil and Gas* sector or the other direction increased from 2003 to 2012 (Figure 10). The attractiveness of the *Oil and Gas* industry (high wages) suggest that more workers were moving into the *Oil and Gas* industry from other sectors. These results show that the *Oil and Gas* sector attracted employees from other sectors of the North Dakota economy. Unfortunately, the data cannot

distinguish if the switch was influenced by business behavior, such as poaching, or the movement of workers into the industry was primarily motivated by increased wages or other factors.

Employee Retention All Intervals

Figure 11 and Table 11 show the percentage and number of employees retained in the *Oil and Gas* sector in North Dakota for all intervals between 2003 and 2012. Results vary by the length of the interval. For example, approximately 2% of employees employed in the *Oil and Gas industry* in 2003 remained employed in the industry in North Dakota in 2012. In comparison, 6.3% of employees employed in the industry in 2008 were still employed in the industry in 2012. This indicates that the level of employee retention drops with length of interval or the level of employee turnover increased over time in the *Oil and Gas* sector in North Dakota.

Workforce shortages imply that employers will have to rely on new employees from other sectors within the state or from outside the state to fill new jobs. Results of high-level turnover also means that employees who enter the *Oil and Gas* sector do not remain employed in the state for long periods. Increasing employee turnover in the *Oil and Gas* sector seems odd because we would expect workers to stay for longer in Oil and Gas industry given higher wages. However, the oil producing western part of the state exhibited this workforce shortage condition. Employers had difficulties filling job vacancies.

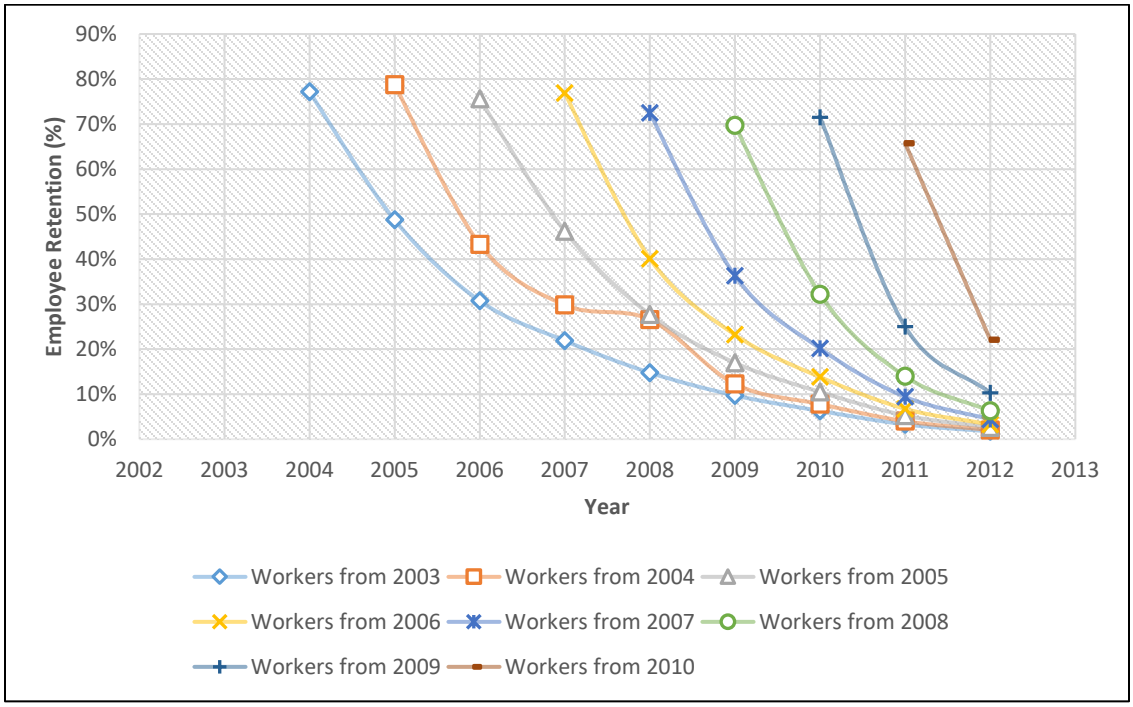

Figure 11: Oil and Gas Industry Employee Retention Percentages, All Intervals, North Dakota, 2003-2012

Table 11: Oil and Gas Industry Employees, Employee Retention Percentages, All Intervals, North Dakota, 2003-2012									
Employees from 2003									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
947	1,063	1,195	1,332	1,493	1,647	1,847	2,061	2,429	X
1.7%	3.3%	6.3%	9.7%	14.8%	21.9%	30.7%	48.7%	77.2%	
Employees from 2004									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
1,113	1,273	1,446	1,620	1,836	2,087	2,346	2,767	X	X
2%	4%	7.8%	12.3%	26.6%	29.8%	43.3%	78.8%		
Employee from 2005									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
1,413	1,653	1,894	2,155	2,506	2,944	3,535	X	X	X
2.6%	5.3%	10.5%	17%	27.7%	46.2%	75.6%			
Employees from 2006									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
1,749	2,067	2,386	2,753	3,266	4,022	X	X	X	X
3.3%	6.7%	13.8%	23.2%	40.1%	76.9%				
Employees from 2007									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
2,316	2,800	3,288	3,924	5,028	X	X	X	X	X
4.4%	9.4%	20.2%	36.3%	72.5%					
Employees from 2008									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
3,229	3,982	4,788	6,204	X	X	X	X	X	X
6.3%	14%	32.2%	69.7%						
Employees from 2009									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
5,075	6,564	8,717	X	X	X	X	X	X	X
10.3%	25%	71.5%							
Employees from 2010									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
10,219	14,984	X	X	X	X	X	X	X	X
22.1%	65.7%								
Employees from 2011									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
23,920	X	X	X	X	X	X	X	X	X
62.1%									

Job Retention All Intervals

Figure 12 and Table 12 present the percentage and number of jobs retained in the *Oil and Gas* sector in North Dakota for all intervals between 2003 and 2012. Similarly, results for all intervals from 2003 to 2012 indicate that job retention varies over time or interval length. Looking at longest period or interval, about 1.4% of employee-jobs from 2003 to 2011 still existed in 2012. However, close to 3.9% of employee-jobs between 2008 and 2011 remained in 2012. Overall, job retention reduces over time or the length of interval under consideration. This means that job turnover was increasing over the period. These results support the preceding result on employee turnover. Recall, a job describes, an "employee job" so changes in number of employees or employee retention will change job retention or job turnover.

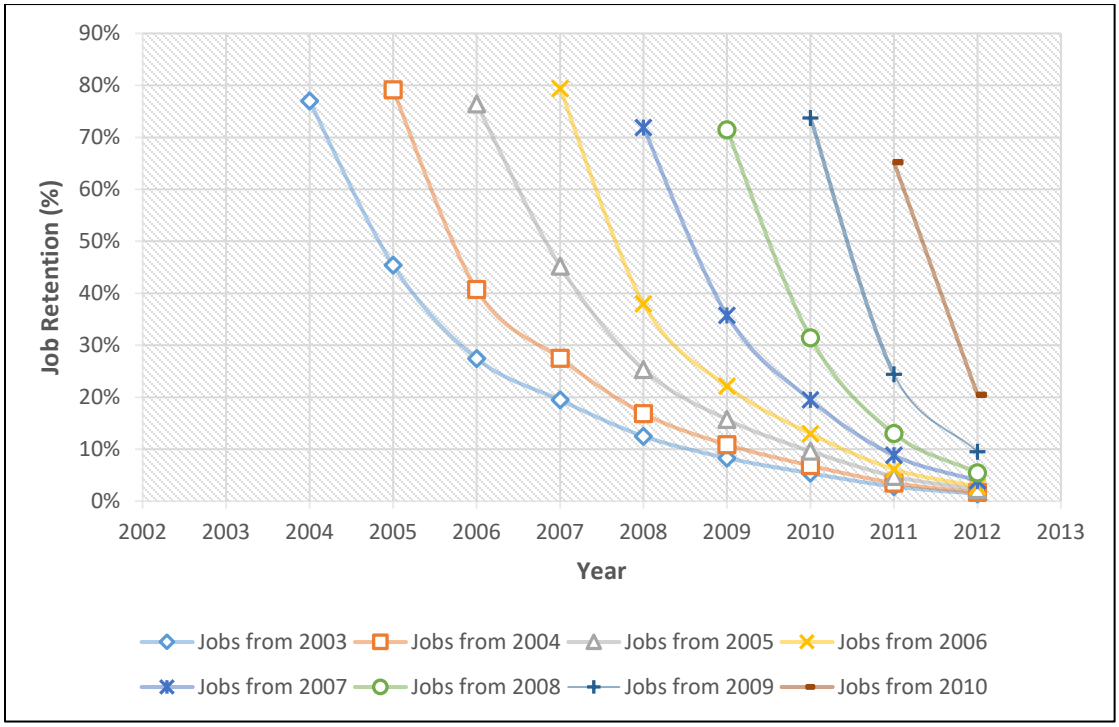

Figure 12: Oil and Gas Industry Job Retention Percentages, All Intervals, North Dakota, 2003-2012

Table 12: Oil and Gas Industry Jobs, Job Retention Percentages, All Intervals, North Dakota, 2003-2012									
Jobs from 2003									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
955	1,131	1,286	1,432	1,598	1,809	1,986	2,215	2,654	X
1.4%	2.8%	5.4%	8.3%	12.5%	19.5%	27.4%	45.4%	77%	
Jobs from 2004									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
1,129	1,379	1,590	1,795	2,028	2,333	2,594	3,066	X	X
1.7%	3.5%	6.8%	10.9%	16.8%	27.5%	40.7%	79.1%		
Jobs from 2005									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
1,480	1,847	2,158	2,459	2,825	3,399	4,025	X	X	X
2.2%	4.8%	9.6%	15.7%	25.4%	45.2%	76.4%			
Jobs from 2006									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
1,820	2,303	2,745	3,162	3,692	4,651	X	X	X	X
2.8%	6.1%	13%	22.1%	37.9%	79.4%				
Jobs from 2007									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
2,500	3,180	3,826	4,537	5,715	X	X	X	X	X
3.9%	8.8%	19.5%	35.8%	71.9%					
Jobs from 2008									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
3,383	4,416	5,435	7,008	X	X	X	X	X	X
5.5%	13%	31.4%	71.5%						
Jobs from 2009									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
5,607	7,524	10,121	X	X	X	X	X	X	X
9.5%	24.4%	73.8%							
Jobs from 2010									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
11,127	16,876	X	X	X	X	X	X	X	X
20.4%	65.2%								
Jobs from 2011									
2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
25,795	X	X	X	X	X	X	X	X	X
59.7%									

ADDITIONAL WORKFORCE CHARACTERISTICS

Employees with a Single Job

Table 13 shows the number of employees that worked for a single employer or held the same job (one job) during the year. Table 13 also shows the percentage composition of the workforce of employees with one employer. Percentage of workforce with single job is illustrated in Figure 13.The North Dakota workforce is majority composed of employees with a single employer. On average, 290,776 employees held a single job between 2003 and 2012 in all sectors of the North Dakota economy.

Table 13: Employees and Percentage of Employees with Same Job to Active Workforce 2003-2012

Year	Employees With Same Job	Percentage Workforce (%)
2003	255,288	70.9
2004	256,532	69.9
2005	259,717	69.3
2006	265,757	69.6
2007	270,609	69.1
2008	279,834	70.3
2009	292,580	72.3
2010	310,510	72.0
2011	347,183	71.9
2012	369,754	71.8

The number of employees holding a single job increased by close to 45% from the lowest level in 2003 (255,288) to the highest level in 2012 (369,754). The percentage composition of the workforce working for one employer show three general trends. A period of decline between 2003 and 2007 followed by a noticeable rise between 2007 and 2009. The period from 2009 to 2012 is steady. Single employee proportion of the workforce ranges from 69.3% in 2007 to 72.3% in 2009.

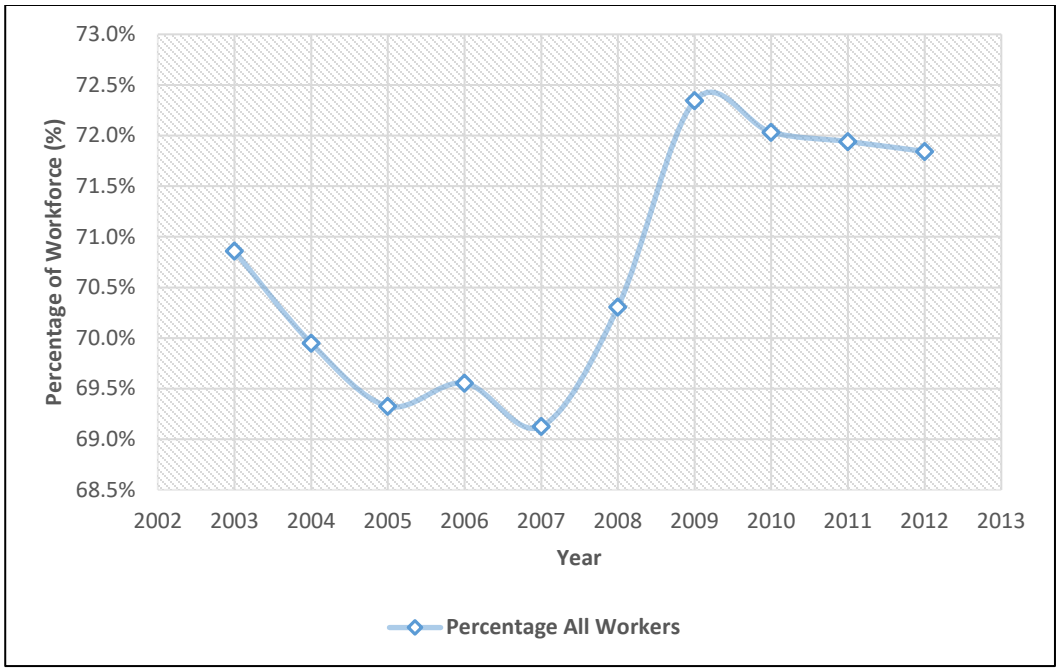

Figure 13: Percentage of Workforce with Same Job, North Dakota, 2003-2012

Employees with Multiple Jobs

Table 14 provides a summary of the number of employees that held more than one job or worked for more than one employer. Also shown is the percentage composition of multiple job employees to the workforce in North Dakota for each year between 2003 and 2012 (Figure 14). The North Dakota workforce has fewer employees with multiple jobs or working for multiple employers per year compared to those that work for a single employer discussed previously.

Table 14: Number of Employees and Percentage of Workforce with Same Job, North Dakota, 2003-2012

Year	Employees with Multiple Jobs	Percentage of Workforce (%)
2003	104,988	29.1
2004	110,209	30.1
2005	114,909	30.7
2006	116,324	30.4
2007	120,861	30.9
2008	118,189	29.7
2009	111,849	27.7
2010	120,556	28.0
2011	135,409	28.1
2012	144,914	28.2

On average 119,821 employees worked for multiple employers in North Dakota between 2003 and 2012. The number of employees holding multiple jobs increased by approximately 38% for the ten-year period. The percentage of multiple job employees in the workforce has remained steady over the 2003 to 2012 period.

Figure 14: Percentage of Workforce with Multiple Jobs, North Dakota, 2003-2012

New Employees in Workforce

New employees are workers that appear in the workforce for the first time from previous year to the following. Results in Table 15 and Figure 15 show the number of new employees in all sectors in North Dakota increased between 2004 and 2012. On average, close to 76,324 joined the North Dakota workforce between 2004 and 2012. The number of employees added to the workforce grew by 111% from 56,105 added in 2004 to 118,529 in 2012. This noticeable increase points to changes that occurred in the North Dakota workforce. The proportion of the workforce represented by new employees ranged from 15.3% in 2004 to 24.5% in 2011. Figure 15 shows new employee percentage of workforce.

Table 15: New Employee, Percentage in Workforce, All Sectors North Dakota, 2003-2012		
Year	**New Employees All Sectors**	**Percentage of Workforce (%)**
2004	**56,105**	**15.3**
2005	**58,498**	**15.6**
2006	**60,618**	**15.9**
2007	**62,751**	**16.0**
2008	**62,498**	**15.7**
2009	**64,905**	**16.0**
2010	**84,577**	**19.6**
2011	**118,439**	**24.5**
2012	**118,529**	**23.0**

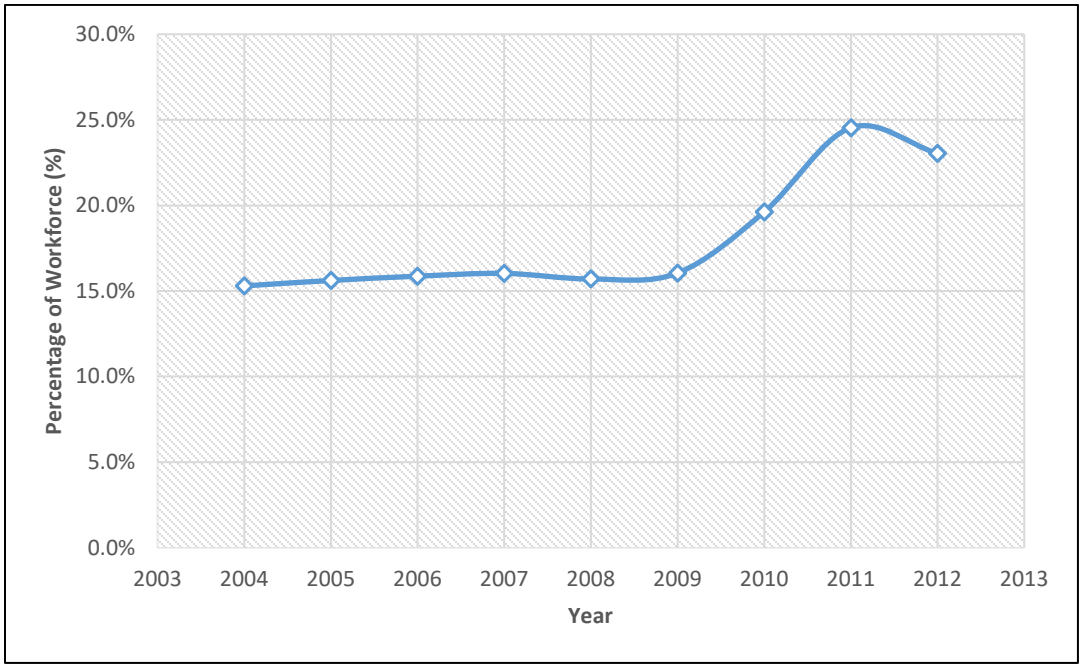

Figure 15: Percentage of New Employees in Workforce, All Sectors, North Dakota, 2003-2012

Employee Residency All Sectors

State origin is the three digits describing the state of birth (UEI) and state abbreviation. However, state of origin does not describe the state of residency of an employee. For example, an individual who was born in Ohio and moved and has lived and worked in North Dakota for an extended period is considered a resident of North Dakota (not Ohio). This notwithstanding,

grouping employees by state of origin can give a sense of some of the changes that have occurred over time.

For example, an increase in the number of employees not born in North Dakota or neighboring states (Minnesota, South Dakota, Wyoming, and Montana) might reflect the attractiveness of North Dakota to other states or employees from non-regional states. Table 16 and Figure 16 show the number and percentage of employees born in North Dakota, regional states (Minnesota, South Dakota, Wyoming, and Montana), and other states (e.g. Florida, North Carolina).

The number of employees in all three groups according to state of birth increased between 2003 and 2012. On average, 254,659, 74,146, and 81,663 employees were born in North Dakota, regional, and other states. The number of employees born in North Dakota increased by close to 4 percent during the ten-year period from 2003 to 2012. Employees born in regional and other states respectively increased by 62% and 225% from 2003 to 2012. Even though state or birth does not portend state of residency, the change for employees born in other state supports the idea that the economic climate in North Dakota (e.g. low unemployment and job opportunities) attracted employees from states beyond the region (e.g. Florida, Arizona).

Table 16: Employees and Percentage of Employees by State of Birth, All Sectors North Dakota, 2003-2012

Year	North Dakota	Regional	Other States
2003	247,383 (68.7%)	62,224 (17.3%)	50,669 (14.1%)
2004	250,943 (68.4%)	64,099 (17.5%)	51,699 (14.1%)
2005	252,347 (67.4%)	66,372 (17.7%)	55,907 (14.9%
2006	255,111 (66.8%)	68,206 (17.9%)	58,764 (15.4%)
2007	257,257 (65.7%)	71,347 (18.2%)	62,866 (16.1%)
2008	257,185 (64.6%)	71,347 (18.3%)	68,194 (17.1%)
2009	255,116 (63.1%)	74,406 (18.4%)	74,907 (18.5%)
2010	257,288 (59.7%)	80,453 (18.7%)	93,325 (21.6%)
2011	257,834 (53.4%)	89,260 (18.5%)	135,498 (28.1%)
2012	256,122 (49.8%)	93,743 (18.2%)	164,803 (32.0%)

The percentage of the workforce born in regional states remained stable between 2003 and 2012. The percentage of employees born in other states has steadily increased from 2003 with a noticeable change observed after 2009 (Figure 16). The percentage of employees born in other states increased by 13.5% from 18.5% in 2009 to 32% in 2012 (the highest increase among the three groups from 2009). These observed changes coincide with the economic expansion witnessed by the state especially as it relates to the surge in crude oil production in the western part of the state. This report next looks at workforce residency in the *Oil and Gas* industry.

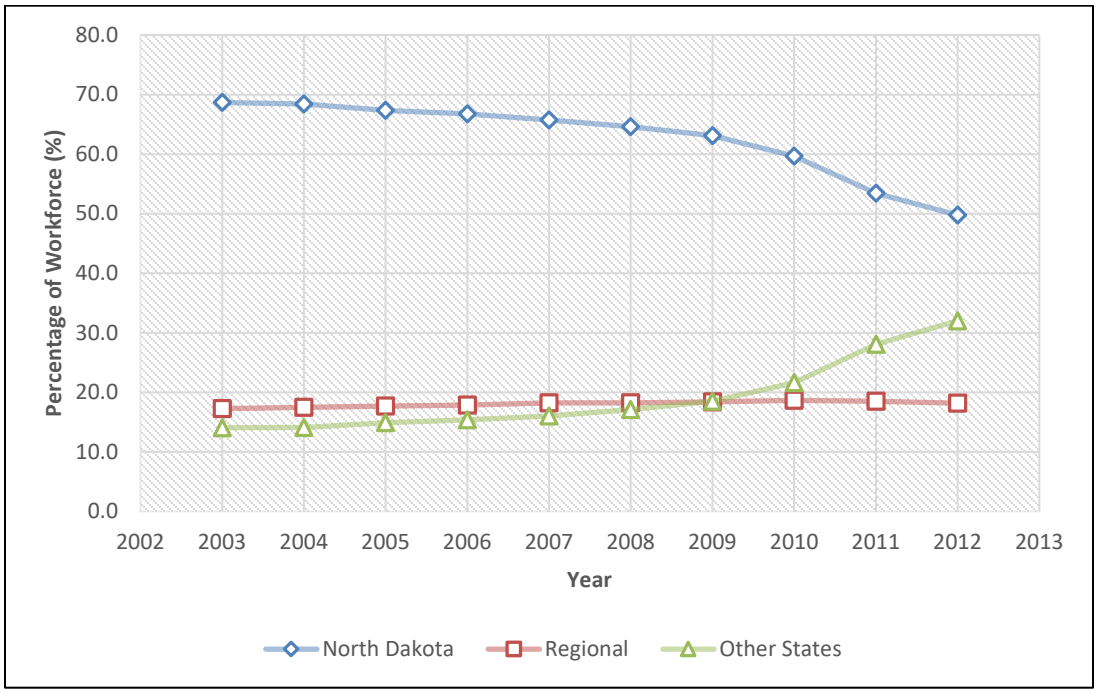

Figure 16: Percentage of Employees by State of Birth, All Sectors, North Dakota, 2003-2012

Employee Residency in Oil and Gas Industry

The rapid influx of employees seeking employment and particularly oil production related jobs in North Dakota led to issues that were widely publicized in both local and national media. These concerns included housing shortages, shortage of private and public services, and workforce related concerns. Table 17 and Figure 17 show the number and percentage of employees born in North Dakota, regional (Minnesota, South Dakota, Wyoming, and Montana), and other states employed in the *Oil and Gas* sector between 2003 and 2012.

The number of employees and percentage of workforce born in North Dakota in the *Oil and Gas* sector declined between 2003 and 2012. Employees born in other states saw a

remarkable rise while employees born in regional states rose steadily during the ten-year period. In fact, employees born in other state represented more than half (59%) of the workforce of the *Oil and Gas* sector workforce beginning in 2010, the peak of shale oil exploration. Prior to 2010, employees born in North Dakota dominated the *Oil and Gas* industry representing as much as 82% of the workforce in 2003.

The average number of employees from 2003 to 2012 by state of birth also shows the dominance of employees born in other states in the North Dakota *Oil and Gas* sector. On average, 7,613 employees born in other states worked in the *Oil and Gas* sector between 2003 and 2012. During the same period, 4,003 and 1,708 employees were born in North Dakota and regional states, respectively. The increase in percentage of employees not born in North Dakota in the *Oil and Gas* sector provides anecdotal support to the widely held view that increasing numbers of workers beyond regional states moved into North Dakota to seek work in the expanding *Oil and Gas* industry. In that case, it appears employees' state of birth closely matches state of origin.

Table 17: Oil and Gas Industry Employees and Percentage by State of Birth , 2003-2012

Year	North Dakota	Regional	Other States
2003	2,223 (82.1%)	177 (6.5%)	309 (11.4%)
2004	2,404 (80.4%)	198 (6.6%)	389 (13.0%)
2005	2,931 (75.7%)	298 (7.7%)	644 (16.6%)
2006	3,278 (74.5%	323 (7.3%)	799 (18.2%)
2007	3,807 (66.1%)	580 (10.1%)	1,375 (23.9%)
2008	4,337 (56.9%)	897 (11.8%)	2,387 (31.3%)
2009	4,616 (43.5%)	1,594 (15.0%)	4,400 (41.5%)
2010	5,128 (25.4%)	3,161 (15.7%)	11,904 (59.0%)
2011	5,727 (16.6%)	4,857 (14.1%)	23,936 (69.3%)
2012	5,575 (13.7%)	4,999 (12.3%)	29,985 (73.9%)

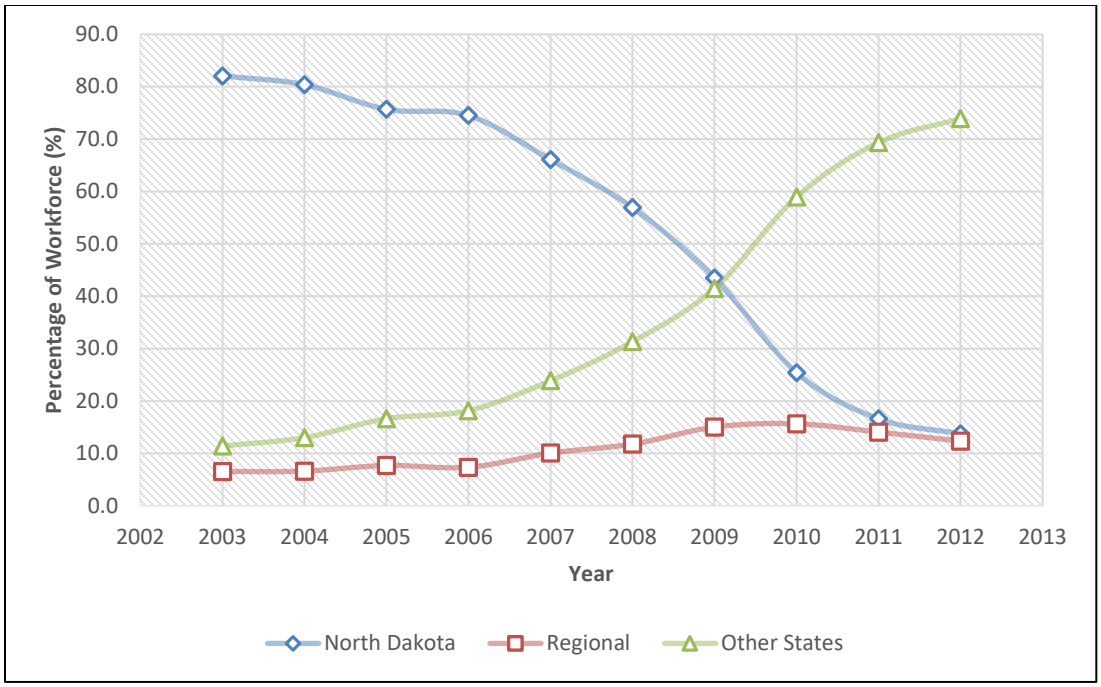

Figure 17: Oil and Gas Industry Percentage of Employees by State of Birth, 2003-2012

SUMMARY

The purpose of this study was to describe employee and employee-job retention (implied turnover), and potential level of employee job switching from other sectors to the *Oil and Gas* sector from 2003 to 2012. Also included in this study is description of North Dakota's workforce characteristic between 2003 and 2012. Specifically, given the contribution of the *Oil and Gas* sector to North Dakota's economy. The analysis of employee and job retention, and workforce characteristics for the *Oil and Gas* sector was undertaken as well.

The North Dakota Workforce Safety and Insurance (WSI) provided data for this study. The data involve individual employee records (e.g. rate class, state of birth) for people who have worked in North Dakota between 2003 and 2012. The dataset contains 136 rate classes representing different sectors of the North Dakota economy. Nine rate classes from WSI classification related to oil and gas exploration and associated activities represented the *Oil and Gas* sector. These nine rate classes correspond with Mining, Quarrying, and Oil and Gas extraction of the North American Industry Classification System code (NAICS).

Close to 6 million observations, representing a cross section of rate classes (can be grouped to sectors) existed during the 2003 to 2012 period of analysis. The 6 million observations are employee-jobs, which reflect employees working in different rate classes. These include employees with several jobs or those working for more than one employer across different rate classes. Both the number of employees and jobs in all sectors in North Dakota increased by 43% between 2003 and 2012. Specifically, the *Oil and Gas* sector witnessed an exponential growth in its workforce and the number of employee-jobs. Number of employees grew by 1340% while number of jobs grew by 1380% from 2003 to 2012.

The 2003 to 2004 and the 2004 to 2005 represent the two-year intervals in which most employees remained in the workforce from the previous year to the following. As much as 86.2% of employees remained in the workforce in all sectors of the North Dakota economy. The 2011 to 2012 interval had the least employee retention rate (82.1%). In general, the number of employees retained decline for all nine two-year intervals. Results also show that retention rates decline as length of interval increases. This means that turnover increases over time within all sectors of the North Dakota economy as well as in the *Oil and Gas sector*, specifically. The most number of employee-jobs retained in any two-year interval was 79.4% from 2006 to 2007. The trend in percentage of employee-jobs that remained from the previous year to the following had three periods of declining jobs (2003 to 2006, 2006 to 2008, and 2009 to 20012) and two periods of increasing employee-job retention (2005 to 2007 and 2007 to 2010). Similarly, employee-job retention decreases over time or as interval length increases.

Changes in employee retention in the *Oil and Gas* sector in general declines for two-year intervals beginning with the 2004 to 2004 interval to the last interval in 2011 to 2012. The exception is the highest level of employee retention of 78.8% in 2004 to 2005 interval. Trend

in job retention also shows that the most number of jobs retained for the two-year interval, 79.1% occurred in 2004 to 2005 period. The trend in job retention also declines for all nine-2 year period with the lowest level of 62.1% in 2011 to 2012 interval. Employee and job retention in the *Oil and Gas* sector, decline with increasing number of intervals under consideration. This means that the level of employee and employee-job turnover increased between 2003, and 2012, and for the longest intervals within this period.

The number of employees switching jobs from all other sectors to the *Oil and Gas* sector in 2012 or vice versa (8,756) was close to eight times what it was in 2003 (1,024). Overall, between 2003 and 2012, 35,213 workers moved to the *Oil and Gas* sector from all other sectors or moved into all other sectors from *Oil and Gas*. The total number of employees who switched jobs made up about 23% of the overall *Oil and Gas* sector workforce between 2003 and 2012. The proportion of employees that switched to the *Oil and Gas* sector workforce peaked in 2005 (36.3%) with lowest level of 19.3% in 2012.

North Dakota employees characteristics results shows that overall, close to 71% percent of the workforce had a single job or worked with a single employer between 2003 and 2012 while about 29% had more than one job or worked for more than one employer. The number of workers employed by a single employer as a percentage of the total workforce peaked in 2009 (72.3%) with the lowest level observed in 2007 (69.1). The peak proportion of employees with more than job occurred in 2007 (30.9) whereas the lowest level was observed in 2009 (27.7%).

The number of new employees in all sectors increased by 111% from 56,105 new employees in 2004 to 118,529 new employees in 2012. The *Oil and Gas* sector witnessed exponential growth during the same period. In 2004, 952 new employees joined the *Oil and Gas* sector while in 2012 that number had increased to 19,797 new employees. The marked increase in *Oil and Gas* sector employees is potentially associated with the surge in oil production and likely need for employees.

State of birth was used as a proxy to assess employees' state of origin or residency. State of birth does not directly infer state of residence but on aggregate provided anecdotal evidence on residency of North Dakota, regional states (e.g. Minnesota, South Dakota, Montana, and Wyoming), and other states (e.g. California, Arizona) employees. Employees born in North Dakota dominated the workforce with the majority of employees throughout the ten-year period of evaluation. The number and percentage of employees born in North Dakota decreased from a peak of 68.7% in 2003 to 49.8% in 2012.

The proportion of employees born in regional states has remained steady from 2003 to 2012 ranging between 17% and 18%. Employees born in other states exhibits a marked upward trend from 14.1% of the workforce in 2003 to 32% in 2012. The upward trend in employees born in other state was markedly noticeable after 2009. To get a better appreciation of the likely link between state of birth and residency, an assessment of the composition of the *Oil and Gas* sector workforce was undertaken.

The decline in the proportion of the workforce born in North Dakota in the *Oil and Gas* sector in North Dakota provided circumstantial evidence that state of birth likely reflects state residency at least for the *Oil and Gas* sector. Workers born in North Dakota declined from 82.1% of the workforce in 2003 to 13.7% in 2012. Regional states born employees increased from 2003 (6.5%) to 2012 (12.3%). Employees born in other states show a distinct increasing trend starting in 2003 (11.4%) to 2012 (73.9%). State of birth state of residency closely matches each other. Having most workers in the *Oil and Gas* sector as residents of other states besides North Dakota and neighboring or regional states has workforce implications in North Dakota, specifically in the Oil and Gas sector. If most of the workers from other states are transient (do not plan to stay) in North Dakota, employee retention is likely to be lower (higher turnover). Observations seem to support this idea. Despite the increase in the number of jobs in North Dakota, employee retention rate in percentage (employee turnover) declined during 2003 and 2012 period.

CONCLUSION

North Dakota has witnessed a major change in its economic base. The *Oil and Gas* sector has overtaken agriculture as the most dominant sector (largest contributor to state gross product) of North Dakota's economy. The *Oil and Gas* sector comprised of Mining, Quarrying, and Oil and Gas extraction using NAICS classification. Oil production in the Bakken shale in Western North Dakota drives the dominance of the Mining, Quarrying, and *Oil and Gas* extraction. The surge in oil production opened job opportunities for employees in the state and beyond. Additionally, the favorable economic climate in the state (e.g. low unemployment rate) attracted employees to all other sectors of the economy as well. The observed influx of employees from outside the state and potentially those moving from sector to sector affected workforce retention (turnover) and brought changes to North Dakota workforce characteristics in general.

In general, the number of employees and jobs in North Dakota has increased from 2003 to 2012. This indicates that the favorable economic climate in North Dakota has attracted employees and created new jobs in all sectors of the economy. This trend is most even more so evident in the *Oil and Gas* sector, which saw a spectacular rise in the number of employees and jobs. Both the number of workers and employee-jobs grew at a similar level as illustrated by the number of jobs per employee close to a little above one.

Results show that the rate of employee and job retention (turnover) diminishes (increases) over time for different length of year intervals between 2003 and 2012. The number of workers and employee-jobs from the previous year to the following year for consecutive periods represents a significant proportion of the workforce for the following year from 2004 to 2012. A host of factors might be responsible for the decline in employee and employee job retention. This study does not explore the potential reasons for changes in workforce and

employee-jobs in North Dakota. However, it is possible to link the lower worker and employee-job retention rate for the 10-year period to increasing number of people reaching retirement age (Baby Boomers) and leaving the workforce. This means the number of employees and jobs between 2003 and 2011 that remained in North Dakota in 2012 reflects more employees reaching retirement age. Another point might be that most workers who entered the state during the surge in oil exploration were transient (stay for a short period). Therefore, as economic conditions improved in their state of residency, most of them opted to return, leaving positions unfilled in North Dakota.

An increasing number of employees from all other sectors of the economy moved into the *Oil and Gas* sector potentially to benefit from relatively higher wages in the *Oil and Gas* sector. Majority of the workforce in North Dakota have one job or work for a single employer. With the increasing number of available jobs and a relatively favorable economic climate, North Dakota witnessed a rise in the number of new employees in all sectors of the economy. The increase in the number of new employees was noticeable in the *Oil and Gas* sector. The composition of workers by state of birth also point to changes in the North Dakota workforce that has occurred for the last decade.

The proportion of employees born in North Dakota dominated North Dakota's workforce between 2003 and 2012. However, the share of workers born in North Dakota's diminished over time. The percentage for neighboring states (e.g. Minnesota, Montana, South Dakota and Wyoming) increased slightly (almost steady) whereas a noticeable increase in proportion of employees born in other states was observed. Employees born in other states in the *Oil and Gas* sector witnessed the most dramatic change within the period. In fact, the number and proportion of employees born in other states doubled (2010) and was as much as five times (2012) the number and proportion of employees born in North Dakota. In general, although the state of birth does not directly reflect state of residency. The increase in workers born in other state in the *Oil and Gas sector* suggest that state of birth reflects state of residency at least in the *Oil* and *Gas* industry. This assertion also is supported by the widely held view that most employees who moved into North Dakota, specifically, the oil patch in western part of the state came from beyond regional states.

The WSI data used in this report might not provide answers for some of the changes in workforce and jobs witnessed in North Dakota recently. However, observed trends gleaned from the WSI data are beyond anecdotal. An elaborate analysis using other related dataset might provide a better understanding of the causes and effects of the trends observed in this report.

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