# BLOOD AND BLACK GOLD: NATURAL RESOURCE EXTRACTION AND VIOLENT CRIME ON AMERICAN INDIAN RESERVATIONS

by

Laura Kate Sikoski

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# DEDICATION

Thank you to my family for their support, to Dr. Wendy Stock, Dr. Diane Charlton, Dr. Nick Hagerty, and Dr. Mark Anderson for their guidance, and to the 2023 cohort members for the company, kindness, and camaraderie.

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# ABSTRACT

Using 2001 to 2016 precinct-level crime data, I examine the relationship between natural resource development in the Bakken oil fields and violent crime on American Indian reservations. While previous studies find positive effects of the Bakken oil boom on crime, the impacts of the oil boom on crime within reservations have never been evaluated. I find that the increase in crime caused by the Bakken oil boom was significantly more severe in reservations, driving the increase in regional crime found by other studies. These results suggest that community safety outcomes should be considered by federal, state, and tribal governments for future natural resource development on reservation.

# INTRODUCTION

One third of American Indians live on reservations, where high levels of poverty and complicated law enforcement jurisdictions are associated with crime rates over twice the national average (Lucchesi and Echo-Hawk, 2018; Williams, 2012). Adding to their consistently high crime rates, reports of crime in reservations in Montana and North Dakota nearly tripled in the early 2000's (Horwitz, 2014). Local law enforcement agencies attributed the spike to the Bakken oil boom and the subsequent influx of itinerant workers. High profile cases of violent homicides[1], methamphetamine and opioid trafficking, increased reports of missing persons cases, graphic sexual assaults, and incidents of human trafficking of Native women and girls have generated increased national attention to reservation crime.[2][3] In this paper, I study the effect of oil development on crime in reservation communities. Although several studies have shown that oil booms result in increased crime[4], the differential impacts on crime on reservations have never been evaluated.

[1] In 2012 a grandmother and three of her grandchildren, ages, 13, 10 and 6, were shot and killed in the small town of New Town, ND, on the Fort Berthold reservation. The assailant then committed suicide in front of the police in the nearby town of Parshall, also located on the reservation. A fourth grandchild survived by hiding under the bodies of his siblings. This crime shook the small town that had already been struggling with increased crime. The local police chief reports that overall crime in the area has doubled with drug related crime tripling over the past few years. The perpetrator of the quadruple homicide was believed to be high on methamphetamines.

[2] The Missing and Murdered Indigenous People's epidemic has gained international recognition over the past decade. The MMIP epidemic can be defined as a systematic pattern of violent crimes consisting of missingness, human trafficking, violence, sexual assault, and murder, especially femicide, against Indigenous peoples across the Americas due to a legacy of government policies forcing relocation, seizing land, and violence against Native peoples. *Missing and Murdered Indigenous People Crisis | Indian Affairs*. (n.d.). Retrieved February 22, 2023, from https://www.bia.gov/service/mmu/missing-and-murdered-indigenous-people-crisis.

[3] Crane-Murdoch, 2013; Cunningham et. al., 2020; Deer and Nagel, 2017; Horwitz, 2014; Maryfield et. al., 2019; Williams, 2012

[4] Berger and Beckman, 2010; Carrington et. al., 2011; Couttenier et.al., 2014; Ruddell, 2011; O'Connor, 2017; James and Smith, 2017; Lim, 2018

Reservations may be more susceptible to crime due to a unique system where federal, state, and tribal law enforcement jurisdictions overlap. Ultimate jurisdictional authority depends on offender and victim tribal membership status, crime location, and crime type. This overlap causes confusion between agencies, slows police investigations, lowers overall conviction rates, and decreases the likelihood of criminal prosecution.[5] All of these, in turn, can contribute to increased lawlessness on reservations and can make reservations particularly susceptible to exogenous shocks to the regional population.

I exploit variation in police precinct location across the Bakken and reservation boundaries to estimate the differential impacts of the oil boom on violent crime. Utilizing a difference in differences (DD) framework, I find a strong, positive effect of the Bakken oil boom on the occurrence of assaults and homicides among reservation precincts in the Bakken. Although women and Native women experience large increases in crime victimization during the Bakken oil boom,[6] my estimates do not suggest an increase in sexual assaults attributable to the oil boom. This may be due to the underreporting of sexual assault cases by victims.

This paper is the first to examine the differential impacts of resource booms on crime in reservations. In addition, this paper contributes to a growing literature on crime related to the Missing and Murdered Indigenous People's epidemic. Reservations are poised to increase the

[5] Blesse and Diegmann, 2022; Chalfin and McCrary, 2017; Horwitz, 2014

[6] The US Department of State Office to Monitor and Combat Trafficking in Persons and Deer and Nagle (2017) reports documenting the relationship between the oil industry in North Dakota and increased in crimes committed against Native women and children; noting a significant increase in the number of Native women and children falling victim to the sex trafficking industry (DOS, 2017; Deer, S., & Nagle, M. K. (2017)). Deer and Nagle (2017) state that "The Fort Berthold reservation, home to the MHA Nation, has been ground zero for sex trafficking of Native women and children as a result of the Bakken oil boom. The tribe's victim services program has documented the increase in crimes committed against Native women and children".

development of their natural resources in the coming decades. While this development opens an avenue to alleviate the severe poverty present on reservations, it also poses serious threats to already vulnerable communities. This study serves as a starting point for researchers to assess the benefits and risks of resource development on reservations to best prepare tribal governments for future trends in crime associated with natural resource development.

# CHAPTER ONE

# BACKGROUND

Evaluating the effects of resource extraction on crime in reservations differs from earlier work because Native American tribal nations with recognized land are separate entities with different legal systems than the states and the federal government. Overlapping jurisdictional boundaries and high poverty rates stemming from reservation development could potentially worsen crime associated with increases in natural resource extraction.

## Jurisdictional Boundaries and Crime on Reservations

Historical patterns of reservation development and law enforcement jurisdictional boundaries directly impact modern levels of crime on reservations. In 1848, the Treaty of Guadalupe and Hidalgo expanded the borders of the US to the Pacific coast. As a result, the US government was no longer able to push Native populations westward. In 1851, the US began establishing reservations across the west. The US maintained that they had the authority to consolidate Native territories via the decision in *Cherokee Nation v Georgia* 30 US 1 (1831) which established Native American Tribes as "domestic dependent nations," granting the US government primary jurisdictional authority over tribes. *Cherokee Nation v Georgia* sustained the authority of tribal governments to internally govern their citizens, creating dual jurisdictional authority over tribal members.

Federal, State, and Tribal Crime Jurisdictions

Jurisdictional power awards a governing judicial system the right to hear and prosecute cases and in the case of criminal prosecution,[7] to carry out criminal sanctions to punish the offender. All US citizens fall under both state and federal legal jurisdictions. Enrolled members of a Native American tribe who live within reservation boundaries are also subject to a third jurisdiction authority, the tribal court system.

Tribal courts maintain jurisdiction over their respective reservation land. They are independent legal systems with tailored legal structures unique to each Native nation. The sovereignty of tribes gives their court systems the right to establish their own criminal law procedures, but their ability to sentence is limited by the federal government.[8]

In addition to applying sentencing guidelines, the federal government also takes jurisdictional responsibility for certain crimes committed on reservations. The Major Crimes Act (18 U.S.C. § 1553) awards the federal government control over crimes designated as major crimes[9] on reservation land. In the event of a designated major crime, the federal government is responsible for the criminal investigation and prosecution.

[7] Criminal prosecution is the identification, securement and prosecution of an individual who has committed a crime. Prosecution includes but is not limited to investigation procedures, arrests, and legal proceedings of the convicted.

[8] The Indian Civil Rights Act of 1978 established that tribal courts were restricted to sentences of up to one year and fines no larger than $5,000 for any crime. In 2010, the Tribal Law and Order Act reestablished sentencing to a maximum of 3 years and maximum fines of $15,000 for qualifying crimes (Parks and Flute, 2015).

[9] Crimes listed as major crimes by the federal government under the Major Crimes Act include “murder, manslaughter, kidnapping, maiming, sexual abuse under Ch. 109-A, incest, assault with intent to commit murder, assault with a dangerous weapon, assault resulting in serious bodily injury, assault on a person less than 16 years old, felony child abuse or neglect, arson, burglary, robbery, theft under 18 U.S.C. § 661.” (18 U.S.C. § 1153) https://www.justice.gov/sites/default/files/usao-wdok/legacy/2014/03/25/Indian%20Country%20Criminal%20Jurisdiction%20ChartColor2010.pdf

Jurisdictional Authority on Tribal Membership and Crime Location

When assigning jurisdictional authority to a criminal case, the tribal membership status of those involved and the location of the crime play an important role. Tribal members who commit crimes off reservation land are subject to federal jurisdiction regardless of the crime committed.

Because federal court sentencing guidelines are harsher than those set by states,[10] this implies that tribal members face harsher sentences than non-tribal members.[11] Figure 1 illustrates the jurisdictional authority based on location and membership assuming the crime committed does not fall under the Major Crimes Act.

Non-tribal members also face jurisdictional variation depending on the tribal status of the other person involved in the crime. Non-tribal members face federal prosecution for crimes committed against a tribal member on and off reservation land, otherwise they are subject to state prosecution. For example, if a non-tribal member assaults a non-tribal member on reservation land, the state police are responsible for investigating that crime. However, if a non-tribal member assaults a tribal member the crime would fall under federal jurisdiction.

The higher sentencing guidelines in the federal system should disincentivize crime on reservation land, but low detection risks may offset this threat. Ineffective policing and investigation delays caused by overlapping jurisdictions decrease the risk of legal repercussions for criminal activities, which in turn, incentivizes criminal behavior (Blesse and Diegmann,

[10] Crimes in federal jurisdiction must abide by federal sentencing guidelines which establish a minimum sentence for each crime. According to the Bangerter Law Office, federal sentencing guidelines are harsher than state guidelines with longer sentences given to offenders in the federal courts than state courts. https://bangerterlaw.com/federal-crimes-vs-state-crimes-whats-the-difference/
See https://www.ussc.gov/sites/default/files/pdf/about/overview/Overview_Federal_Sentencing_Guidelines.pdf for an overview of federal sentencing guidelines.

[11] Tribal members also face the threat of double jeopardy in the tribal court system.

2022; Chalfin and McCrary, 2017).

## Reservation Poverty

Reservations are some of the poorest places in the US and poverty has a strong, positive correlation with crime (Becker 1968). In 2015, the average household income on reservations was 68% lower than the national average (Anderson, 2016) and unemployment rates on some reservations range from 20% to 80%[12] (Miller 2012, p. 2). In 2022, North Dakota's average unemployment rate of around 2% was magnitudes lower than the rates seen on the Standing Rock (24%), Turtle Mountain (9%), Spirit Lake (9%), and Fort Berthold (7%) reservations.[13]

### US Policy Interventions and Reservation Development

High poverty rates on reservations can be at least partially attributed to US policy interventions that influenced tribal institution development. Existing literature suggests that differing US policy interventions resulted in heterogenous development patterns for reservations relative to the rest of the US (Anderson and McChesney, 1994; Anderson and Parker, 2008; Dipple, 2014; Evans, 2011; Frye and Parker, 2021; Leonard, Parker, and Anderson, 2020). Reservations were developed to avoid intra-indigenous conflict and to spatially separate Natives from encroaching colonizers (Anderson and McChesney, 1994; Dipple, 2014; Frye and Parker, 2021). Dipple (2014) finds that in areas with greater possibilities of economic development by

[12] From 2009 to 2011 the national unemployment rate for Native Americans on and off reservation land was 14.6%, compared to 7.7% for whites. This discrepancy in unemployment trends continues. The spike in unemployment caused by the COVID-19 pandemic resulted in 26% of the Native workforce out of work versus the national average of 14.5% (Anderson, 2016; Miller, 2021).

[13] Reservation unemployment measurements are gathered from the Minneapolis Federal Reserve's Center for Indian Country Development. https://www.minneapolisfed.org/indiancountry/resources/reservation-profiles Unemployment data for the state of North Dakota was collected from the Bureau of Labor Statistics. https://www.bls.gov/eag/eag.nd.htm

colonizers, multiple bands of the same tribe were forced to coexist together on common reservations. Because not all bands shared a centralized government at the tribal level, forcing the bands to merge led to an increase intra-tribal conflict and the development of lower quality government institutions. Per capita income, a marker of long-run development, is 30% lower among tribal nations with forced coexistence[14] (Dipple, 2014).

In addition to underlying cultural stressors, federal oversight by the Bureau of Indian Affairs (BIA) on reservations decreased the effectiveness of tribal institutions by increasing their reliance on federal funding. The Meriam Report of 1928 alerted the US to high mortality, morbidity, and poverty on reservations, spurring the federal government to intervene in tribal politics. The Indian Reorganization Act (IRA) of 1934 offered tribal nations additional federal funding in exchange for extensive federal oversight. Tribes that adopted the IRA were required to adapt their governments to be structured like the three-branched US system, theoretically allowing smoother political interactions with the US. However, the US-style model had little semblance to traditional tribal governing practices, resulting in inefficient tribal governance. Frye and Parker (2021) find that tribal nations that accepted IRA oversight had per capita incomes 12% lower in 2016 than non-IRA nations. They credit the discrepancy in income to increased institutional autonomy among tribes that did not accept the policy.

[14] The Mandan, Hidatsa, and Arikara (MHA) Nations, located on the Fort Berthold in the Bakken, elected to be in a single reservation. Historically the tribes shared land, held similar cultural beliefs, and established a complex trading network between themselves and neighboring tribes. After the smallpox epidemics of the early 1800's, the three tribes banded together to survive and developed a more homogeneous society. Today each tribe remains distinct from the others, maintaining independent bands, clan systems, and cultural heritage, but share a centralized government. The MHA Nation does not experience Dipple's (2014) definition of forced coexistence, suggesting that the tribal government on the Fort Berthold reservation should be more efficient in dealing governing and developing economic opportunities for its people. This claim is supported by the reservation's development of its oil reserves and subsequent low unemployment rates relative to other reservations. From https://www.mhanation.com/history

## An Example of the Institutional Implications of Reservation Poverty on Crime

The ramifications of reservation development and US policy intervention on reservation poverty can be illustrated using community safety outcomes. Tribal Nations are chronically underfunded by the federal government and are unable to support local services through local taxes due to high poverty. For example, the Pine Ridge reservation in South Dakota encompasses an area the size of Connecticut, has a population of 40,000, and an officially reported poverty rate of 54%.[15] For this size population, the Bureau of Indian Affairs recommends a minimum of 112 police officers; the reservation only has 33. At any given time, fewer than 10 officers are available to police the reservation's 3.1 million acres.[16] Distance and police understaffing combine to lower the probability of crime detection (Blesse and Diegmann, 2022). In turn, low perceived detection risk incentivizes criminal behavior and increases the number of crimes in an area[17] (Becker, 1968; Blesse and Diegmann, 2022).

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[15] Other estimates place the actual poverty rate of the Pine Ridge Reservation near 80%. Statistics taken from The Pine Ridge Indian Reservation official cite, located https://www.re-member.org/pine-ridge-reservation#:~:text=The%20officially%20reported%20poverty%20rate,80%25%20of%20the%20reservation's%20population.

[16] The issue of police understaffing is also seen on the Fort Berthold reservation. In 2014 the MHA Nation's tribal police force numbered at 20 officers. The Washington Post reports that at times due to short staffing only two officers were available per shift to cover the 980,000-acre reservation (Horwitz 2014).

[17] An example of low perceived detection risks and its correlation with criminal behavior can be seen on the Pine Ridge reservation. In 2022, Pine Ridge reservation had over 20 questionable deaths, 541 missing persons cases, 522-gun related calls, and 794 assaults (Oglala 2022). Converting the 2022 crime reports from Pine Ridge reservation to the standard FBI measure of crimes per 100,000, the Pine Ridge reservation has a suspicious death rate of 50 and firearm disturbance rate of 1,985. In comparison, the FBI reports that the entire state of South Dakota in 2020 had a homicide rate of 4.5 and aggravated assault rate of 399.1 per 100,000. Of the state's reported homicide cases, a 2021 report of gun related violence in the state explains that despite only making up 9% of the state's population, 36% of gun related homicide victims were Native American. FBI statistics are from the FBI Crime Data Explored South Dakota page, located at https://cde.ucr.cjis.gov/LATEST/webapp/#/pages/explorer/crime/crime-trend. Gun related violence and homicide reports are taken from the 2021 Gun Violence in South Dakota Report by the Everytown support fund, located at https://everystat.org/#SouthDakota.

## Resource Booms and Crime

Several studies examining the economic and social externalities of resource booms find positive associations between resource booms and criminal activity, attributing the increase in crime to an influx of young men with lower levels of education and higher instances of criminal records (Berger and Beckman, 2010; Carrington et. al., 2011; Couttenier et.al., 2014; Ruddell, 2011; O'Connor, 2017; James and Smith, 2017; Lim, 2018). Others find inconclusive results, citing missing data and small sample sizes as serious barriers in conducting causal analysis (O'Connor, 2017; Ruddell et. al., 2014). The literature evaluating the crime impacts of the Bakken oil boom finds a strong positive relationship between the boom and crime, particularly assault (O'Connor, 2017; James and Smith, 2017; Lim, 2018).

### Crime in the Bakken Oil Field

James and Smith (2017) evaluate crimes on US shale producing land from 2000 to 2013. They posit that an influx of oil workers with criminal histories and rising income inequality as possible driving factors for increases in overall crimes. They note that in North Dakota specifically, itinerant workers in the Bakken oil fields were more likely to be sexual offenders than itinerant workers in other regions. They find a statistically significant and positive effect of the oil boom on simple and aggravated assaults,[18] but, only a small (possibility insignificant) effect on rape.

One concern with the James and Smith study is their use of log crime rates which exclude zero valued observations (Lim 2018). In particular, Lim investigates the effects of the early 2000

[18] 0.3% and 0.44% increase in simple and aggravated assault per 1% increase in mining employment, respectively.

oil boom on the Bakken oil field, following other regional studies by Ruddell et.al. (2014) and O'Connor (2017). Lim notes that the ruralness and low population density of North Dakota increases the likelihood that true zero crime rates occur for certain crimes (such as homicide) in less populated counties, making a log estimate of crime rates inappropriate for the region.[19] Lim finds that increases in robbery, rape, murder,[20] and certain violent crimes are not attributable to the oil boom, but rather are proportional to the increase in population caused by the oil boom.

[19] James and Smith (2017) note difficulties in their studying in evaluating rape, robbery, and murder due to their infrequency and drop zero estimates in their model.

[20] Lim reports that the average increase in murder is not consistent over the Bakken, noting that five counties accounted for most murder cases in the post period. Two of the five counties, Ward and Mountrail, include sections of the Fort Berthold reservation.

Figure 1– Police Jurisdiction by Tribal Enrollment and Crime Location

| Tribal Membership Status of Offender and Victim | Within Indian Country | Outside Indian Country |
|---|---|---|
| Offender: Non-tribal<br>Victim: Non-tribal | State | State |
| Offender: Non-tribal<br>Victim: Tribal | Federal | Federal |
| Offender: Tribal<br>Victim: Non-tribal | Federal* | Federal* |
| Offender: Tribal<br>Victim: Tribal | Tribal | Federal* |

*The Tribal court may choose to prosecute the offender in double jeopardy.

# CHAPTER TWO

## DATA

I consider crimes reported to the Uniform Crime Report (UCR) *Offenses Known and Clearances by Arrest*[21] for Montana, North Dakota, and South Dakota from 2001 to 2016. Summary statistics for the full sample are presented in Table 1 and subsets of data used in individual specifications are presented in Table 2. The UCR *Offenses Known and Clearances by Arrest* dataset reports monthly data on all reported crimes, not only crimes that result in a criminal conviction. [22] I assign indicators for assault, sexual assault, and homicide to the individual offences to construct crime categories for analysis.[23] Table 3 provides a description of the crimes in each category.

The UCR sample includes 363 precincts covering three states and 19 reservations.[24] Unlike earlier studies that evaluate county aggregate crime, I evaluate crime at the precinct-level as reservations often lie at the intersection of several counties (see Figure 2). This disaggregated precinct-level approach allows me to distinguish between precincts that operate on or off reservations and determine which are subject to the three jurisdictional systems: federal, state,

[21] This paper used the UCR Offences Known and Clearances by Arrest which includes the UCR Supplementary Homicide Report. In addition to homicide data recorded in the UCR, homicides that occur in North Dakota are cross referenced with the North Dakota Homicide reports to confirm if the death occurred on or off reservation land.

[22] The UCR *Offences Known and Clearances by Arrest* also reports rape, assault, homicide, larceny, and property crimes.

[23] For example, the category of sexual assault includes forcible rape and attempted forcible rape; homicide includes murder, non-negligent manslaughter, and negligent manslaughter.

[24] The Flathead Lake reservation in Montana and the Spirit Lake reservation in North Dakota are excluded from analysis. These reservations are voluntary Public Law 280 reservations, which allows state police to respond to all crimes committed on reservation land regardless of the tribal member status of those involved.

and tribal.[25] Without individual precinct identification, reservation precinct crime would be dispersed across counties and dilute any effects attributable to tribal jurisdictional boundaries.

Figure 3 illustrates the location of reservations, precincts, and the Bakken oil field across the study area. Within the Bakken there are 50 precincts. Six of these precincts are located within reservations on the oil field. Across Montana, North Dakota, and South Dakota, I compare the 6 precincts within the Bakken reservations to the 20 precincts located in the remaining 16 reservations outside the Bakken.

## Reporting Concerns

A caveat in using the UCR data is that police agencies are not *required to report*. Some police agencies never report, while others report inconsistently, resulting in potentially inaccurate crime counts. As a result, previous studies that used the UCR cite issues of incomplete data as a significant barrier to analysis.

To address missing data, this paper takes advantage of the high UCR reporting rates and the implementation of mandatory reporting laws in Montana, North Dakota, and South Dakota. The FBI Crime in the United States database records the percent of precincts in each state that report to the UCR over time. On average the FBI reports that UCR crime reports were filed for over 80% to 99% of precincts North Dakota and South Dakota and over 70% to 88% in Montana in the early 2000's and near total coverage after 2005.[26] Mandatory reporting for North Dakota

[25] Crimes outside of city limits are covered by county sheriff departments. I contacted 28 of the 47 sheriff departments in the study whose county includes part of a reservation and asked for an approximation of the percent of sexual assaults, assaults, and homicides that occur on reservation land before and after 2005. In all interviews, the sheriffs or available law enforcement professional reported that they never or rarely act as the primary responders on reservation crime. I consider all incidences reported by sheriff offices to be non-reservation crimes unless the entirety is within a reservation, or the majority of the county and the sheriff's office is located within a reservation.

[26] Annual reports by state are in Table 5 of the Crime in the United States, from https://ucr.fbi.gov/crime-in-the-u.s/.

began in 1999 and Montana in 2004. South Dakota began reporting in 2001, with high compliance rates, but did not require reporting until 2008.

Despite mandatory reporting, 96 law enforcement agencies do not consistently report to the UCR and are removed from the sample.[27] Twenty-seven of the missing precincts are tribal police and Bureau of Indian Affairs (BIA) offices. Due to incompleteness, tribal and BIA agencies are removed from the study, removing all observations of crime between tribal members and tribal and non-tribal members. While causal analysis of the Bakken oil boom on tribal crime is not possible, analysis on tribal crime beginning in 2008 can be found in the Appendix.

[27] The remaining 69 removed precincts are mainly located in South Dakota and parts of North Dakota outside the Bakken oil field. 9 of the missing precincts are located within the Bakken oil field, not on reservations. 4 are located on reservations in South Dakota. The majority of the 69 precincts removed from the study are missing observations in the pre-period.

Table 1– Study Area Summary Statistics

| | Assault | Sexual Assault | Homicide | Bakken | Reservation | Population | Wells per Mile sq. | Year | Month | Post |
|---|---|---|---|---|---|---|---|---|---|---|
| Min. | 0 | 0 | 0 | 0 | 0 | 78 | 0 | 2001 | 1 | 0 |
| Median | 0 | 0 | 0 | 0 | 0 | 2645 | 0 | 2008 | 6.50 | 1 |
| Mean | 1.52 | 0.074 | 0.0035 | 0.14 | 0.06 | 6967 | 0.028 | 2008 | 6.50 | 0.71 |
| Max | 762 | 86 | 5 | 1 | 1 | 175152 | 1.43 | 2016 | 12 | 1 |
| Obs. | 69564 | 69564 | 69564 | | | | | | | |
| Total Obs. | 208692 | | | 28800 | 11520 | | | | | |
| Precincts | 363 | | | 50 | 20 | | | | | |

Table 2 – Study Area Group Summary Statistics

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | |
|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Min. | 0 | 0 | 0 | 0 | 0 | 0 |
| Median | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | 1.45 | 0.07 | 0.003 | 0.51 | 0.333 | 0.002 |
| Max | 194 | 86 | 5 | 36 | 4 | 5 |
| Total Obs. | 197172 | | | 11520 | | |
| Precincts | 343 | | | 20 | | |

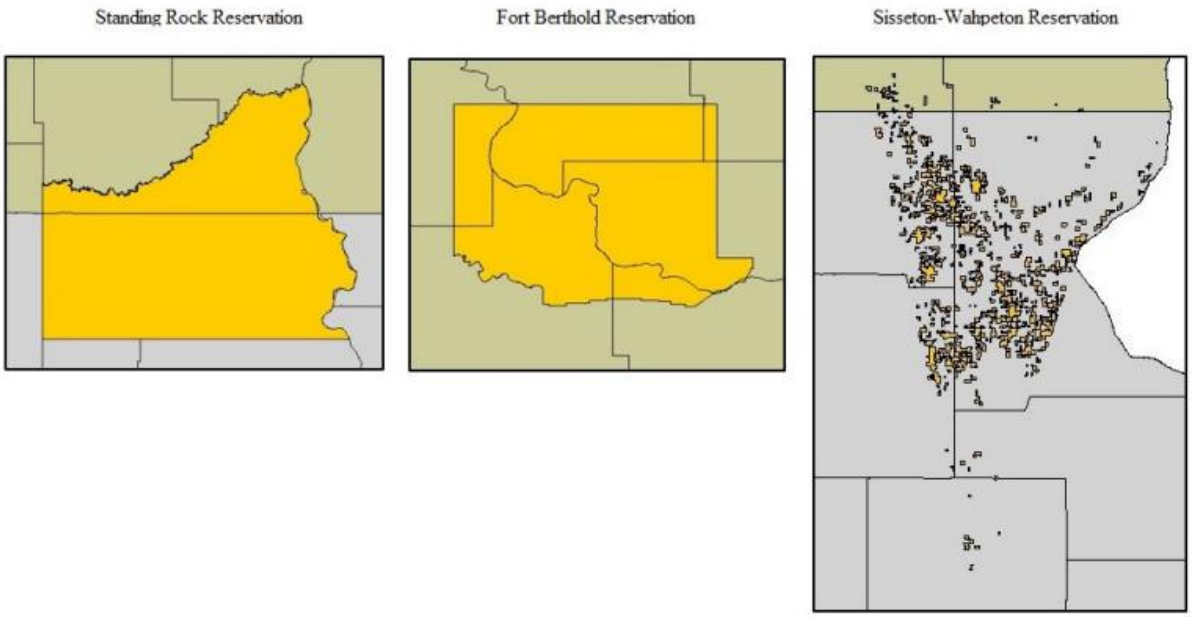
| | *(3) Within Bakken* | | |
|---|---|---|---|
| | Assault | Sexual Assault | Homicide |
| Min. | 0 | 0 | 0 |
| Median | 0 | 0 | 0 |
| Mean | 0.78 | 0.035 | 0.002 |
| Max | 55 | 18 | 4 |
| Total Obs. | 28800 | | |
| Precincts | 50 | | |

Table 3 – Uniform Crime Report (UCR) Variable Descriptions

| **Categorical Crime Variable** | **Crime Offences** |
|---|---|
| Assault | Firearm assault<br>Knife or cutting instrument assault<br>Other dangerous weapon assault<br>Hands, fists, feet, etc. – Aggravated injury assault<br>Other assaults – Simple, not aggravated |
| Sexual Assault | Forcible Rape<br>Attempted Forcible Rape |
| Homicide | Murder non-negligible manslaughter<br>Negligent manslaughter |

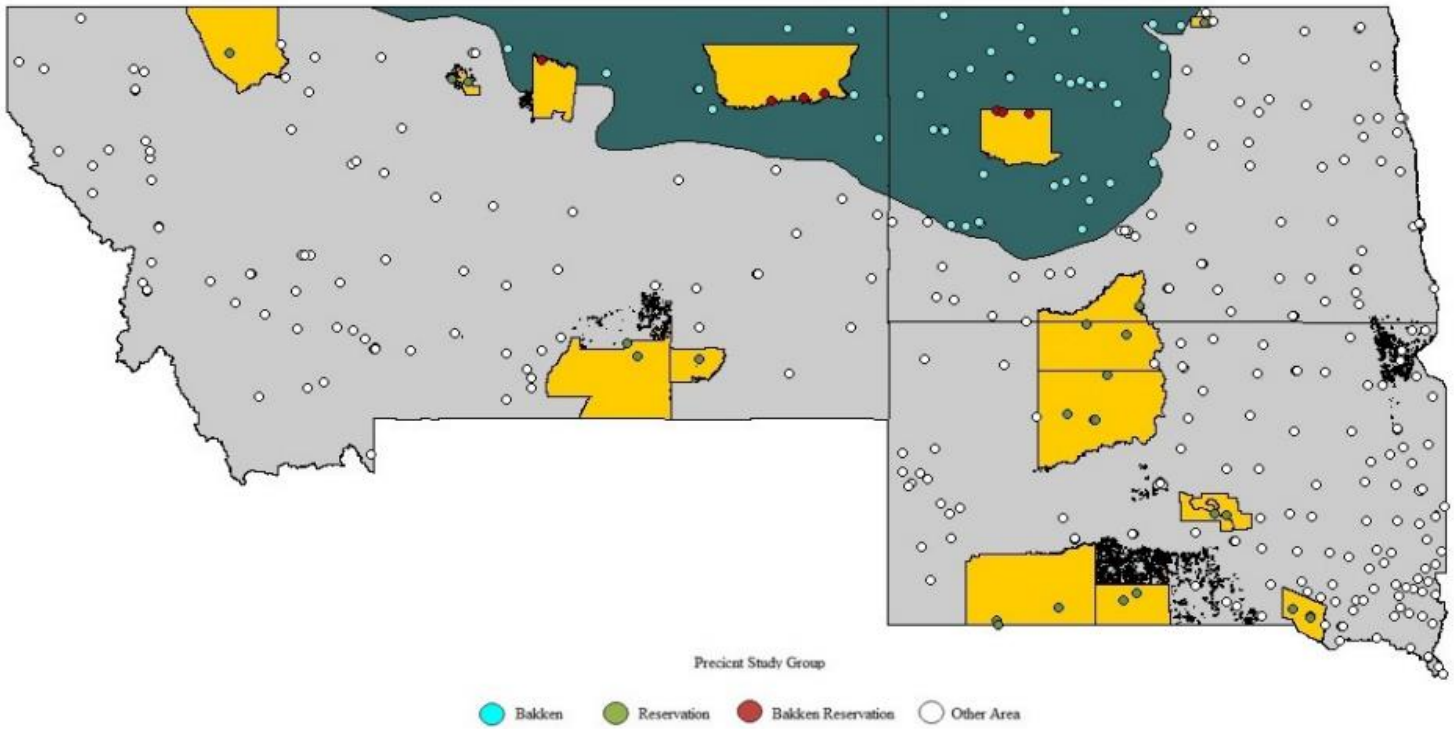
NOTE. – Categorical crime variables for the UCR consist of the listed crime offences. The categorical variable is used as an indicator to assign each individual crime code for the corresponding offences to its respective category and create monthly totals.

Figure 2 – Reservation, State, and County Borders




NOTE. – Figure 2 illustrates the complex location and shape of reservations in relation to state and county borders. Reservations often cross state borders, are intersected by several counties, and can have irregular shapes. All these factors complicate data collection as relevant data is often aggregated to the state or county level. The Standing Rock reservation (left) consists of two counties, one in North Dakota and one in South Dakota. Unlike many reservations, Standing Rock contains all the land within these counties and county level data can be applied reservation analysis. In contrast, the Fort Berthold (center) is intersected by six different counties, each containing different proportions of the reservation. To accurately analyze data on the Fort Berthold reservation, sub-county level measurements are required. While Standing Rock and Fort Berthold have different county intersections, they both have solid borders. The Sisseton-Wahpeton Reservation, however, consists of many pockets of reservation land over seven counties across North Dakota and South Dakota. The lack of cohesive land further complicates analysis, as nearby areas may significantly contribute to reservation estimates but are not subject to the same laws as reservation land.

Figure 3 – Reservations, Police Precincts, and the Bakken Oil Field




NOTE. – Map of study area highlighting the location of reservations, the Bakken oil field, and precinct locations. Reservations are colored gold, the Bakken oil field is dark blue. Flathead and Spirit Lake reservations not shown.

# CHAPTER THREE

# METHODOLOGY

I investigate the differential effects of the Bakken oil boom on violent crime in reservations within the Bakken oil fields. I employ three Poisson difference-in-differences models to compare changes in crime reported by state police precincts across jurisdictional boundaries. I assess changes in assault, sexual assault, and homicide.

## Estimating Equations

Equation 1 evaluates the overall changes in crime before and after the Bakken oil boom on (1) non-reservation crime in and out of the Bakken oil field, (2) reservation crime in and out of the Bakken oil field, and (3) crime within the Bakken oil field on and off reservation land.

$$Crime_{p,m,y} = \alpha + \beta_1(Post_{m,y} * Treat_p) + \beta_2 Pop_{p,y} + \beta_3(month_m * year_y) + \beta_4 precinct_p + \varepsilon_{p,m,y}$$

Let $Crime_{p,m,y}$ be a count variable of the number of assaults, sexual assaults, or homicides reported by precinct $p$, in year $y$, in month $m$. $Treat_p$ is a binary treatment variable distinguishing the location of a precinct in the Bakken oil field or on a reservation. $\beta_1$ measures the average pre- post- difference in crime incidents for:

(1) police precincts within the Bakken compared to precincts outside the Bakken (excluding reservation precincts)

(2) reservation precincts located in the Bakken compared to non-Bakken reservation

precincts

(3) reservations precincts in the Bakken compared to non-reservation precincts in the Bakken

$Post_{m,y}$ is equal to 1 in periods after August of 2005 when the Energy Policy Act of 2005 facilitated the development of horizontal oil drilling in the Bakken region. $Pop_{p,y}$ is the population covered by precinct $p$ in year $y$.

$precinct_p$ fixed effects control for time-invariant determinates of crime or reporting differences across precincts. All precincts within this study are state run precincts that cover non-tribal member crime and are subject to the same legal procedures regardless of their location on or off a reservation. The variable $month_m * year_y$ are month by year fixed effects controlling for individual month variation in crime.[28] Standard errors are clustered at the precinct level.

## Threats to Identification

The identifying assumptions of the difference-in-differences model include parallel trends in the pre-policy period across the treated and untreated groups, no contamination of the treated or untreated groups, and no anticipatory behavior prior to policy implementation. The identifying assumptions hold due to homogenous legal procedure and crime coverage across police precincts, exogenous placement of the Bakken oil field under precincts, unchanging legal jurisdictions and precinct locations, and a uniform federal implementation of the Energy Policy Act of 2005 that facilitated the development of horizontal oil drilling, which I select as the post period.[29]

[28] Table 6 provides model estimates with separate year and month fixed effects.

[29] I select this policy following the work of James and Smith (2017).

First, despite changes in jurisdictional authority due to reservation boundaries and tribal member status of those involved, precincts in this study are identical in their population coverage and jurisdictional authority. Data in this study is restricted to state-run police precincts that are responsible for crime involving non-tribal members both on and off reservation land. State police are unable to prosecute crimes between tribal members or tribal and non-tribal members, removing concerns of systematic reporting differences for different populations between police on and off reservations. Figures 4, 5, and 6 show pre- and post- crime trends across all crimes for all study groups. Figure 4 shows strong parallel pre-trends for assault, with exception of the non-Bakken reservation precincts which experience a sharp increase in assault prior to the boom. Sexual assault pre-trends are consistent for non-reservation precincts but exhibit diverging trends for reservation precincts. Homicide pre-trends are inconsistent across all groups, most likely due to the infrequency of this crime.

Second, the location of precincts over the Bakken oil field is exogenous to the surrounding areas oil production after the oil boom. Oil was not widely produced in the Bakken oil field until the mid-1900's, long after townships and formal jurisdictional boundaries were established, alleviating concerns about reservations, urban centers, or counties lines being specifically placed over oil reserves. Reservation borders and the locations of individual precincts and their subsequent jurisdictional coverage do not change over the study period. Legal boundaries of state and municipal police imply that precincts are unable to prosecute crimes outside their respective jurisdictions, removing concerns of cross contamination. Crime in one police jurisdiction may spill over into adjacent police jurisdiction however, the spatial separation between precincts in the study area makes this unlikely. Any spillovers that may occur are likely

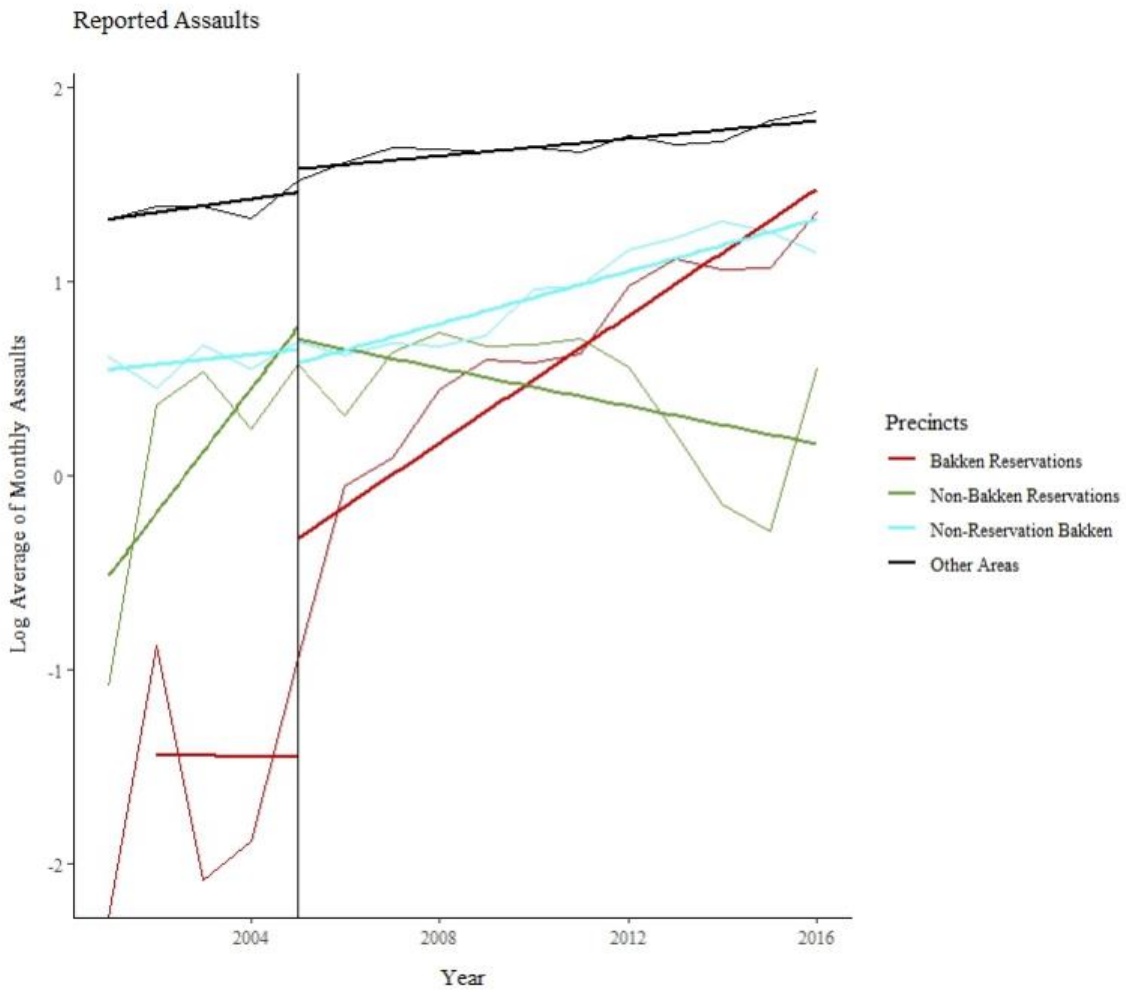
to fall under the county sheriff's jurisdiction.

Finally, the Energy Policy Act of 2005 was implemented nationally in August of 2005. This policy allowed fluids used in horizontal drilling (fracking) to be removed from the list of restricted substances under the Clean Air Act, Clean Water Act, and Safe Drinking Water Act; facilitating the development of new fracking wells (James and Smith, 2017). Prior to the policy, new placement of oil wells shows no increases or decreases prior to 2005 (see Figure 6).

## Rural Crime Data Concerns

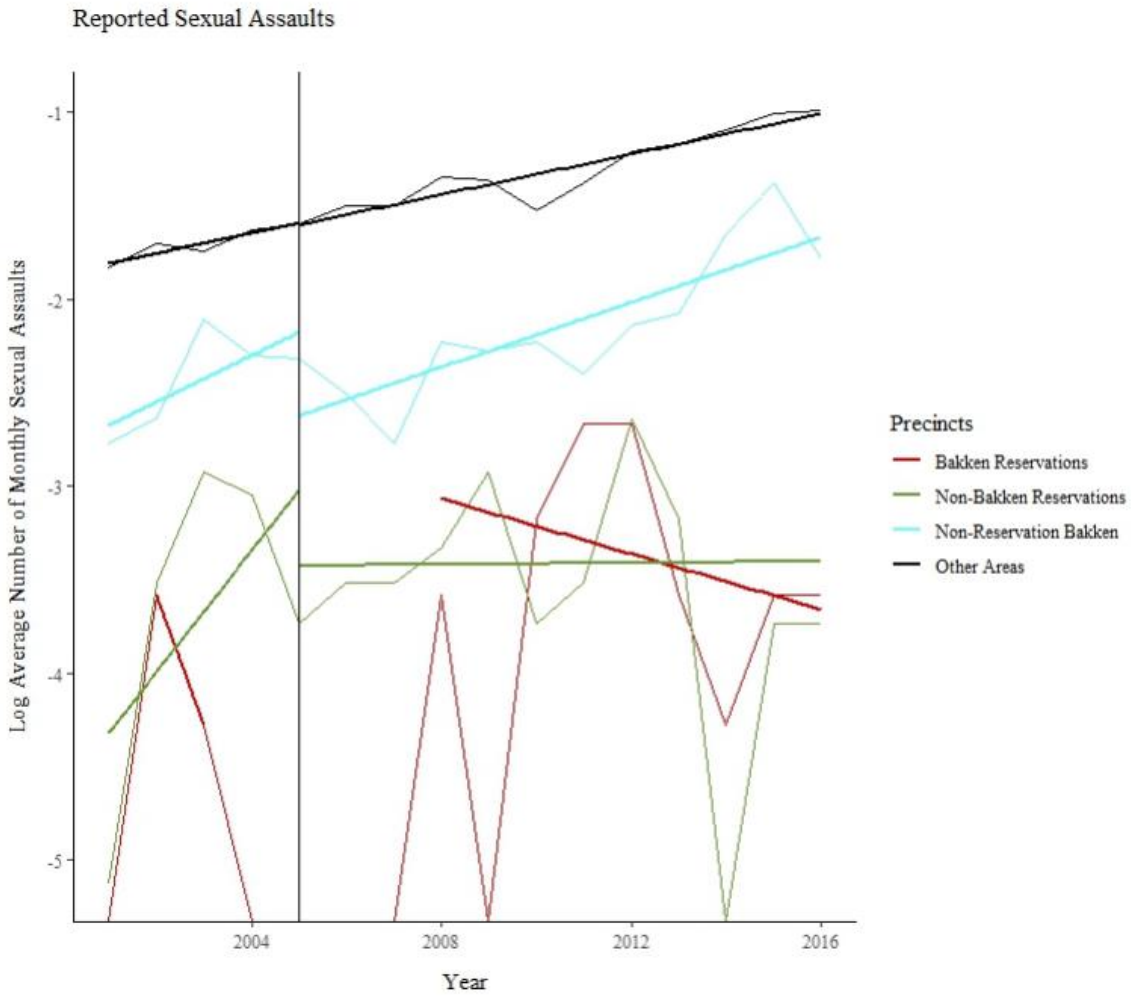
Rural communities are more likely to experience true zero crime rates, skewing the distribution of the data towards zero and making the data unsuitable for standard least squares analysis. However, these zeros provide useful information about the crime trends in rural areas and should be included. I estimate the models using the Poisson distribution to incorporate zero observations and adjust for skewedness following Plassman and Tideman (2001). Additional model specifications using the negative binomial distribution and log and inverse hyperbolic sine transformations of a crime rate dependent variable are located in Tables 6, 7, and 8, respectively. The results from these specifications are consistent with the Poisson model.

Figure 4 – Reported Assault Pre- and Post- Period Time Trends



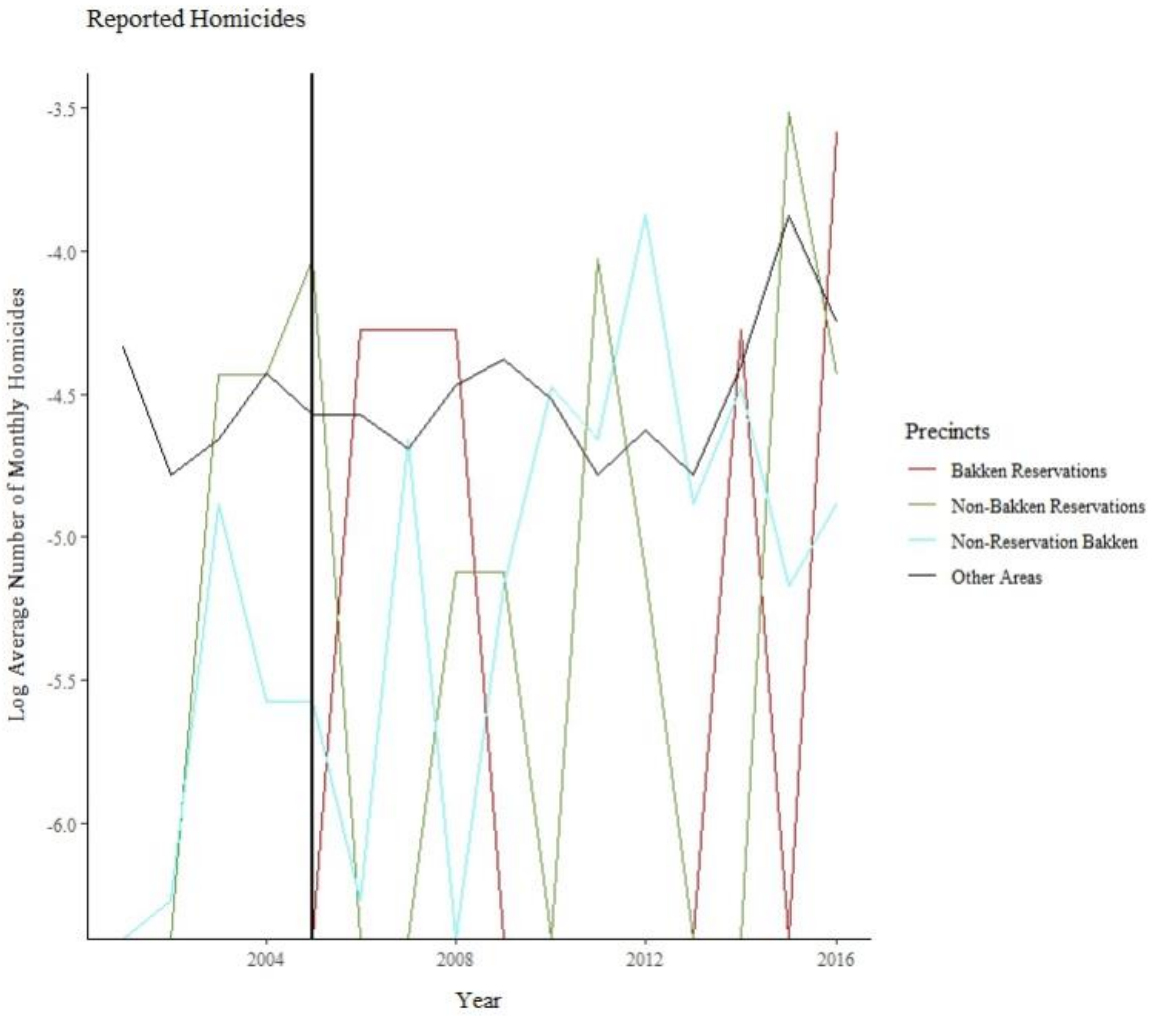

NOTE. – Pre- and post-crime trends for reported assaults are shown above. The thin lines are log average monthly totals for each precinct group; the bolded lines are linear trends lines. Precinct groups reflect the treatment groups, the Bakken region without reservation precincts (Non-Reservation Bakken), non-Bakken reservation areas (Non-Bakken Reservations), reservations on the Bakken (Bakken Reservations), and non-reservation areas outside the Bakken (Other Areas). The vertical line represents the beginning of the Bakken oil boom, defined as the 2005 Energy Policy Act which facilitated the development of hydraulic fracturing wells.

Figure 5 – Reported Sexual Assault Pre- and Post- Time Trends



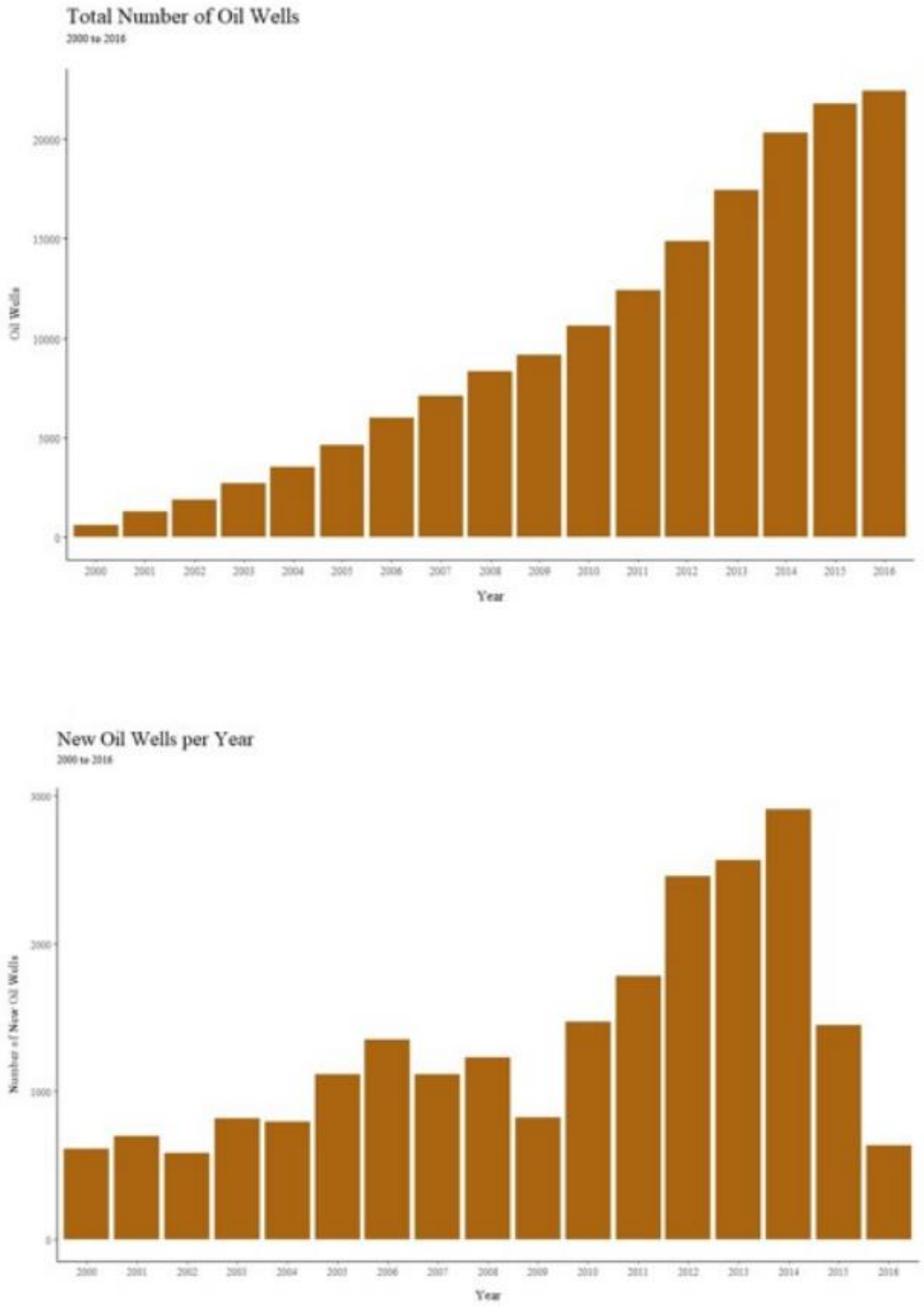

NOTE. – Pre- and post-crime trends for reported sexual assaults are shown above. The thin lines are log average monthly totals for each precinct group; the bolded lines are linear trends lines. Precinct groups reflect the treatment groups, the Bakken region without reservation precincts (Non-Reservation Bakken), non-Bakken reservation areas (Non-Bakken Reservations), reservations on the Bakken (Bakken Reservations), and non-reservation areas outside the Bakken (Other Areas). The vertical line represents the beginning of the Bakken oil boom, defined as the 2005 Energy Policy Act which facilitated the development of hydraulic fracturing wells.

Figure 6 – Reported Homicide Pre- and Post- Time Trends




NOTE. – Pre- and post-crime trends for reported homicides are shown above. The thin lines are log average monthly totals for each precinct group. Precinct groups reflect the treatment groups, the Bakken region without reservation precincts (Non-Reservation Bakken), non-Bakken reservation areas (Non-Bakken Reservations), reservations on the Bakken (Bakken Reservations), and non-reservation areas outside the Bakken (Other Areas). The vertical line represents the beginning of the Bakken oil boom, defined as the 2005 Energy Policy Act which facilitated the development of hydraulic fracturing wells.

Figure 7 – Total and New Oil Wells Per Year 2000 – 2016




NOTE. – The top figure shows the total cumulative sum of new oil wells in the study area from 2000 to 2016. The bottom figure shows the number of new oil wells installed each year. Active oil wells in the region installed before 2000 are not included due to a lack of information re-regarding their end production date.

Table 6 – Negative Binomial Model

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | | *(3) Within Bakken* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Post*Bakken | 0.33* | −0.10 | 0.92* | 2.34** | 0.99 | 20.84*** | | | |
| | (0.16) | (0.20) | (0.37) | (0.81) | (1.29) | (0.54) | | | |
| Post*Rez | | | | | | | 1.84* | 0.64 | 18.41*** |
| | | | | | | | (0.75) | (1.24) | (0.45) |
| Jurisdiction Population | 0.00 | 0.00 | 0.00 | 0.00 | −0.00 | −0.00 | 0.00 | −0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. ORI Code | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Month*Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Num. Obs. | 65724 | 65724 | 65724 | 3840 | 3840 | 3840 | 9600 | 9600 | 9600 |
| Deviance | 34602.17 | 16076.80 | 3438.72 | 2119.99 | 291.35 | 48.27 | 4661.08 | 1720.28 | 233.70 |
| Log Likelihood | −90286.16 | −19826.41 | −2613.55 | −3734.42 | −287.20 | −53.18 | −10945.49 | −1847.64 | −194.65 |
| Pseudo $R^2$ | 0.48 | 0.48 | 0.19 | 0.39 | −0.02 | −0.86 | 0.43 | 0.36 | −0.22 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. – Coefficients can be interpreted as rate ratios by raising *e* to the estimated coefficient. Numbers in parentheses are standard errors clustered at the precinct level. Dependent variables are count variables for assaults, sexual assaults, and homicides reported monthly. Independent variables are jurisdictional population, a binary distinguishing the post period beginning in August of 2005, and binary indicators for a precinct's location on a reservation or on the Bakken oil field. Results for non-reservation precincts are located in columns 1-3, reservation only precinct results are located in columns 4-6, and results for reservation versus non-reservation precincts in the Bakken are located in columns 7-9.

Table 7 – Log Dependent Crime Rate

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | | *(3) Within Bakken* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Post*Bakken | 0.22** | −0.11** | | 0.74*** | 0.15*** | | | | |
| | (0.08) | (0.04) | | (0.12) | (0.00) | | | | |
| Post*Rez | | | | | | | 0.66*** | −0.11 | |
| | | | | | | | (0.09) | (0.35) | |
| Jurisdiction Population | −0.00 | | −0.00*** | 0.00 | | | −0.00 | −0.00 | −0.00*** |
| | (0.00) | | (0.00) | (0.00) | | | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. ORI Code | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. Month*Year | YES | YES | YES | YES | YES | | YES | YES | YES |
| Num. obs. | 27441 | 6450 | 613 | 1091 | 96 | | 3503 | 589 | 53 |
| $R^2$ | 0.53 | 0.77 | 0.97 | 0.68 | 0.98 | | 0.46 | 0.83 | 1.00 |
| Adj. $R^2$ | 0.52 | 0.75 | 0.95 | 0.60 | 1.10 | | 0.42 | 0.72 | 1.00 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. –Numbers in parentheses are standard errors clustered at the precinct level. Dependent variables are count variables for assaults, sexual assaults, and homicides reported monthly. Independent variables are jurisdictional population, a binary distinguishing the post period beginning in August of 2005, and binary indicators for a precinct's location on a reservation or on the Bakken oil field. Results for non-reservation precincts are located in columns 1-3, reservation only precinct results are located in columns 4-6, and results for reservation versus non-reservation precincts in the Bakken are located in columns 7-9.

Table 8 – Inverse Hyperbolic Sine Crime Rate Dependent Variable

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | | *(3) Within Bakken* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Post*Bakken | 0.00 | −0.00 | 0.00* | 0.00 | 0.00 | 0.00 | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | | |
| Post*Rez | | | | | | | 0.00 | 0.00 | 0.00 |
| | | | | | | | (0.00) | (0.00) | (0.00) |
| Jurisdiction Population | 0.00 | | 0.00 | −0.00 | | −0.00 | −0.00 | 0.00 | −0.00 |
| | (0.00) | | (0.00) | (0.00) | | (0.00) | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. ORI Code | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Month*Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Num. Obs. | 65724 | 65724 | 65724 | 3840 | 3840 | 3840 | 9600 | 9600 | 9600 |
| $R^2$ | 0.43 | 0.06 | 0.01 | 0.34 | 0.09 | 0.06 | 0.34 | 0.08 | 0.03 |
| Adj. $R^2$ | 0.42 | 0.05 | 0.00 | 0.30 | 0.03 | −0.00 | 0.32 | 0.06 | −0.00 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. –Numbers in parentheses are standard errors clustered at the precinct level. Dependent variables are count variables for assaults, sexual assaults, and homicides reported monthly. Independent variables are jurisdictional population, a binary distinguishing the post period beginning in August of 2005, and binary indicators for a precinct's location on a reservation or on the Bakken oil field. Results for non-reservation precincts are located in columns 1-3, reservation only precinct results are located in columns 4-6, and results for reservation versus non-reservation precincts in the Bakken are located in columns 7-9.

# CHAPTER FOUR

## RESULTS

Table 4 presents the estimated effects of the Bakken oil boom on assaults, sexual assaults, and homicide.[30] Among precincts in the Bakken, reservation precincts were 6.5 times more likely to report an assault after the boom relative to non-reservation precincts before the boom. Compared to other reservation precincts, reservation precincts on the Bakken were 8 times more likely to report an assault. Notably, non-reservation precincts on Bakken show a positive, but insignificant, increase in assaults after the boom. This finding suggests that results from earlier studies showing increases in violent crime are driven by reservation areas.

Homicide shows a strong, positive, and statistically significant effects after the oil boom across all treatment groups. Non-reservation precincts in the Bakken are 2.5 times more likely to report a homicide than precincts outside the Bakken before the boom. This finding contradicts James and Smith (2017) and Lim (2018) who find inconclusive results on the effect of the oil boom on homicide.

I find inconsistent results for sexual assault, indicating an insignificant or mild positive impact of the oil boom, consistent with James and Smith (2017)

[30] Results for alternative model specifications using the Poisson distribution can be found in Table 5.

Table 4 – Poisson Model Main Results

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | | *(3) Within Bakken* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Post*Bakken | 0.08 | −0.13 | 0.91* | 2.09** | 1.09 | 17.60*** | | | |
| | (0.21) | (0.21) | (0.36) | (0.78) | (1.37) | (0.79) | | | |
| Post*Rez | | | | | | | 1.87* | 0.64 | 14.39*** |
| | | | | | | | (0.75) | (1.25) | (0.47) |
| Jurisdiction Population | 0.00 | −0.00 | 0.00 | 0.00*** | −0.00 | −0.00 | −0.00 | −0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. ORI Code | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Month*Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Num. Obs. | 56256 | 46464 | 25404 | 3128 | 814 | 95 | 7182 | 5735 | 846 |
| Deviance | 106992.50 | 23805.04 | 4006.38 | 5217.81 | 362.11 | 66.66 | 12268.53 | 2264.39 | 283.27 |
| Log Likelihood | −100109.11 | −19966.18 | −2641.98 | −4346.27 | −281.98 | −53.87 | −11720.51 | −1819.54 | −197.13 |
| Pseudo $R^2$ | 0.82 | 0.54 | 0.10 | 0.55 | −0.13 | −0.44 | 0.65 | 0.35 | −0.21 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. – Coefficients can be interpreted as rate ratios by raising *e* to the estimated coefficient. Numbers in parentheses are standard errors clustered at the precinct level. Dependent variables are count variables for assaults, sexual assaults, and homicides reported monthly. Independent variables are jurisdictional population, a binary distinguishing the post period beginning in August of 2005, and binary indicators for a precinct's location on a reservation or on the Bakken oil field. Results for non-reservation precincts are located in columns 1-3, reservation only precinct results are located in columns 4-6, and results for reservation versus non-reservation precincts in the Bakken are located in columns 7-9

Table 5 – Poisson Alternative Fixed Effects

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | | *(3) Within Bakken* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Post*Bakken | 0.08 | −0.13 | 0.91* | 2.09** | 1.09 | 16.47*** | | | |
| | (0.21) | (0.21) | (0.36) | (0.76) | (1.30) | (0.51) | | | |
| Post*Rez | | | | | | | 1.87* | 0.64 | 13.80*** |
| | | | | | | | (0.74) | (1.23) | (0.53) |
| Post | −0.01 | 0.30 | −1.06** | −0.30 | 1.23 | −17.61*** | −0.19* | 0.10 | 0.31 |
| | (0.03) | (0.24) | (0.38) | (0.27) | (1.23) | (0.83) | (0.08) | (0.27) | (1.54) |
| Jurisdiction Population | 0.00 | −0.00 | 0.00 | 0.00*** | −0.00 | −0.00 | −0.00 | −0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. ORI Code | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Num. Obs. | 56256 | 46464 | 28032 | 3264 | 2112 | 540 | 7296 | 5952 | 2970 |
| Deviance | 107744.28 | 24112.41 | 4212.15 | 5539.67 | 558.40 | 144.66 | 12593.57 | 2540.29 | 409.00 |
| Log Likelihood | −100485.00 | −20119.86 | −2744.87 | −4507.20 | −380.13 | −92.88 | −11883.03 | −1957.49 | −259.99 |
| Pseudo $R^2$ | 0.82 | 0.54 | 0.14 | 0.56 | 0.08 | −0.06 | 0.66 | 0.37 | 0.03 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. – Coefficients can be interpreted as rate ratios by raising *e* to the estimated coefficient. Numbers in parentheses are standard errors clustered at the precinct level. Dependent variables are count variables for assaults, sexual assaults, and homicides reported monthly. Independent variables are jurisdictional population, a binary distinguishing the post period beginning in August of 2005, and binary indicators for a precinct's location on a reservation or on the Bakken oil field. Results for non-reservation precincts are located in columns 1-3, reservation only precinct results are located in columns 4-6, and results for reservation versus non-reservation precincts in the Bakken are located in columns 7- 9.

# CHAPTER FIVE

# ROBUSTNESS CHECKS

## Event Study

I perform an event study to assess any unseen trends in crime. Figure 8 provides visualizations of the regression results. I find that the year coefficients for assault and sexual assault are statistically significant and positive prior to the boom, indicating annual increases in these crimes unrelated to the oil boom. These annual trends are not observed in the reservation only analysis.

The event study indicates a statistically significant, positive, and steadily increasing trend for assault starting with the initial year of the oil boom for reservations precincts in the Bakken. Non-reservation precincts in the Bakken show a steadily increasing trend in the later years of the oil boom however, they exhibit negative changes in assault in the years immediately following the boom. Neither sexual assault nor homicide show increasing annual trends.

## Oil Drilling Intensity Measure

Earlier studies control for county level oil production as a proxy for oil field worker population or drilling intensity. I omit this measurement in my primary model specifications due to the subcounty level observation unit and concerns surrounding possible endogeneity of oil production and reservation status. Reservations imposed additional regulations, taxation, and tribal permitting preference to oil companies in their territories,[31] raising the concern that oil

[31] For additional information on the taxes imposed on oil wells in reservation land, please consult the Oil and Gas Tax Reporting Instructions for Fort Berthold provided by the Tax Commissioner of North Dakota available at:

production within reservations is systematically different from that in other areas.

To address the possible impact of oil production on my results, I aggregate to the county and reservation level[32] and use individual well data from State Geological Survey data to create an oil production intensity measure. Using each well's permit or drilling start date,[33] I create a monthly rolling sum of the active oil wells in each county and divide by the county's or reservation's area to construct a measure of oil drilling intensity. Figure 9 shows the total number of oil wells over time and annual increases in the number of new wells. Figure 10 shows the geolocated wells over the study area, before and after the oil boom, distinguishing reservations from other counties.

I re-estimate equation 1 including the oil drilling intensity measure as a covariate and introduce a new estimating equation using drilling intensity is a continuous treatment variable.

$$Crime_{c,m,y} = \alpha_1\left(Drill_{c,m,y} * Treat_c\right) + \alpha_2\, Pop_{p,y} + \alpha_3\,(month_m * year_y) + \alpha_4\, county_c + \varepsilon_{c,m,y}$$

Where $Drill_{c,m,y}$ is the number oil wells per square mile in county $c$, month $m$, and year

https://www.tax.nd.gov/sites/www/files/documents/forms/business/oil-gas/fortbertholdreservationtaxreportinginstructions.pdf

[32] To account for the overlap of county and reservation land, I remove all land that belongs to a reservation from the counties it intersects and assign it a unique county code, making each reservation a unique county, separate from existing counties. Counties that intersect, but not fully within, the oil field are considered part of the Bakken treatment group.

[33] The State Geological Survey data does not consistently provide end dates for oil production across different wells. Without a consistent end production date, a total measure of active drilling wells cannot be determined. To accommodate this data restriction, I create a rolling sum of new wells starting in January of 2001 through December of 2016 to create the oil well density measure.

$y$. $\alpha_3$ then measures the expected log count of county level crime associated with one additional well per square mile for the treatment variables specified in equation 1. All other variables are defined as in equation 1.

Tables 9 and 10 present my findings. Introducing oil drilling as a continuous variable, I find a significant increase for assault, sexual assault, and homicide for reservation counties within the Bakken oil field. Evaluating non-reservation precincts, I find no significant increases in crime associated with the Bakken oil field but, significant increase in homicide attributable to oil drilling. Oil drilling intensity is statistically significant and positively associated with all crimes across all study groups.

Introducing oil drilling intensity as a continuous treatment, I find significant increases in assault and sexual assault for non-reservation precincts on the Bakken and reservation precincts on the Bakken compared to other reservation precincts. I find a positive, but statistically insignificant effect on the Bakken for reservation precincts compared to non-reservation precincts.

## Homicide Analysis

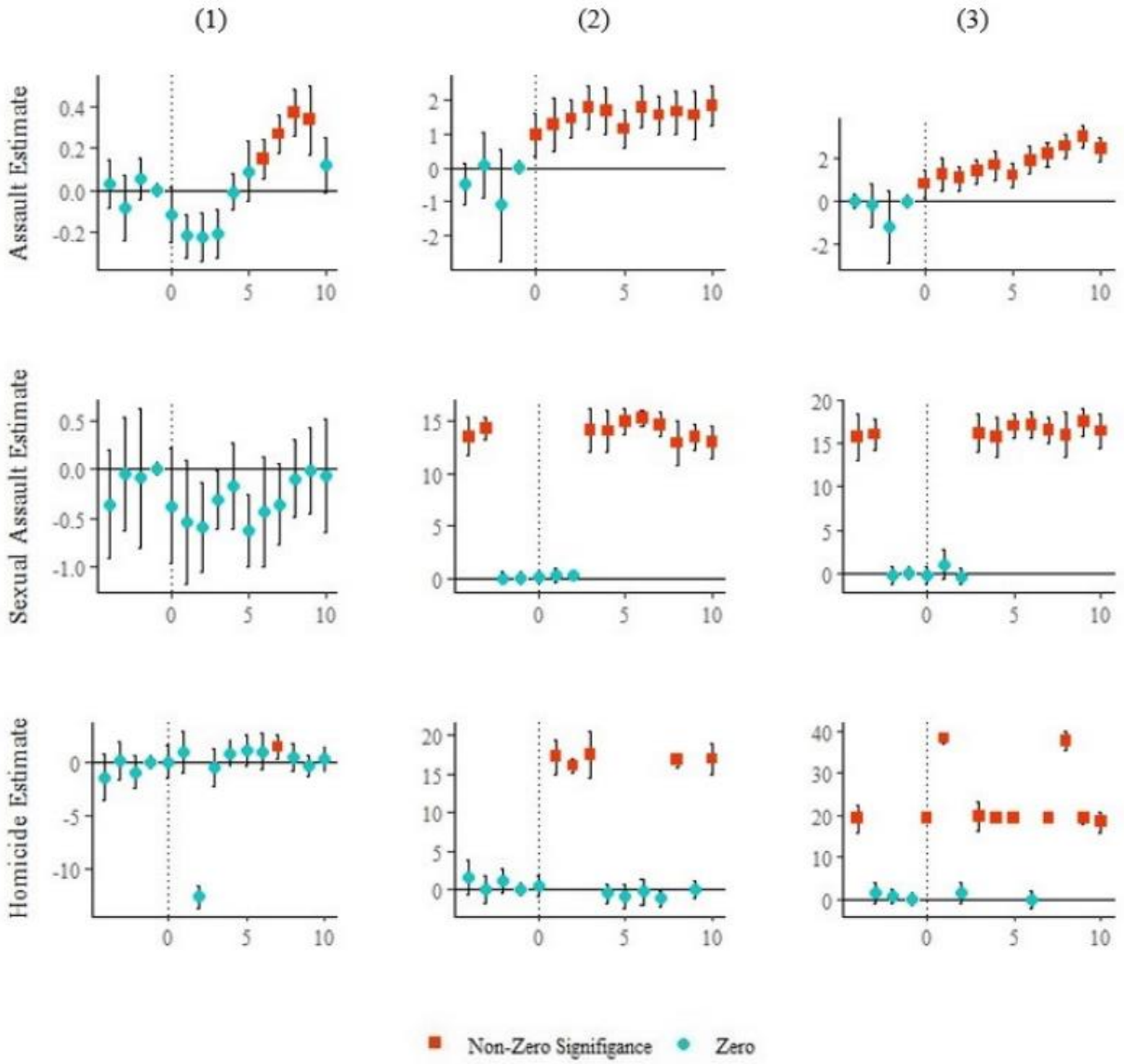
Throughout the main and differential analyses, the results of homicide reporting after the oil boom are highly significant and large. For example, precincts on reservations on the Bakken are over 1.7 million times more likely to report a homicide after the oil boom. To assess the validity of these results I repeat analysis removing any monthly homicide counts greater than one.[34] The results are provided in Table 11. I find that removing the outliers from the homicide

[34] I introduce a new specification with a zero-one dependent homicide variable. Regressions including and excluding outliers are performed in line with the other model specifications.

data increases the magnitude of the coefficient across all model specifications.

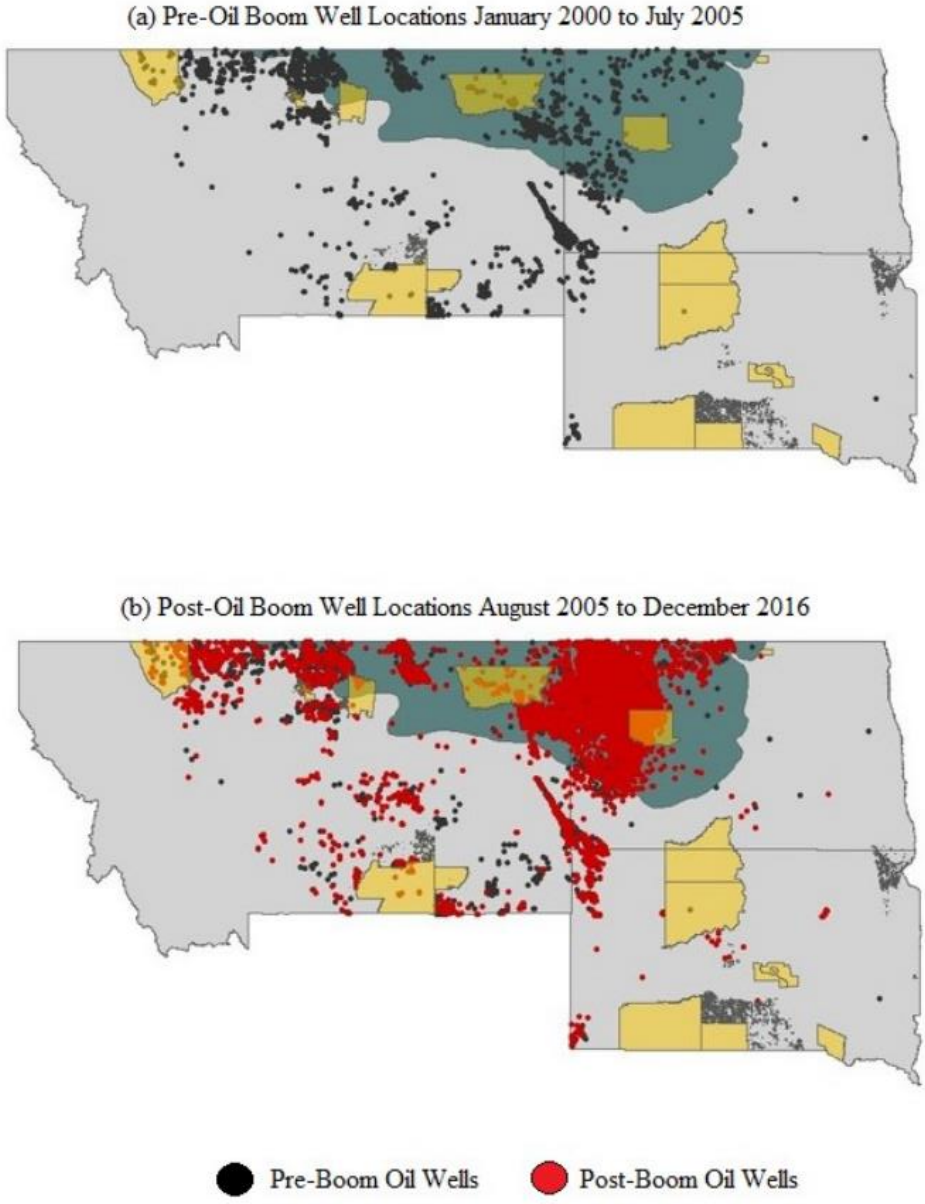
The magnitude and significance of these results can likely be attributed to precincts that reported zero to one changes in homicides. Prior to the oil boom, there were no reported homicides within the Bakken on reservation land. After the boom annual homicides increased, primarily hovering around one annual homicide. These zero to one changes increased the initial low probability to a higher, but still small, probability of reporting a homicide in a given month.

Figure 8 – Event Study Graphs




NOTE. – Column (1) shows the results for non-reservation precincts in and out of the Bakken oil field column (2) for reservation precincts in and out of the Bakken; column (3) for precincts in the Bakken on and off a reservation. The first row presents results for assault, the second row for sexual assault, and the third row for homicide. The x-axis measures time with zero reflecting the beginning of the post period. Coefficient estimates that are not statistically different from zero are shown in blue, non-zero coefficients are show in red. Error bars show the 95\% confidence interval around the estimate.

Figure 9 – Oil Well Location Over Time




NOTE. – The top figure (a) presents the locations of oil wells across the study region before the Energy Policy Act of 2005 in black. The bottom figure (b) presents oil wells drilled after 2005 in red. The Bakken oil field is shown in blue, reservations are in yellow.

Table 9 – Oil Drilling Intensity Control

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | | *(3) Within Bakken* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Post*Bakken | 0.03 | −0.15 | 0.55 | 2.31*** | 1.52* | | | | |
| | (0.18) | (0.22) | (0.36) | (0.40) | (0.64) | | | | |
| Post*Rez | | | | | | | 1.97*** | 0.56* | 15.29*** |
| | | | | | | | (0.16) | (0.24) | (0.49) |
| Wells per Mile sq. | 0.96*** | 0.83* | 0.87** | 3.70*** | 2.83*** | | 1.56*** | 1.01** | 1.44** |
| | (0.28) | (0.33) | (0.28) | (0.27) | (0.67) | | (0.22) | (0.34) | (0.49) |
| County Population | 0.00 | −0.00 | 0.00* | 0.00** | 0.00 | | −0.00* | −0.00* | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. FIPS | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. Month*Year | YES | YES | YES | YES | YES | | YES | YES | YES |
| Num. Obs. | 31488 | 27456 | 18096 | 1432 | 258 | | 5076 | 4048 | 728 |
| Deviance | 71458.62 | 17097.76 | 3584.33 | 1837.20 | 128.45 | | 6734.87 | 1646.94 | 271.89 |
| Log Likelihood | −67991.01 | −15317.57 | −2431.29 | −1773.35 | −111.70 | | −7492.88 | −1451.31 | −195.44 |
| Pseudo $R^2$ | 0.87 | 0.60 | 0.13 | 0.63 | −0.29 | | 0.78 | 0.42 | −0.22 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. – Coefficients can be interpreted as rate ratios by raising *e* to the estimated coefficient. Numbers in parentheses are standard errors clustered at the precinct level. Dependent variables are count variables for assaults, sexual assaults, and homicides reported monthly. Independent variables are jurisdictional population, a binary distinguishing the post period beginning in August of 2005, and binary indicators for a precinct's location on a reservation or on the Bakken oil field. Results for non-reservation precincts are located in columns 1-3, reservation only precinct results are located in columns 4-6, and results for reservation versus non-reservation precincts in the Bakken are located in columns 7-9.

Table 10 – Oil Drilling Intensity Continuous

| | *(1) Non-Reservation* | | | *(2) Reservation Only* | | | *(3) Within Bakken* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Wells per Mile sq.*Bakken | 2.71*** | 1.48* | 0.45 | 6280.69* | 8450.46*** | | | | |
| | (0.64) | (0.76) | (0.63) | (2594.84) | (1988.89) | | | | |
| Wells per Mile sq.*Rez | | | | | | | 3.46 | −0.15 | 87.37 |
| | | | | | | | (3.02) | (0.51) | (46.43) |
| Wells per Mile sq. | −1.44* | −0.66 | 0.66 | −6276.38* | −8447.29*** | | 1.53*** | 1.01** | 1.50** |
| | (0.61) | (0.72) | (0.61) | (2594.94) | (1988.69) | | (0.22) | (0.34) | (0.51) |
| County Population | 0.00 | −0.00 | 0.00* | 0.00 | 0.00 | | −0.00* | −0.00* | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. FIPS | YES | YES | YES | YES | YES | | YES | YES | YES |
| F.E. Month*Year | YES | YES | YES | YES | YES | | YES | YES | YES |
| Num. obs. | 31488 | 27456 | 18096 | 1432 | 258 | | 5076 | 4048 | 728 |
| Deviance | 70476.72 | 17095.24 | 3586.80 | 2181.10 | 131.72 | | 7140.53 | 1647.87 | 273.80 |
| Log Likelihood | −67500.05 | −15316.31 | −2432.52 | −1945.30 | −113.34 | | −7695.71 | −1451.78 | −196.39 |
| Pseudo $R^2$ | 0.87 | 0.60 | 0.13 | 0.60 | −0.30 | | 0.77 | 0.42 | −0.22 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. – Coefficients can be interpreted as rate ratios by raising *e* to the estimated coefficient. Numbers in parentheses are standard errors clustered at the precinct level. Dependent variables are count variables for assaults, sexual assaults, and homicides reported monthly. Independent variables are jurisdictional population, a binary distinguishing the post period beginning in August of 2005, and binary indicators for a precinct's location on a reservation or on the Bakken oil field. Results for non-reservation precincts are located in columns 1-3, reservation only precinct results are located in columns 4-6, and results for reservation versus non-reservation precincts in the Bakken are located in columns 7-9.

Table 11 – Homicide Robustness Checks

| | *(1) Non-Reservation* | | *(2) Reservation Only* | | *(3) Within Bakken* | | *Binary Dependent Variable* | | |
|---|---|---|---|---|---|---|---|---|---|
| | All | N.O. | All | N.O. | All | N.O. | (1) | (2) | (3) |
| Post*Bakken | 0.91* | 0.60 | 17.60*** | 21.08*** | | | 0.72* | 17.98*** | |
| | (0.36) | (0.34) | (0.79) | (0.64) | | | (0.34) | (1.12) | |
| Post*Rez | | | | | 14.39*** | 14.39*** | | | 14.61*** |
| | | | | | (0.47) | (0.47) | | | (0.43) |
| Jurisdiction Population | 0.00 | 0.00** | −0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| F.E. Month | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. ORI Code | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| F.E. Month*Year | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Num. Obs. | 25404 | 65653 | 95 | 3837 | 846 | 846 | 25404 | 95 | 846 |
| Deviance | 4006.38 | 2873.74 | 66.66 | 32.95 | 283.27 | 283.27 | 3503.55 | 49.62 | 244.85 |
| Log Likelihood | −2641.98 | −2188.24 | −53.87 | −38.66 | −197.13 | −197.13 | −2364.78 | −43.81 | −175.43 |
| Pseudo $R^2$ | 0.10 | 0.13 | −0.44 | −1.65 | −0.21 | −0.21 | 0.06 | −0.74 | −0.32 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

NOTE. – All homicides; N.O. - No outliers; outliers are anything greater than one homicide per month. Numbers are the rate ratios found by raising *e* to the variable coefficient. Numbers in parentheses are standard errors clustered at the precinct level for columns 1-6 and county level for 7-8.

# CONCLUSION AND DISCUSSION

As some of the poorest areas in the US, reservations are searching for ways to improve the economic conditions of their communities. Reservations hold 30% of domestic US coal reserves, 50% of uranium, and 20% of natural gas with an estimated worth of $1.5 trillion. They are expected to introduce natural resource extraction industries to their territories in the coming years (Grogan et. al., 2011; Regan and Anderson, 2014). While these industries promise much needed economic stimulus, they also pose the threat of exacerbating crime on reservations. The overlapping of federal, state, and tribal law enforcement on reservation land results in decreased police effectiveness and lowers the risk of arrest for criminals, thereby incentivizing criminal behavior (Chalfin and McCrary, 2017; Blesse and Diegmann, 2022). Although oil booms have been associated with increased criminal behavior, no one has assessed the impact of natural resource extraction on reservations.

Using a panel dataset of precinct level crime reports from Montana, North Dakota, and South Dakota, I explored the differential effects of crime on reservation land from the Bakken oil boom. I find the likelihood of assault and homicide increases on reservations in the Bakken after the oil boom. This increase is magnitudes greater than non-reservation areas in the Bakken and is not related to underlying crime trends on other reservations. There is inconclusive evidence to suggest that sexual assault increased due to the oil boom.

Although my findings show significant increases in crime reported by state police on reservations, these calculations omit all crimes reported by the federal and tribal authorities, removing crime involving tribal members. Tribal and federal precincts report considerably more crime incidents than state precincts (see Figures 10, 11, and 12). In addition to more crime,

Native Americans are also more likely to be the victim of a violent crimes than other racial groups (Feir and Akee, 2019; Lucchesi and Echo-Hawk, 2018; Williams, 2012). This suggests that the actual impact of the Bakken oil boom on reservation crime is likely much higher than what is observable with national crime databases.

To mitigate crimes within reservations, policy makers may look towards established legal precedent of the federal government's responsibilities towards tribal nations. Known as the trust responsibility, the federal government has

> "…an obligation to provide those services required to protect and enhance tribal lands, resources, and self-government, [including] those economic and social programs which are necessary to raise the standard of living and social well-being of the Indian people to a level comparable to the non-Indian society." [35]

In the example of the ongoing lawsuit Oglala Sioux Tribe v. Department of Interior, the tribe states that the BIA failed to provide necessary funding to support tribal law enforcement services, violating the federal trust responsibility, resulting in high levels violent crime and drug trafficking within the reservation (Oglala, 2022). The tribe asserts that if proper funding and personnel are provided, tribal police would be able to provide the necessary level of law enforcement services to detect and deter future crime on reservation land.

Alongside federal support, improving jurisdictional cooperation between states and tribes may be a viable avenue to decreasing crime. Policies such as Public Law 280[36] and cross-

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[35] From the American Indian Policy Review Commission Final Report of 1977. Full text provided at https://eric.ed.gov/?id=ED164229.

A summary of the federal trust responsibility can be found at https://www.acf.hhs.gov/ana/fact-sheet/american-indians-and-alaska-natives-trust-responsibility#:~:text=The%20trust%20doctrine%20is%20a,tribes%20and%20respect%20their%20sovereignty.

[36] Public Law 280, passed in 1968, delegates federal authority over tribal land to state law enforcement (Jimenez and Song, 1998). The statue was adopted by several states, mandating the police, and later voluntarily adopted by individual tribal nations.

deputization[37] between state and tribal agencies increase the number of officers able to respond to reservation crimes, discouraging criminal activity (Chalfin and McCrary, 2017; Blesse and Diegmann, 2022). These polices increase police coverage, shorten response times, improve state-tribal relations, and facilitate economic development (Anderson and Parker, 2008; DOJ, 2018; Cookson, 2006; Cookson 2010). However, there also is evidence that indicates these policies can decrease tribal trust in state law enforcement, increasing hostility between tribal members and law enforcement and vigilante justice on reservations (Jimenez and Song, 1998; Goldberg and Champagne, 2006).

The results of this paper are invaluable in educating reservation law enforcement and policy makers on how to best prepare their communities for future natural resource development. Reservations and Native American communities are largely understudied, resulting in a dearth of economic analysis for informing development plans, federal, state, and reservation policy. Future research examining the reservation impacts of natural resource extraction on quality of life and safety will be crucial to mitigating future tragedy.

[37] Cross-deputization is an agreement between state and tribal law enforcement where officers from tribal and state police are given authority over crimes in both jurisdictions (DOJ, 2018).

# REFERENCES CITED

Anderson, T. (2016). The Wealth Of (Indian) Nations. *The Hoover Institution*. https://www.hoover.org/research/wealth-indian-nations-1

Anderson, T. L., & McChesney, F. S. (1994). Raid or Trade? An Economic Model of Indian-White Relations. *The Journal of Law and Economics*, *37*(1), 39–74. https://doi.org/10.1086/467306

Anderson, T. L., & Parker, D. P. (2008). Sovereignty, Credible Commitments, and Economic Prosperity on American Indian reservations. *The Journal of Law and Economics*, *51*(4), 641–666. https://doi.org/10.1086/590205

Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy, 76, 169-217.* https://doi.org/10.1086/259394

Blesse, S., & Diegmann, A. (2022). The Place-Based Effects of Police Stations on Crime: Evidence from Station Closures. *Journal of Public Economics*, *207*, 104605. https://doi.org/10.1016/j.jpubeco.2022.104605

Berger J. and Beckman J.P. (2010) Sexual Predators, Energy Development, and Conservation in Greater Yellowstone. *Conservation Biology*, 24(3), 891-896. https://doi.org/10.1111/j.1523-1739.2010.01449.x

Board of Oil and Gas Conservation. (n.d.) Well Surface GIS Data File. Montana Department of Natural Resources and Conservation. https://bogwebfiles.dnrc.mt.gov/GISData/

Carrington, Kerry, Russell Hogg, and Alison McIntosh. (2011) .The Resource Boom's Underbelly: Criminological Impacts of Mining Development. *Australian & New Zealand Journal of Criminology 44(3):335–354.*

Chalfin, A., & McCrary, J. (2017). Criminal Deterrence: A Review of the Literature. *Journal of Economic Literature*, *55*(1), 5–48. https://doi.org/10.1257/jel.20141147

Cookson, J. (2006). *The Relative Poverty of American Indian Reservations Why Does Reservation Poverty Persist Despite Rich Neighbors?* [Master, Montana State University]. https://scholarworks.montana.edu/xmlui/bitstream/handle/1/1103/CooksonJ0506.pdf?sequence=1

Cookson, J. A. (2010). Institutions and Casinos on American Indian Reservations: An Empirical Analysis of the Location of Indian Casinos. *The Journal of Law and Economics*, *53*(4), 651–687. https://doi.org/10.1086/649030

Couttenier, M., Pauline Grosjean, P. and Sangnier, M. (2014). The Wild West is Wild: The Homicide Resource Curse. *Discussion Papers 2014-12, School of Economics, The University of New South Wales*.

Crane-Murdoch, S. (2013, February 22). On Indian Land, Criminals Can Get Away with Almost Anything. *The Atlantic*. https://www.theatlantic.com/national/archive/2013/02/on-indian-land-criminals-can-get-away-with-almost-anything/273391/

Cunningham, S., DeAngelo, G., & Smith, B. (2020). Fracking and Risky Sexual Activity. *Journal of Health Economics*, *72*, 102322. https://doi.org/10.1016/j.jhealeco.2020.102322

Deer, S., & Nagle, M. K. (2017). *The Rapidly Increasing Extraction of Oil, and Native Women, in North Dakota*.

Dippel, C. (2014). Forced Coexistence and Economic Development: Evidence from Native American Reservations. *Econometrica*, *82*(6), 2131–2165. https://doi.org/10.3982/ECTA11423

DOJ. (2018) *Cross-Deputization in Indian County*. Community Oriented Policing Services US Department of Justice. https://www.sheriffs.org/sites/default/files/Cross%20Deputization%20in%20Indian%20Country.pdf

DOS. (n.d.). *The Link Between Extractive Industries and Sex Trafficking* (Civilian Security, Democracy, and Human Rights). United States Department of State Office to Monitor and Combat Trafficking in Persons. https://www.state.gov/wp-content/uploads/2019/02/272964.pdf

Evans, L. E. (2011). Expertise and Scale of Conflict: Governments as Advocates in American Indian Politics. *American Political Science Review*, *105*(4), 663–682. https://doi.org/10.1017/S0003055411000347

Feir, D., & Akee, R. (2019). First Peoples Lost: Determining the State of Status First Nations Mortality in Canada Using Administrative Data. *Canadian Journal of Economics/Revue Canadienne d'économique*, *52*(2), 490–525. https://doi.org/10.1111/caje.12387

Frye, D., & Parker, D. P. (2021). Indigenous Self-Governance and Development on American Indian Reservations. *AEA Papers and Proceedings*, *111*, 233–237. https://doi.org/10.1257/pandp.20211099

Goldberg, C., & Champagne, D. (2006). Is Public Law 280 Fit for the Twenty-First Century Some Data at Last. Connecticut Law Review, 38(4), 697-730.

Grogan, M. (n.d.). *Native American Lands and Natural Resource Development*.

Horwitz, S. (2014). Dark side of the boom. *Washington Post*. http://www.washingtonpost.com/sf/national/2014/09/28/dark-side-of-the-boom/

James, A., & Smith, B. (2017). There Will Be Blood: Crime Rates in Shale-Rich U.S. Counties. *Journal of Environmental Economics and Management*, *84*, 125–152. https://doi.org/10.1016/j.jeem.2016.12.004

Jimenez, V., & Song, S. (1998). Concurrent Tribal and State Jurisdiction Under Public Law 280. *The American University Law Review*, *47*(6), 1627–1707.

Leonard, B., Parker, D. P., & Anderson, T. L. (2020). Land Quality, Land Rights, and Indigenous Poverty. *Journal of Development Economics*, *143*, 102435. https://doi.org/10.1016/j.jdeveco.2019.102435

Lucchesi, A., & Echo-Hawk, A. (2018). *Murdered and Missing Indigenous Women & Girls A Snapshot of Data from 71 Urban Cities in the United States* (No. 2; Our Bodies, Our Stories Series). Seattle Indian Health Board Urban Indian Health Institute. https://airc.ucsc.edu/resources/mmiwg-uihi-report.pdf

Lim, S. H. (2018). Does Shale Energy Development Mean More Crime? The Case of the Bakken Oil Boom. *Growth and Change*, *49*(3), 413–441. https://doi.org/10.1111/grow.12242

Maryfield, B., Orchowsky, S., Pierotte, L., Myrent, M., FireMoon, P., Rink, E., & Skewes, M. (2019). Measuring the Criminal Justice System Impacts of the Increased Presence of Methamphetamine in the Bakken Oil Formation. *Justice Research and Statistics Association.* https://www.ncjrs.gov/pdffiles1/nij/grants/253270.pdf

Miller, R. J. (2012). *Reservation "Capitalism": Economic Development in Indian Country*. Praeger.

Miller, R. J. (2021). Establishing Economies on Indian Reservations. *The Regulatory Review*. https://www.theregreview.org/2021/04/08/miller-establishing-economies-indian-reservations/

NDIC Oil and Gas Division. (n.d.) Oil and Gas Division Wells. North Dakota Oil and Gas Division. https://gis.dmr.nd.gov/gisdownload.asp

O'Connor, C. D. (2017). Oil, Crime, and Disorder: A Methodological Examination of the Oil Boom's Impact in North Dakota. *Deviant Behavior, 38*(4), 477–491. https://doi.org/10.1080/01639625.2016.1197025

Oglala Sioux Tribe v. Department of Interior, 22-cv-05066-KES (9th Cir. 2022) https://turtletalk.files.wordpress.com/2022/10/24-first-amended-complaint.pdf

Parks, M. R., & Flute, D. (n.d.). *Tribal Law and Order Act: Enhanced Sentencing Authority*.

Plassmann, F., & Tideman, T. N. (2001). Does the right to carry concealed handguns deter countable crimes? Only a count analysis can say. *The Journal of Law & Economics*, *44*(S2), 771–798. https://doi.org/10.1086/323311

Regan, S. E., & Anderson, T. L. (2014). *The Energy Wealth of Indian Nations*. LSU Journal of Energy Law and Resources, 3(1), 195-224.

Ruddell, R. (2011). Boomtown policing: Responding to the dark side of resource development. *Policing,* 5(4), 328-342. https://doi.org/10.1093/police/par034

Ruddell, R., Jayasundara D. S., Mayzer, R., and Heitkamp, T. (2014). Drilling Down: An Examination of the Boom-Crime Relationship in Resource Based Boom Counties. *Western Criminology Review,* 15(1), 3-17. http://wcr.sonoma.edu/v15n1/Ruddell.pdf

Shultz, L. (2023). South Dakota Oil Well Location Data. South Dakota Geological Survey Program.

United States Department of Justice. Federal Bureau of Investigation. Uniform Crime Reporting Program Data: Offenses Known and Clearances by Arrest, 2000 to 2016. Inter-university Consortium for Political and Social Research [distributor], 2012-06-19.

Williams, T. (2012, February 21). Higher Crime, Fewer Charges on Indian Land. *The New York Times*. https://www.nytimes.com/2012/02/21/us/on-indian-reservations-higher-crime-and-fewer-prosecutions.html

# APPENDIX

## EXPLORATORY ANALYSIS OF TRIBAL CRIME STATISTICS

## Exploratory Analysis of Tribal Crime Statistics

Tribal and Bureau of Indian Affairs (BIA) agency data is crucial to estimating the full effects of the Bakken oil boom on reservation crime. The BIA operates as the federal authority on reservations, managing all crimes between tribal and non-tribal members and all crimes lists under the Major Crimes Act[38]. Tribal police are responsible for crimes involving enrolled tribal members not covered by the BIA. Unfortunately, the UCR only reports BIA and tribal precinct data from 2008-2016, beginning after the post period of the main study. Although my findings show significant increases in crime reported by state police on reservations, these calculations omit all crimes reported by the federal and tribal authorities. If these excluded crimes involving tribal members increased by the same magnitude as those reported by the state precincts, then the effects of the oil boom on the incidence of crimes on reservations is most likely higher than what we observe using national crime databases.

## Analysis on the Bakken Oil Field

Table 12 provides summary statistics comparing crimes reported by tribal and BIA precincts to state police across the main comparison groups. On average, tribal and BIA precincts in the Bakken reported an average of 2.96 assaults, 0.14 sexual assaults, and 0.043 homicides, per month. In comparison, the state precincts on the Bakken reported an average of 0.95

[38] Crimes listed as major crimes by the federal government under the Major Crimes Act include "murder, manslaughter, kidnapping, maiming, sexual abuse under Ch. 109-A, incest, assault with intent to commit murder, assault with a dangerous weapon, assault resulting in serious bodily injury, assault on a person less than 16 years old, felony child abuse or neglect, arson, burglary, robbery, theft under 18 U.S.C. § 661." (18 U.S.C. § 1153) https://www.justice.gov/sites/default/files/usao-wdok/legacy/2014/03/25/Indian%20Country%20Criminal%20Jurisdiction%20ChartColor2010.pdf

assaults, 0.04 sexual assaults, and 0.04 homicides per month[39]. Non-Bakken areas report similar results, with reservation crime incidents several magnitudes larger than state crime incidents. This finding is consistent with reports of elevated crime rates within reservations, often found to be double the national average (Williams, 2012).

Figures 10, 11, and 12, show the log average of monthly crimes reported by tribal, BIA, and state precincts on and off reservations and the Bakken oil field. The average monthly totals of assaults, sexual assaults, and homicides reported by tribal and BIA precincts is consistently higher than totals reported by state precincts. Tribal and BIA reported crime show strong parallel trends on and off the Bakken oil field after the oil boom.

## Conclusion

Available estimates of crime on reservations before and after the Bakken oil boom are limited by the availability of tribal precinct and BIA data. I find that crime reported by tribal and BIA precincts is consistently higher than that of state precincts across all regions of the study. The high levels of crime reported by tribal and federal agencies suggest that the estimates presented in the main study may underestimate the true crime increase on reservation lands due to the Bakken oil boom.

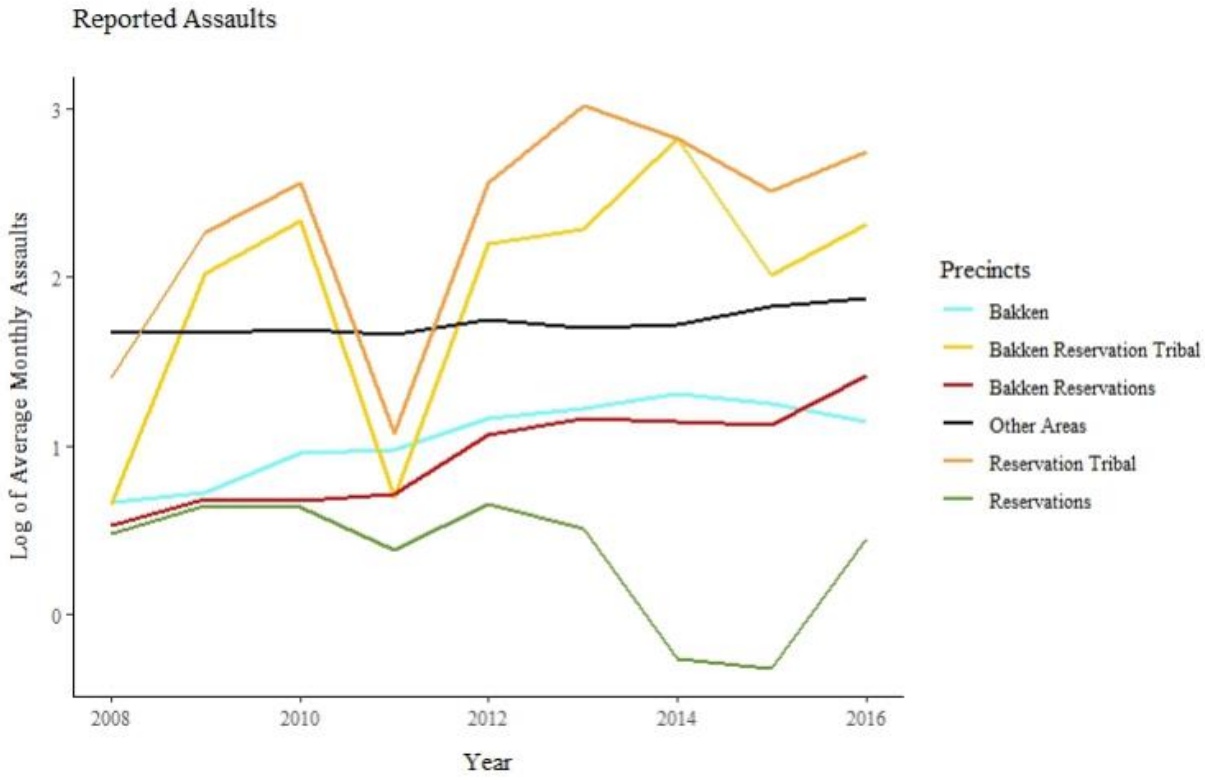
[39] Tribal and BIA precincts do not report jurisdiction population, removing the possibility of per capita crime rate comparisons.

Table 12 – Tribal Agency Summary Statistics

| | *Bakken Tribal* | | | *Bakken State* | | |
|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Min. | 0 | 0 | 0 | 0 | 0 | 0 |
| Median | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | 2.96 | 0.14 | 0.043 | 0.95 | 0.04 | 0.003 |
| Max | 53 | 7 | 5 | 53 | 18 | 4 |
| Obs. | 900 | | | 17820 | | |
| Precincts | 3 | | | 50 | | |

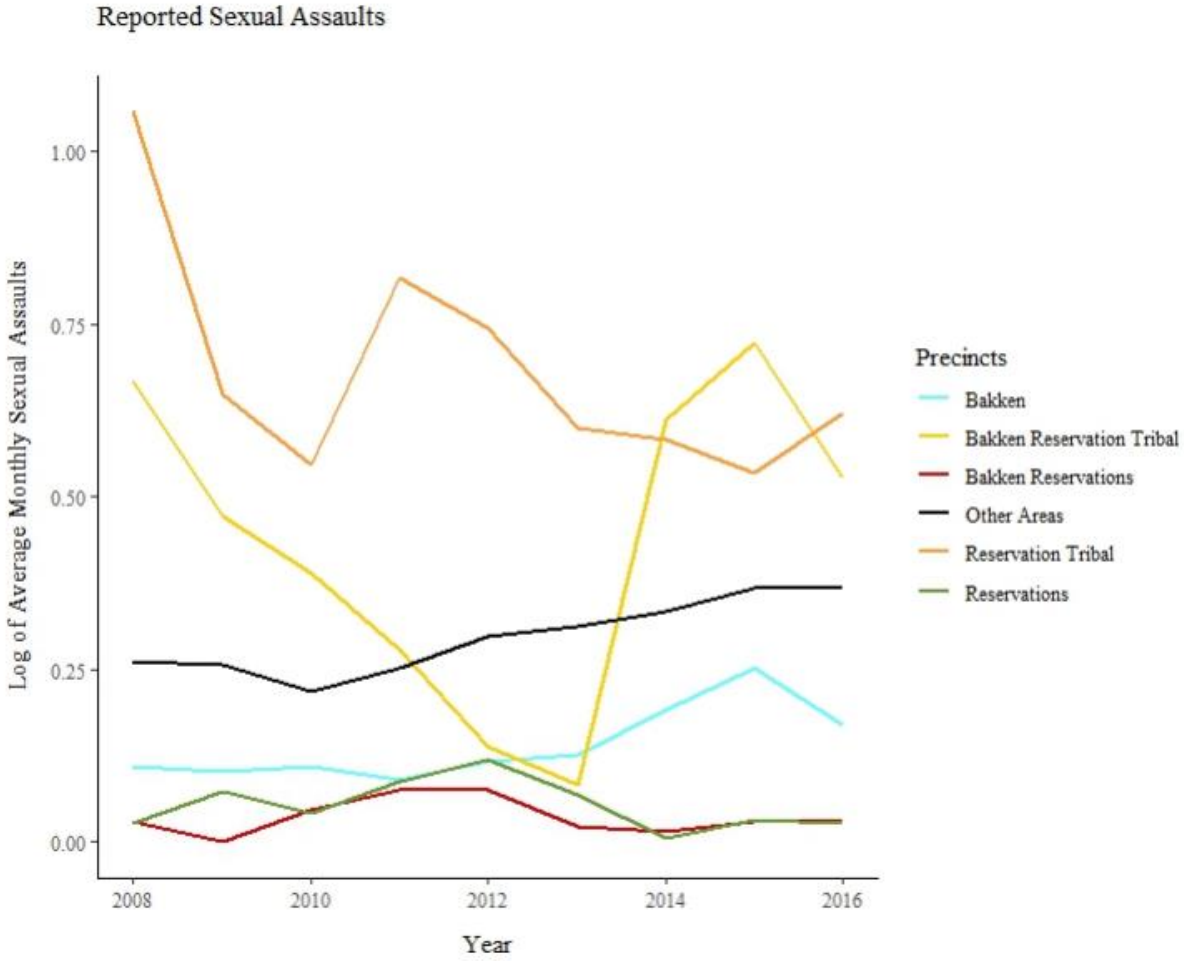
| | *Non-Bakken Tribal* | | | *Non-Bakken State* | | |
|---|---|---|---|---|---|---|
| | Assault | Sexual Assault | Homicide | Assault | Sexual Assault | Homicide |
| Min. | 0 | 0 | 0 | 0 | 0 | 0 |
| Median | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | 4.048 | 0.227 | 0.036 | 1.746 | 0.091 | 0.004 |
| Max | 155 | 11 | 5 | 212 | 31 | 5 |
| Obs. | 4716 | | | 107172 | | |
| Precincts | 15 | | | 319 | | |

Figure 10 – Reported Assaults Pre- and Post Time Trends Tribal Crime



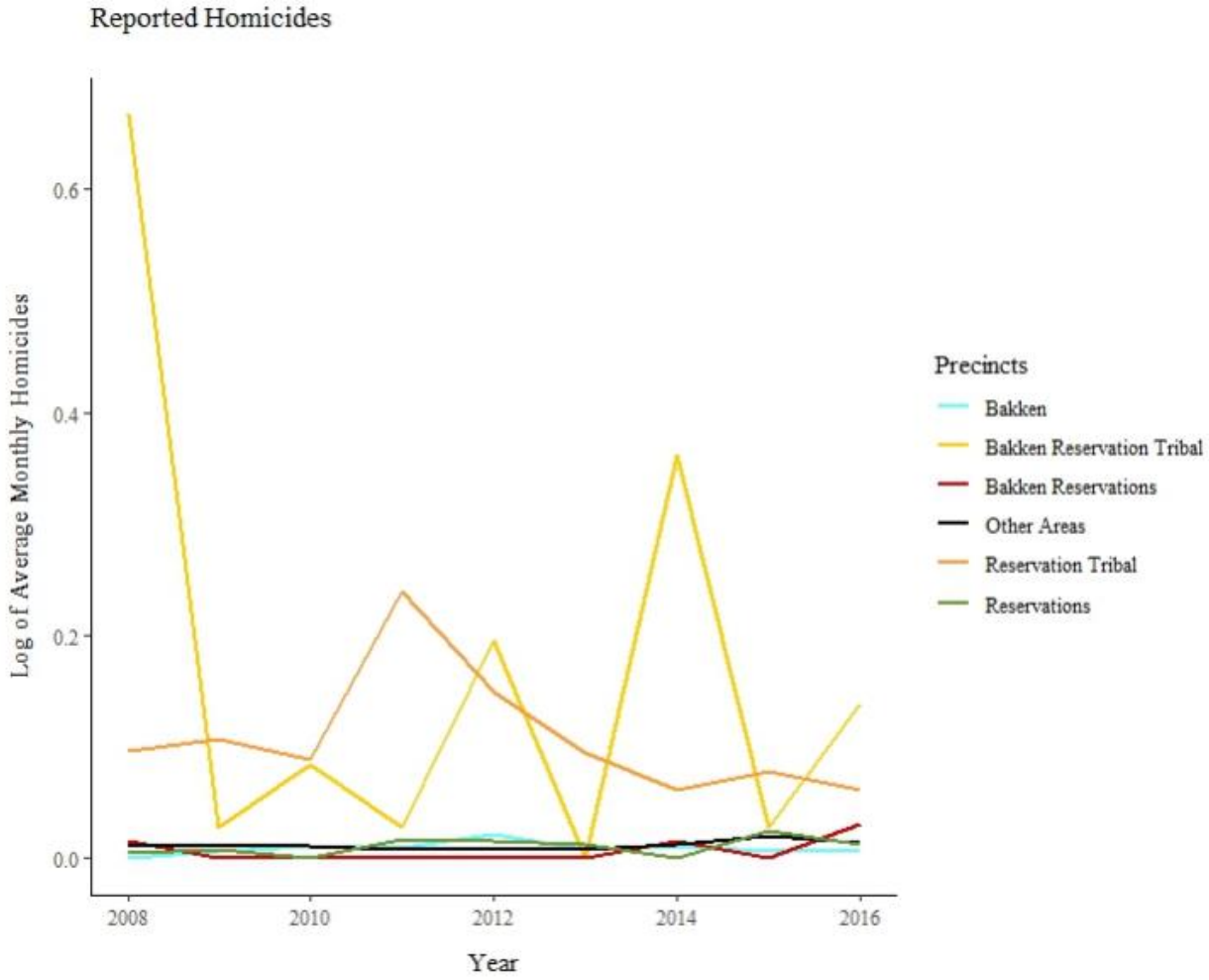

NOTE. – Crime trends for reported assaults are shown above. The log average of monthly assaults is reported. Precinct groups reflect the treatment groups, the Bakken region without reservation precincts (Bakken), non-Bakken reservation areas (Reservations), reservations on the Bakken (Bakken Reservations), non-reservation areas outside the Bakken (Other Areas), reservation tribal police outside the Bakken (Reservation Tribal), and tribal police on reservations in the Bakken (Bakken Reservation Tribal).

Figure 11 – Reported Sexual Assaults Pre- and Post Time Trends Tribal Crime




NOTE. – Crime trends for reported sexual assaults are shown above. The log average of monthly assaults is reported. Precinct groups reflect the treatment groups, the Bakken region without reservation precincts (Bakken), non-Bakken reservation areas (Reservations), reservations on the Bakken (Bakken Reservations), non-reservation areas outside the Bakken (Other Areas), reservation tribal police outside the Bakken (Reservation Tribal), and tribal police on reservations in the Bakken (Bakken Reservation Tribal).

Figure 12 – Reported Homicides Pre- and Post Time Trends Tribal Crime




NOTE. – Crime trends for reported homicides are shown above. The log average of monthly assaults is reported. Precinct groups reflect the treatment groups, the Bakken region without reservation precincts (Bakken), non-Bakken reservation areas (Reservations), reservations on the Bakken (Bakken Reservations), non-reservation areas outside the Bakken (Other Areas), reservation tribal police outside the Bakken (Reservation Tribal), and tribal police on reservations in the Bakken (Bakken Reservation Tribal).