

MORE THAN JUST A LAND ACKNOWLEDGEMENT:
THE RELATIONSHIP BETWEEN LAND BACK MOVEMENTS AND ECONOMIC
OUTCOMES IN INDIGENOUS COMMUNITIES WITHIN THE U.S.

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

[Brigitte Arcoite]

MORE THAN JUST A LAND ACKNOWLEDGEMENT:
THE RELATIONSHIP BETWEEN LAND BACK MOVEMENTS AND ECONOMIC
OUTCOMES IN INDIGENOUS COMMUNITIES WITHIN THE U.S.

Brigitte Arcoite

May 2024

Economics

Abstract

The land back movement in its current state began in 2018 and has rapidly gained traction since. The main call in this movement is for the return of government owned ancestral lands to their original stewards. Years of land dispossession, beginning when settlers first arrived, has left Indigenous peoples in what is now called the U.S. with a fraction of the land they call home. This paper seeks to decompose the economic impacts of land back movements by analyzing the relationship between land changes on tribal lands and several economic outcome indicators, which include annual income, educational attainment, the local unemployment rate, and the number of occupants per room. This paper also facilitates a cursory analysis of the relationship between land back and cultural strength, for which language spoken at home is used as a proxy variable. The results of this paper indicate that though the effect of receiving one unit of land back is small, with significant land change those effects could be very large. Our analysis of the effects of land back on language use showed no statistically significant results. Further research in this area should focus on understanding the non-economic impacts of land back movements. This paper concludes by recommending continued government action to return tribal lands, as well as moves towards supporting Indigenous sovereignty over Indigenous affairs, particularly in the collection, analysis, and reproduction of data.

KEYWORDS: Indigenous Rights, Land Back, Political Economic Analysis, Land Tenure
JEL: Z18

May 2024

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED
UNAUTHORIZED AID ON THIS THESIS

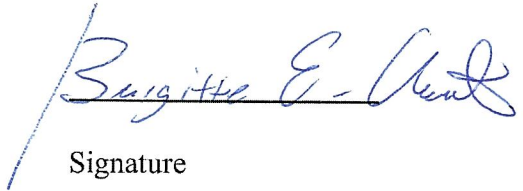

Signature

TABLE OF CONTENTS

1	INTRODUCTION.....	5
	1.1 History of Land Dispossession.....	9
	2 LITERATURE REVIEW.....	15
	2.1 Quality of Life Outcomes.....	15
	2.2 Understanding the Outcomes.....	17
3	THEORY/METHODOLOGY.....	21
4	DATA.....	31
	4.1 Description of Data.....	31
	4.2 Data Structure.....	33
	4.3 Data Preparation.....	34
	4.4 Descriptive Analysis.....	37
	4.5 Land Back Case Analysis.....	39
5	ANALYSIS.....	43
	5.1 Graphical Analysis.....	43
	5.2 Tabular Analysis.....	46
6	CONCLUSION.....	57
7	APPENDIX.....	67

Introduction

While the current understanding of “land back” has been in popular discourse since 2018, North American Indigenous peoples have been fighting for their land since Columbus arrived in 1492. For the activists engaged in this movement land back is understood as an act of resistance against the oppressive forces Natives have and continue to experience at the hands of settlers and colonial governments (Goodluck, 2023). While the explicit goal of this battle is for the physical reclaiming of historical and cultural lands, it is intertwined with the distinct goal of Indigenous sovereignty. One interpretation of this Indigenous sovereignty refers to a self-determination that is cultural (rather than legal), recognizes the interdependence of political actors, and involves the dismantling of the settler-colonialist framework that continues to dehumanize and disenfranchise (Bauder et al., 2023).

Land back is often assumed to call for a radical dispossession of private property. In reality, the central calls for land back do not insist upon the ceding of property, but instead the return of federal lands, particularly those managed under the National Park Service (Kennedy, 2022; Goodluck, 2023; Robbins, 2021; Bender, 2022). The U.S. federal government, though establishing several co-management relationships of federal land with tribal nations has yet to return any of this federally owned land, despite having the power to (Kennedy, 2022). The government has, however, worked to consolidate several thousand square kilometers of tribal land through the Land Buy Back Program for Tribal Nations (U.S. Department of Interior, 2023). This practice is notably incomplete, because it fails to fully establish Indigenous sovereignty over Indigenous affairs.

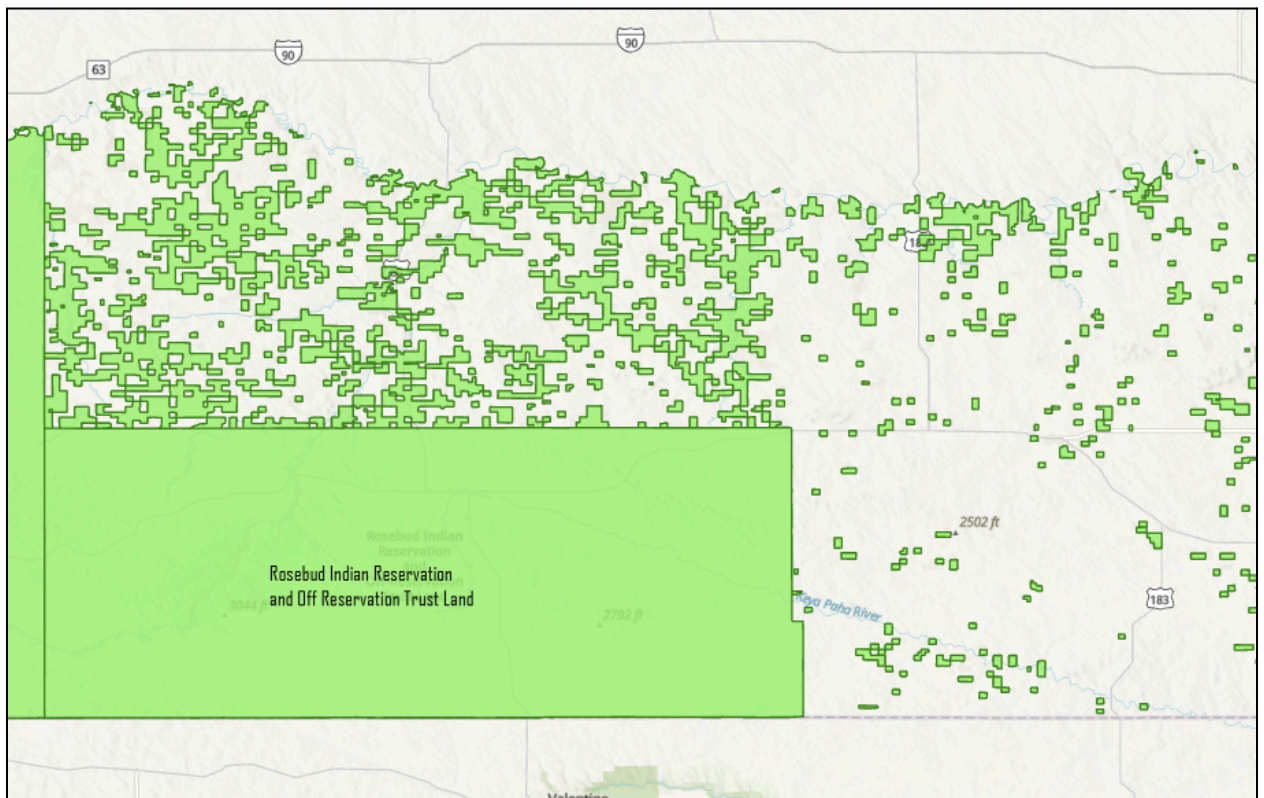
In practice, what land back has looked like is multifaceted, with nations receiving land through “outright land title purchases, donations from private landowners, transfers from land conservancies, and federal and state legislation, including long overdue recognition of tribes that did not have legal status” (Goodluck, 2023).

While there have been several successful cases of land back in action, Indigenous peoples currently occupy only 1% of the land they historically occupied before the arrival of European settlers. This repeated and continued history of land dispossession has displaced Natives from their familial lands and forced them onto, often, agriculturally unstable terrain (Farrell et al., 2021). This relocation occurred with the knowledge that several nations regularly migrated across current state and country boundaries, leaving them confined to a fraction of the land they may have called home (Farrell et al., 2021). This does not take into account the several nations who were relocated to nonhistorical regions or had their legal status as federally recognized tribal nations removed (ILTF, 2016).

With just a fraction of the land once occupied, opportunity for economic mobility is scarce. This is evident in the fact that Indigenous peoples around the world experience the worst outcomes in poverty, health, education, and political participation (Mitchell & Enns, 2014). Further, the division of land under the General Allotment Act resulted in a pattern of checkerboarding that leaves a significant amount of non-Native owned land within reservation boundaries (Indian Land Tenure Foundation, n.d). This significantly impedes the sovereignty of Indigenous peoples over their own affairs, because nations are restricted from economic activities that require large contiguous plots of land (Indian

Land Tenure Foundation, n.d). These realities are attributed to the loss of land and the legacy of settler-colonialism, but there has yet to be a comprehensive statistical analysis of the relationship between these issues.

Figure 1: An example of the pattern of checkerboarding as displayed on the Rosebud Indian Reservation in SD.



Source: AIANNH Shapefiles, Department of the Interior.

This paper seeks to remedy this lack of research by examining the relationship between land back movements and the quality of life for Indigenous communities. With the referenced history in mind, this paper hypothesizes that the rough average of 1,700 square kilometers of land recovered has had a positive effect on economic stability and

cultural strength (Goodluck, 2023). To the best of our knowledge, this is the first time an economic analysis of land back movements has been conducted.

This paper also investigates whether land back movements have a positive measurable effect on surrounding communities, using the same outcome and explanatory variables as above. Previous research has found that the effects of reservation property rights for First Nation members are moderate and primarily experienced in spillover effects by non-band members moving into the region (Aragón & Kessler, 2020). In this way, it is hypothesized that there will be a positive spillover effect in surrounding non-Native communities when land back is the variable of interest.

Since material wealth is not the only way to understand well-being, we acknowledge the role non-economic indicators play in quality of life considerations. This is particularly true for those Native communities who view themselves as in relationship with the land rather than in possession of it, and may not seek to maximize economic outcomes at the cost of resource extraction (Bauder et al., 2023). With that being said, the scope of this paper is mostly limited to an analysis using purely economic outcome variables, due to a lack of research capacity and data availability.

The following section will paint a portrait of the patterns in which land theft has occurred, providing context into what questions we ask and why. While a deeper history of the genocidal crimes committed is necessary to understand the full weight of violence, loss, and trauma that continues to be felt by Natives and the land, the scope of this paper limits itself to the history of land loss. Further, this paper recognizes that these crimes occurred outside of the boundaries of what is now called the United States. This paper

focuses its analysis, however, on land back movements within the U.S., due to current legal and political boundaries limiting access to comprehensive land back data.

The following sections of the paper are broken up as follows: Section 1.1 provides a brief history of land dispossession within the contiguous U.S. as context for why this research was initiated and how it was implemented. Section 2 offers a detailed analysis of the literature relevant to land tenure and economic outcomes for Indigenous peoples. Section 3 outlines the model employed for this analysis, a description of why each control variable was chosen, and the relevant theory used. Section 4 describes the source of data used and summary statistics relevant to understanding the impact of our research question. Section 5 analyzes the results of the regressions that were run, in addition to providing a visual representation of land back and loss. Section 6 concludes with a review of the results and suggestions for an implementation of the understanding gained through this study.

History of Land Dispossession

A settler-colonialist legacy has been embedded in American thought since its foundation. Simply put, settler-colonialism aims to “replace Indigenous populations with an invasive permanent settler population” (Native Land Information System, n.d). This legacy has repeatedly undermined the inherent sovereignty of Indigenous peoples using baseless religious, racial, legal, and philosophical justifications.

Perhaps the most influential of these, was the Doctrine of Discovery. A series of papal bulls established between 1452 and 1493 incited the theft of land, using the influence and authority of the Catholic Church to falsely establish legitimacy behind a series of colonial experiments (Pieratos et al., 2020). The doctrine’s significance in

American thought should not be understated. As recently as 2005, Supreme Court Justice Ruth Bader Ginsburg voted against the tribal sovereignty of the Oneida Nation, using the Doctrine of Discovery as a legal foundation (Pieratos et al., 2020). In 2012, the U.S. stayed silent in a Permanent Forum on Indigenous Issues denouncing the legitimacy of the doctrine (United Nations, 2012). The U.S. decision to abstain from signing the UN Declaration on Indigenous Self-Determination reflects the government's paternalistic understanding of indigenous sovereignty: 'it can only exist under our rules and within our walls.' This inherently subjects tribal nations to a very limited understanding of sovereignty, defined only by the (federally managed) decisions they can make within their nations.

As might be expected, these infringements were not the first. American freedom, from its beginnings, has conflicted with freedom for Indigenous peoples, because it has relied on the erasure of and the theft of their land. To finance the American Revolution, “the American rebel government sold speculative land grants” for titles to Indigenous-owned land. Throughout the 17th century, the thoughts of influential American thinkers, such as John Locke—who claimed that the “New World” was *terra nullius* or “land without a master” (Bauder & Mueller, 2023)—were used to justify this appropriation of Indigenous land. While these thinkers inspired American freedom, democracy, and sovereignty, these rights were not intended to extend to Natives. This is evident in the 19th century Supreme Court decisions referred to as the Marshall Trilogy, which served to denounce Indigenous sovereignty over their own affairs. During this same time, in 1830, the Indian Removal Act was established, giving the president discretion to initiate heavy handed negotiations with nations to give up land in the East

for land in the West. This act alone resulted in the lack of present-day tribal land designations East of the Mississippi (ILTF, 2016).

Even then, between 1778 and 1871, the U.S. government implicitly acknowledged Natives as independent nations with rights to self-determination in its willingness to sign a slew of treaties (Slattery, 1991). More explicitly, the Northwest Ordinance stated, “The utmost faith shall always be observed towards the Indians; their land and property shall never be taken from them without their consent; and in the property, rights and liberty, they never shall be invaded or disturbed, unless in just and lawful wars authorized by Congress.” The respect for this sovereignty, however, was little to nonexistent, with treaties broken at the whim of settlers and the backtracking government (Lee, 2021). Many tribal nations opposed the imposition of these abstract borders upon the land by these treaties and refused to sign anything claiming ownership of the land (Kiiwetinepinesiik Stark, 2012). Others signed treaties to protect the lands they inhabited, or far more commonly, were pressured and misled by the government to give up land.

All of the treaties made by the federal government with Indigenous nations have since been “broken, changed or nullified” in some way (Oliff, 2011). The disappearance and poor management of the details and history of these treaties further demonstrates the indifference of the federal government over Indigenous affairs. The Fort Laramie Treaty is one of the most notable, both in its history and relatively recent media spotlight. After more than a decade of the Sioux Wars of the Great Plains, various Sioux nations signed the Fort Laramie Treaty in 1868, which gave permanent title to the Black Hills and South Dakotan land west of the Missouri. Not ten years later, in 1876, this land was seized by the U.S. government after the Sioux successfully defended their land in the Battle of the

Little Bighorn from the U.S. General Custer and his troops. To this day, Custer's name is memorialized across the region, with federal lands, roads, attractions, and towns named after him. Meanwhile, the Sioux still don't have their land.

This is just one of the many wars fought since the arrival of European settlers in the 17th century, which were used in succession to falsely establish an American territorial authority and sovereignty over the land. Worse yet, Indigenous peoples who fought in defense of their homelands were persecuted and executed. The beginning of this brutal history is marked by the 1598 massacre of 800 Acoma people in the colony of New Mexico. In 1862, Abraham Lincoln ordered the hanging of 38 Dakota men in the largest mass execution in U.S. history, for their role in the Dakota Uprising. And on December 16th, 1890 the U.S. Army massacred at least 300 men, women, and children when misinformed fears about the intention of a religious dance incited frenzied violence.

Meanwhile, the forced migration of tribal nations during the Reservation Era continued to perpetuate the large-scale loss of tribal land. Most notable was the Cherokee Trail of Tears of 1838—just one of many migrations that continued throughout the 19th century. On the journey from North Carolina to Oklahoma, it is estimated that 6,000 men, women, and children died from starvation and harsh weather conditions (NIH, n.d). Other nations were forced to move an average of 239 kilometers from their original homelands (Farrell et. al, 2021). The longest distance of these forced migrations was the Modoc people's 2565 kilometer walk from California and Oregon to Ottawa, Oklahoma (Farrell et. al, 2021).

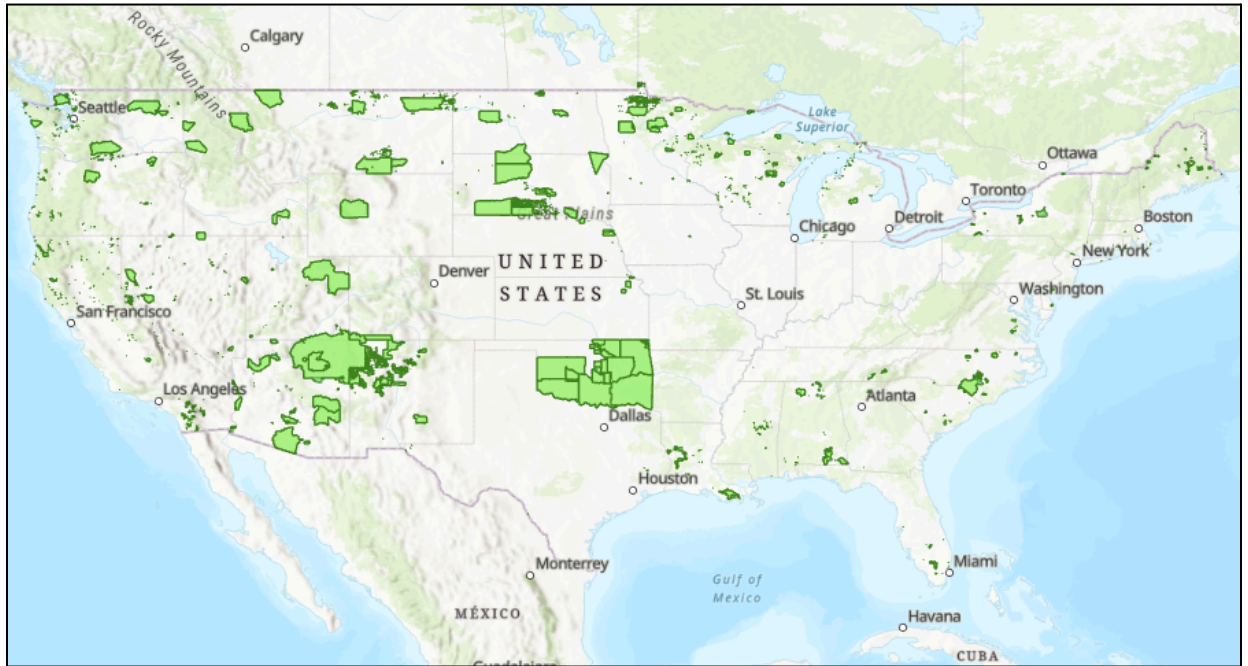
Currently, tribal nations only occupy 41% of the land they were promised in the Reservation Era (Farrell et al., 2021; Northern Plains Reservation Aid, n.d.). The

Allotment Era, as named for the General Allotment Act of 1847, is responsible for this loss of land, which divided reservation land into 160-acre allotments designated for Native families. The “surplus land” was seized by the government and sold off as settlements (Northern Plains Reservation Aid, n.d.). This appropriation did not end until 1934, with the enactment of the Indian Reorganization Act (Indian Land Tenure Foundation, n.d. 2). Only 11% of land promised to tribal nations has been recovered since then (Northern Plains Reservation Aid, n.d.). While the government effectively repealed the General Allotment Act in 1934, as soon after as 1953, both federal and state governments alike began the process of terminating tribes’ status as independent nations. Soon after from 1953 to 1970—a period characterized as the Termination Era by the Indian Land Tenure Foundation—11,466 people lost their tribal identity and a further 5,512 square kilometers of land were lost (ILTF, 2016). The Relocation Act of 1956—which encouraged migration of Natives to urban centers on the spurious promises of better job opportunities—was the last of large scale policies that resulted in migration from and/or loss of tribal land (Nesterak, 2019).

As it stands now, Indigenous peoples across the U.S. are still fighting for their land back. As modern day political events and violent trends continue to infringe on the rights of Indigenous peoples, what remains constant is a sacred connection to the land and a determined effort to get it back.

There are approximately 974 Indigenous nations (574 federally recognized, approximately 400 non-federally recognized) within the U.S., making the question of how land was taken from Indigenous peoples unarguably ungeneralizable (U.S.

Figure 2: Extent of tribal land area in the contiguous U.S. (2021)



Source: AIANNH Shapefiles, Department of the Interior.

Government Accountability Office, 2012). And yet, there are similarities in how these nations were dispossessed of their land. While it would be interesting to understand how the land taken from Natives affects their outcomes, that is beyond the scope of what this paper does. Instead the remainder of this paper will focus on the modes in which land has been given back.

Literature Review

Quality of Life Outcomes

While there has been no attempt made to quantify the effects of land back movements, previous efforts in the literature provide a starting point to understand the scope of the problem.

Farrell et al. (2021) is the first and only paper to systematically calculate the scale of land loss for tribal nations across the contiguous U.S. In this effort, they find that Indigenous peoples have experienced a 99% cumulative reduction in land tenancy (Farrell et al., 2021). Their analysis further indicates that no tribe within the U.S. has maintained complete sovereignty over their historical land area (Farrell et al., 2021). In fact, 42% of nations were completely dispossessed of their land and on average the rest occupy only 2.6% of their lands (Farrell et al., 2021).

Farrell et al. uses this aggregation of historical and present land tenure data to investigate trends in the climate risks and economic values associated with the land. To this end, they conclude that current tribal lands are less endowed with natural resources, more likely to experience extreme weather events, and are situated in areas once seen as economically undesirable (Farrell et al., 2021).

The literature also suggests poorer health outcomes for Natives living off their historical lands. An Australian review comparing several health metrics amongst Aboriginals living on and off traditional homelands found that overall health was better for those living on these traditional lands (McDermott et al., 1998). Measures for overall health include mortality and hospitalization rates as well as prevalence of obesity, diabetes, and hypertension (McDermott et al., 1998). This paper suggests that improved

health outcomes for those who choose to live on Aboriginal homelands reflect a revival of social and cultural vitality (McDermott et al., 1998). This is in contrast to the poor quality of living that exists as a result of legacies of trauma (McDermott et al., 1998). With that being said, this paper makes a point to remind the audience of the potential for a selection effect, where those who choose to live in homeland communities may be more likely to take care of their health.

Beyond these outcomes, an extensive array of other vulnerabilities exist for Native communities who experience among the highest levels of poverty and food insecurity, police brutality and incarceration, and low educational attainment (UN Department of Economic and Social Affairs Indigenous Peoples, n.d.; Pieratos et al., 2020; Mitchell & Enns, 2014). Despite these facts, Native experiences have continued to be erased and ignored. While the federal government's stated relationship with tribal nations is to responsibly manage, protect, and serve the people and their land, significant mismanagement has occurred (Deloria et al., 2018; U.S. Department of Interior, 2022). Recently, the Department of Interior acknowledged that they had failed in their role as trustee of tribal trust lands, leading to the loss of billions of dollars of income for Native landowners (Indian Land Tenure Foundation, n.d.).

More than anything, though, Natives have continued in their resilience and resistance, fighting to defend their land in war, refusing to accept demeaning congressional decisions, establishing political demonstrations, and most recently in demanding land back. It is necessary to avoid a deficit-based approach in understanding these issues, because not only is it unrepresentative, but encourages proscriptive solutions without the interest, insight, and expertise of Indigenous perspectives.

Understanding the Outcomes

With such an extensive body of research surrounding the current economic experiences of Indigenous peoples, there is an even larger body that attempts to explain the reason behind these experiences. In reviewing the literature, Cornell and Kalt (1994) find that there are four broad camps of interpretation: 1) “those that attribute underdevelopment to powerlessness, dependency, and expropriation” 2) “those that treat differential outcomes as factorial in economic terms” 3) “those that cite intrinsic aspects of Indian societies usually indigenous culture or tribal social organization”, and 4) “those that blame persistent poverty on the absence of effective governing institutions”. The literature suggests there may be varying levels of merit for each of these explanations, though there has been no research to jointly decompose these effects.

The most substantial body of literature attempts to quantify the effect of institutional problems or differences on economic outcomes. For one, there has been speculation that economic outcomes on reservation land may improve with more concrete property rights, inspiring the First Nations Property Ownership Act in Canada (First Nations Property Ownership Initiative, 2010). These predictions stem from the fact that Indigenous land is not considered an asset in the Western sense. To ensure that the land was unable to pass out of Indigenous hands, it was converted to trust land managed by the U.S. government. It is very challenging, then, to take out a loan, because Indigenous land cannot be used as collateral. The literature surrounding the effect of these property rights, however, suggests mixed findings.

Aragón (2020) finds that the effects for First Nation members are moderate and primarily experienced in spillover effects by non-band members moving into the region.

Findings even suggest that median income decreases by one standard deviation for every 1.5% of land held under lawful possession (Aragón, 2020). Aragón proposes that the miniscule effect of property rights on reserve land could be explained by their often rural and remote locations, therefore suggesting that where land is taken back matters (Aragón, 2020).

Alternatively, research on Comprehensive Land Use Settlements, which, instead of establishing property rights clarify the collective rights of ownership, indicates an increase in real income on Aboriginal reserves by 13% (Aragón, 2015). This corroborates our hypothesis that land back will improve economic outcomes, as both these strategies provide solutions that improve sovereignty in a culturally integrative way. A similar understanding was reached in Cornell and Kalt (2000), which conducted a case analysis finding that the most successful tribal governments have institutions in place that align with the underlying cultures of the nation. This conclusion was reached through the finding of a positive effect on reservation employment levels.

On the other hand, Anderson and Parker (2008), suggest that tribal sovereignty should be interpreted as a double-edged sword because while having authority to imbed their culture in institutions and policies, it can come at the cost of economic development if strong contracts are not enforced. This is evidenced in that the per-capita income for Natives living on reservations was 30% more when under the judicial jurisdiction of the U.S. (as opposed to having jurisdictional sovereignty). These findings hold robustness against endowments, geographical isolation, education levels, acculturation, land tenure and economic conditions in surrounding regions.

Previous literature has established that culture does have an effect on economics outcomes (Guiso et al., 2006). To this degree, studies in this field have attempted to look at the question of Indigenous outcomes through the lens of cultural practice and social norms. To this extent, Gitter et al. (2002) find that employment rates and wages are higher for Indigenous men living off reservation than on reservation. Further, research notes that levels of education do not have an effect on wages earned within a reservation (George & Kuhn, 1994). These findings are aligned with those from Trosper (1978) which indicates that ranches on the Northern Cheyenne reservation produce less output per acre than surrounding non-reserve land. Possible explanations given for these results, are a difference in the technical knowledge of ranching and/or explicit goals other than that of profit-maximization (Trosper, 1978). These findings allude to the fact that something about living on reservation decreases quality of living. Given the limited analyses of the papers above, it is impossible to say whether these effects were caused by a difference in culture. Additionally, it is often very challenging to parse out the two-way causality that exists between culture and economic outcomes.

With that being said, there has been explicit research suggesting that culture differs for Indigenous peoples living on and off reservations. George and Kuhn (1994), for example, reveal that there is a greater percent of native language spoken at home for individuals living on the reserve. This supports our predictions for the effect of land back movements on the revival of language as a cultural indicator.

These results may be interpreted with the following logic. As found in Farrell et al. (2021) tribal lands have less opportunity for participation in the extractive economy and are located in remote and economically undesirable locations. Furthermore, due to the

previously mentioned responsibility of the U.S. government to manage trust lands, there is often a significant level of bureaucracy that tribal nations must go through if they make decisions to develop their land. This red-tape creates significant management and oversight costs if the nation chooses to “make changes to land use, make capital improvements, [or] to lease lands” (Anderson & Parker, 2008). In fact, Anderson and Lueck (1992) found that economic productivity was 80-90% lower on tribal trust land and 30-40% lower on individual trust land than on fee simple lands. While this would be an interesting question to observe within our own research, the data we use does not include information on type of land tenure.

Irrespective of the validity of these interpretations, continued research needs to come from a place of supporting Indigenous autonomy, data sovereignty, and respect for Indigenous ways of knowing. The blaming of current inequalities on ways of life intrinsic to Indigenous culture is unproductive and blind to historical reality. This language recalls the Assimilation Era, where a misguided concern for the experiences of Natives fueled campaigns with the aim to “kill the Indian, save the man” or which framed the issue as an “Indian Problem”. Unsurprisingly, these expressions and the efforts surrounding them were unsuccessful and reproduced more trauma and government dependency. This reality expresses the harm in viewing any behavioral decision purely as a function of profit maximization. Simply put, profits may not have always been the goal for tribal nations, but this is not the sole factor to blame for the current injustices they experience.

Theory/Methodology

The objective of this paper was to decompose the effects of land back movements on Indigenous communities, through several measures, all of which are grouped into the broad category of economic stability. While there are several other quality of life indicators that would be both interesting and important to analyze—including individual health, strength of culture, and regional environmental health—this paper’s scope was mostly limited to strict measures of economic stability, due to a lack of capacity and available data. Cultural strength was briefly explored by observing the relationship between land back and the estimate of people speaking any language other than English and Spanish or languages within Indo-European and Asian-Pacific Islander categories.

This research uses a difference-in-difference approach to measure the over-time variation between and within tribal nations who have gained and have not gained land back. Because of the nature of the data structure, the outcomes are not specific to American Indians or tribal lands. Rather, each geographic area level overlaps with tribal land areas and thus includes a percentage of American Indians in the population. Thus the data naturally captures the spillover effects of land back movements on non-Natives in the surrounding community.

There is one significant challenge that this paper anticipates. For many Indigenous peoples, the land is interconnected with cultural identity, family history, and is deeply sacred. It is anticipated that this intimate valuation of the land will be captured in several of the outcome variables we are using. Since the effects of the cultural, familial, and spiritual value that reclaiming the land has are challenging to decompose into quantifiable variables, what we expect to find is that these effects will be expressed in the effect of the

land back variable. We will keep this fact in mind, then, as we interpret the results in the analysis of the data.

When it comes to the effects of land back movements on economic outcomes the null and alternative hypothesis are as follows:

H_0 = No statistically significant relationship between gaining land back on economic stability.

H_1 = Statistically significant relationship between gaining land back on economic stability.

When it comes to the effects of land back movements on cultural strength, as measured through language the null and alternative hypothesis are as follows:

H_0 = No statistically significant relationship between gaining land back on cultural strength as measured through language use.

H_1 = Statistically significant relationship between gaining land back on cultural strength as measured through language use.

A lack of foundational economic literature in the field on Indigenous land back movements resulted in a restrictive and primitive model within this study. With that being said, we applied Pendakur's research on 'The Effects of Modern Treaties and Opt-In Legislation on Household Incomes in Aboriginal Communities' to build out the following MLR model:

$$(Y_{ist} = \beta_0 + \beta_2 I_{st} + \beta_3 A_{st} + \beta_4 P_{hst} + \beta_6 A_{st} I_{st} + \beta_4 A_{st} P_{hst} + \beta_{10} X_{ist} + \alpha_s + \gamma_t + u_{st})$$

Equation 1

Let $t = 2011, 2012, 2013, 2014, 2015 \dots 2021$. Let $s = 1 \dots S$ index the federally recognized tribal nations. Let Y_{ist} be one of the four dependent variables of interest. Let I_{st} be a dummy variable where 1 indicates the respondent is Indigenous and 0 indicates non-Indigenous. Let A_{st} represent the amount of land given back in square kilometers.] Let $P_{hst} = \{P_{hst}\}_{h=1}^5$ be a vector of dummy variables that represent the type of land designation which are Colony (1), Community (2), Indian Colony (3), Indian Community (4), Indian Rancheria (5), Indian Reservation (6), Indian Village (7), Off Reservation Trust Land (8), Oklahoma Tribal Statistical Areas (9), Pueblo (10), Pueblo De (11), Pueblo Of (12), Ranch (13), Ranch Reservation (14), Rancheria (15), Reservation (16), State Designated Tribal Statistical Area (17), Tribal Designated Statistical Area (18), Trust Land (19) Finally, let X_{ist} be a vector of individual-level covariates which naturally differ for each model.

Due to the covarying nature of many of these outcome variables, this study employs the use of simultaneous equations. Instead of regressing each equation separately, they are fitted into a system of equations reusing the above model. In the equation where annual income is our outcome variable of interest, for example, at least one of the variables of employment status, educational attainment, and occupants per room are endogenous factors that should be accounted for in our understanding of the

individual's income. In order to correctly model a simultaneous system of equations, we ensured that each equation had at least one unique variable.

Furthermore, in order to account for both the group level and individual specific characteristics of reservations, this study attempted to employ a mixed effects model. The *xtsur* command was downloaded to STATA SE 1.8 which was used to account for these random effects within a simultaneous equations system. As described on a Boston College *xtsur* user guide, "The approach for this command is based on constructing a multistep (stepwise) algorithm using Generalized Least Squares (GLS) and the Maximum Likelihood (ML) procedures. The method [was] originally developed by Erik Biorn (JoE)." In order to include interaction terms and indicator variables that would not run, *xtsur* was replaced with *sureg*. This has the effect of dropping out the ability to account for random and fixed effects which we would have hoped to model for. The above model was also run using *Reg3* in order to cross-reference the validity of the results within the *surreg*. One problem with each of these two options used, is that they assume normal distribution when the data is not normally distributed.

There are four dependent variables of interest describing economic stability within this study: 2022 inflation adjusted income per capita, unemployment levels, educational attainment, and occupants per room. The explanatory variables of interest are land and water area expressed in terms of square kilometers as well as the area of land change (if any) each year. This data also includes a measure of land tenure which allows this paper to investigate if effects vary with the type of land tenure track and geographic region.

The process of selecting control variables was supported by an extensive background knowledge as to what reasonably affects each of these dependent variables. In addition, the list of variables was chosen from a selection of the only known data set that would link ZCTAs with our AIANNH Shapefiles (the ACS). Since all variables are expressed in terms of estimates, there are two equations nested below in order to build an understanding of the effects on both ends of the spectrum of economic stability. In this way, there were two basic simultaneous equations run; one highlighting the best-case scenario and the other, the worst-case scenario. If a variable below is described in its generic form, one should assume that the entire suite of variables are listed. A list and rationale of the control variables, for each dependent variable is described below each equation. To demonstrate that the rule for the simultaneous equations model is satisfied, the unique variable is starred in each list of control variables.

$$\begin{aligned} \text{Income (15kto19999k)} &= (\text{Vars}_{\text{of interest}}) + A_{\text{ge}} + C_{\text{itizenship Status}} + E_{\text{educational Attainment}} + M_{\text{arital Status}} + \\ &R_{\text{ace}} + U_{\text{employment Rate}} + S_{\text{ex}} + u \\ \text{Income (75kto>200k)} &= (\text{Vars}_{\text{of interest}}) + A_{\text{ge}} + C_{\text{itizenship Status}} + E_{\text{educational Attainment}} + M_{\text{arital Status}} + \\ &R_{\text{ace}} + U_{\text{employment Rate}} + S_{\text{ex}} + u \end{aligned}$$

Equation 2

Income: Income is used due to the known and obvious effect of more income on the status of economic stability. The lower bracket of income was used, due to it being the lowest available, while the higher bracket of income is the result of a combination of categories. This combined variable was employed after a non-statistically significant

effect that land back had on the “Greater than \$200,000” variable; which makes sense considering the unlikelihood of land back pushing people into the highest income bracket.

- *Age* is used to capture the effects that experience in the workforce would have on Income.
- *Citizenship Status* is used due to the current trend that immigrants earn less on average than born citizens.
- *Educational Attainment* is used due to the fact that there is a college premium in earned income.
- *Marital Status* is used due to the ways in which that marital status can affect earned income.
- *Race* is used due to the fact that wage discrimination continues to exist in the economy. This is in addition to fewer outcomes for upward mobility for POC, particularly Black and Indigenous communities, due to years of systemic racism.
- *Sex* is used to capture the proven discriminatory effect that gender has on earned income in the workforce, particularly due to having children.
- * *Unemployment Rate* is used to capture the effect that being unemployed would have on income.

Educational Attainment (9-12nodiploma)= (Vars_{of interest}) + A_{ge} + C_{itizenship Status} + I_{ncome} +

P_{overty Status} + R_{ace} + S_{ex} + *u*

Educational Attainment (Graduateorprofessionaldegree)= (Vars_{of interest}) + A_{ge} + C_{itizenship}

Status + I_{ncome} + P_{overty Status} + R_{ace} + S_{ex} + *u*

Educational Attainment: Educational attainment is used as a proxy variable for economic stability, due to the fact that having a college degree provides support both for finding a job, and earning income in a higher bracket, among other benefits.

- *Age* is used because of the fact that those below and above certain age categories are less likely to have achieved certain degrees of educational attainment. This is because many younger age groups are highly unlikely to have completed high school, let alone reached higher education. On the other end of the spectrum, it is not nearly as common for people of older age to have attended a higher education institution.
- *Citizenship Status* is used because of the current trend that being a first generation immigrant makes one less likely to attend college.
- *Income* is used due to the fact that earning in a higher income bracket makes someone more likely to attend/ have attended a higher education institution.
- * *Poverty Status* is used due to the fact that growing up in poverty makes one less likely to be able to achieve academically. This is due to the lack of opportunity for upward mobility and the severe number of stressors that exist in impoverished environments.
- *Race* is used due to the fact that individuals of different racial identities have different likelihoods of going to a higher educational institution.

- *Sex* is used due to the current trend in which women are more likely to attend higher education institutions, in addition to other trends in which women are more likely to achieve certain educational attainment levels.

$$\text{Unemployment Rate} = (\text{Vars}_{\text{of interest}}) + A_{\text{ge}} + E_{\text{educational Attainment}} + I_{\text{income}} + M_{\text{arital Status}} + R_{\text{ace}} + S_{\text{ex}} + V_{\text{eteran Status}} + u$$

Equation 4

Unemployment Rate: Unemployment rate is used to model the effect that not being in the workforce has on economic stability.

- *Age* is used because of the fact that individuals of different ages have different likelihoods of being unemployed.
- *Educational Attainment* is used due to the current trend that not attending college makes one more likely to be unemployed.
- *Income* is used due to the fact that being in certain income brackets makes someone more or less likely to be unemployed.
- *Marital Status* is used due to the fact that individuals of different marital status have different likelihoods of being members of being unemployed.
- *Race* is used due to the fact that the unemployment rates vary rather significantly by race.
- *Sex* is used due to the fact that unemployment rates vary rather significantly by gender.

- * *Veteran Status* is used due to the fact that there is a high unemployment rate for veterans.

$$\text{Occupants per Room } (>2.01) = (\text{Vars}_{\text{of interest}}) + I_{\text{income}} + C_{\text{citizenship Status}} + E_{\text{educational Attainment}} + F_{\text{ertility Rate}} + M_{\text{arital Status}} + R_{\text{ace}} + u$$

$$\text{Occupants per Room } (<.50) = (\text{Vars}_{\text{of interest}}) + I_{\text{income}} + C_{\text{citizenship Status}} + E_{\text{educational Attainment}} + F_{\text{ertility Rate}} + M_{\text{arital Status}} + R_{\text{ace}} + u$$

Equation 5

Occupants per Room: Occupants per room is used to represent another mode of economic stability/standard of living. The greater the number of occupants per room, the more cramped the living quarters are and presumably less comfortable and habitable the space is. This can seemingly have an effect on the upward mobility of an individual if they do not have a space where they can succeed.

- *Citizenship Status* is used due to the fact that immigrants are more likely to live in cramped living quarters. This is especially true in recent media reports of families living in and outside New York City.
- *Educational Attainment* is used due to the fact that educational attainment has an effect on the number of occupants per room.
- *Income* is used due to the fact that level of income would affect how much room a person could afford.
- * *Fertility Rate* is used due to the effect that having more children would have on occupants per room.

- *Marital Status* is used due to the fact that your relationship status would have an effect on the number of occupants per room, if living together.
- *Race* is used due to the fact that the number of occupants per room varies with racial identity.

$$\text{Language Spoken at Home (Other)} = (\text{Vars}_{\text{of interest}}) + A_{\text{ge}} + C_{\text{itizenship Status}} + R_{\text{ace}} + u$$

Equation 6

Language Spoken at Home: Language Spoken at Home is used as a measure of cultural strength. The prediction is that if land back has an effect on cultural strength it would be noticed in a revitalization of traditional Native languages. One limitation is that the “Other” category of language reports on more than just Indigenous languages, even though they were recorded separately. Another limitation here is that the Ancestry and Hispanic/Latino Origin variables are simply not included in this regression. For one the Ancestry variable had the same issue as Language, and would have been impossible to draw out the effects of different Indigenous ethnic backgrounds. Another reason was due to a lack of capacity to be able to collect and organize the data properly. These limitations must be taken into account when evaluating the strength of the model.

- *Age* is used due to the fact that Indigenous languages are preserved and spoken by older individuals in the population more than younger age groups.
- *Citizenship Status* is used due to the fact that immigrating from another country makes someone far more likely to speak a language than English.

- *Race* is used due to the fact that different language groups are spoken in different regions of the world and thus correlated with certain racial identities.

In addition to these control variables a set of interaction terms was created and regressed in order to capture the effects of 1) being Indigenous while receiving land back and 2) how land tenure track might affect our outcomes of interest. In total there were 20 of these variables, due to one of the land tenure tracks (Village) being dropped.

As a reminder instead of regressing our above equations separately, they are fitted into a simultaneous equation model. The reason we listed all of the variables was to capture any extraneous effects not explained by our explanatory variables. We did not care about any of the effects of these coefficients—because the way the variables are recorded as levels makes them all highly correlated with each other—so we are not including other variables that would explain the controls within our model. For further detail on the definitions of the control variables see the appendix.

Data

Description of Data

The land back data was obtained through the American Indian/Alaska Native/Native Hawaiian (AIANNH) Areas Shapefile which maintains a continuous annual record of land tenure for federally recognized American Indian reservations, off-reservation trust land areas, state-recognized American Indian reservations, and Hawaiian home lands (HHLs) since 2006.

Only years 2011 through 2021 of this dataset were utilized to match the available data in the American Community Survey (ACS). While Alaskan Native Village Statistical Areas (ANVSAs) and HHLs were included in the AIANNH areas and recorded by the Census Bureau Boundary and Annexation Survey, only lands that fall within the contiguous U.S. are used in this analysis. This restriction is due to the research's limited scope of interest on the land back outcomes for American Indians. While the same research question is worth asking for Alaskan Native and Native Hawaiian lands, this analysis focuses only on the outcomes of American Indians due to their separate and distinct history of land dispossession. State recognized American Indian tribal land areas were included in our analysis to fully capture the effect of land back movements on Indigenous communities, regardless of whether the federal government has rescinded their tribal status. With that being said, there is a complicated history behind the establishment of state-recognized American Indian reservations, due to many reservations having dubious claims of indigenous ancestry. This knowledge is reserved for future analysis in this paper in the subsection entitled "Land Back Case Analysis".

The ACS 5-year estimates were employed to capture population level control and dependent variables for measures of economic stability and cultural strength. These 5-year estimates, which are calculated over a 5-year period, but reported on each year, were chosen to ensure closer statistical accuracy for smaller population areas and subgroups, in addition to accessing the data at a ZCTA specific level. Each variable is a measure of the estimated number of individuals within a ZCTA who fall under a specific category of that variable. Depending on the level of specificity required in the variable categories, either Detailed or Subject tables were used. The only characteristic that differed when using these tables was the type of variables available.

Data Structure

Since the ACS does not have data aggregated at the tribal level, the AIANNH Areas were linked to the ACS with ZCTA overlays in order to identify an estimate of individuals who live within any of the above-listed American Indian land boundaries. A list of zip codes that correspond with our areas of interest was accessed using the Longitudinal Employer Household Dynamics (LEHD) Origin Destination Employment Statistics (LODES) crosswalk file available from the U.S. Census Bureau. All data that wasn't matched between the ACS and the AIANNH files was dropped due to incomplete observations. Of 18,426 post-merge observations, 19 were dropped from the AIANNH data set and 126 dropped from the ACS data.

Once combined, the data is best described as an unbalanced pooled dataset in that new individuals are surveyed every five years to represent their communities. Unbalanced describes the fact that several tribal land designations areas were added or removed during the ten year time span in which the data is recorded. A case analysis of

the tribal areas that have been removed and those that have lost/gained significant land areas is discussed later in this paper in the “Land Back Case Analysis” subsection. One thing that can be noticed when comparing the percentage values of the nested category variables to the total values of that variable is that the percentages don’t add up to 100%. This is not of particular concern, as the estimates are just that.

There are 78 unique variables, without the creation of interaction terms and indicator variables. In total, 152 variables were used within the *Reg3* regressions to increase the specificity of the model. Beyond that, the original 78 variables is a function of the way in which ACS data is structured. As previously discussed, each category of variables (e.g. income, age, race, sex, etc.) there are several levels of variables. Under the suite of income variables, for example, “Earned >\$200,000” describes the number of individuals in the given population who earn more than \$200,000 each year. All variables are expressed in terms of percentages of the population that fall into that category.

Data Preparation

As might be expected, most of the variables that fall under a specific category such as “Age” are highly correlated with one another. If someone is less than 5 years old, it is impossible for them to be 5-9 years old and so we would expect to see a high level of negative correlation between these variables. This is exactly what was found when running a partial power correlation test. While we have to include these variables within the model in order to account for the effects they have on our dependent variables, we are not trying to understand the impact of these variables. In this sense, including these variables, despite multicollinearity, is not a problem for our model. When adding the “Change in Land/Water Area” variables to our regression, we also noted that the

correlation between these and the variables “Land/Water Area”, all less than .90, was weak enough for us to be able to include in the model.

	aland	awater
aland	1.0000	
awater	0.3287	1.0000
ldelta	0.2336	-0.0253
lwater	0.0355	0.0064

Finally, upon running this analysis a heteroskedasticity test (Chi Square) was run to check for non-constant variance. On each of our regressions a p-value of 0.000 was found, prompting the creation of robust standard errors for each of our output tables.

Table 1 - Demographic Statistics	
N	18,281
	Number (%)
Age	
>5 years old	2.922
5-9 years old	3.106
10-14 years old	3.227
15-19 years old	3.124
20-24 years old	2.916
25-29 years old	2.789
30-34 years old	2.750
35-39 years old	2.692
40-44 years old	2.668
45-49 years old	3.383
50-54 years old	3.586
55-59 years old	4.504
60-64 years old	3.866

65-69 years old	3.202
70-74 years old	2.707
75-79 years old	1.792
80-84 years old	1.176
>80 years old	1.023
Educational Attainment	
<9 th Grade	3.491
9-12 No Diploma	6.746
High School	24.085
Some College	17.475
Associate's	6.048
Bachelor's	8.270
Graduate Degree or Professional Degree	3.980
Income	
Earned <\$10,000	9.413
Earned \$15,000-19,999	6.494
Earned \$20,000-24,999	6.330
Earned \$25,000-29,999	6.063
Earned \$30,000-34,999	5.847
Earned \$35,000-39,999	5.283
Earned \$40,000-44,999	5.132
Earned \$45,000-49,999	4.457
Earned \$50,000-59,999	8.258
Earned \$60,000-74,999	9.903
Earned \$75,000-99,999	10.810
Earned \$100,000-124,999	6.359
Earned \$125,000-149,999	3.406
Earned \$150,000-199,999	3.026
Earned >\$200,000	2.428
Language Spoken at Home	
English Only	85.970
Spanish	6.042
Indo-European	1.090
Asian or Pacific Islander	0.735
Other	6.026
Marital Status	
Married	49.964
Widowed	7.080
Divorced	12.103
Separated	1.902
Never Married	28.951
Occupants per Room	
<.5 Occupants per Room	69.765
.51-1 Occupants per Room	25.662
1.01 to 1.5 Occupants per Room	3.168
1.51 to 2 Occupants per Room	0.983
>2.01 Occupants per Room	0.421

Place of Birth	
Native	96.004
Foreign Born: Naturalized	1.624
Foreign Born: Not Naturalized	2.374
Race	
White Only	67.885
Black Only	4.586
American Indian / Alaskan Native Only	19.056
Asian Only	0.951
Native Hawaiian Pacific Islander Only	0.143
Other	2.343
Two or more races	5.035
Sex	
Male	50.328
Female	45.650
Veteran Status	
Veteran	10.293
Nonveteran	89.707

Table 2 - Economic Indicator Rates	
	Number (%)
Women with Births in Past 12 Months	5.994
Labor Force Participation	55.862
Poverty Rate	15.202
Unemployment Rate	9.276

Descriptive Analysis

A couple points of interest come to mind when reviewing Table I and II due to their differences from anticipated values, specifically those on tribal land. For one, 68% of the population in this dataset identifies as white only while only 19% of the population identifies as American Indian or Alaskan Native. While this is a high amount compared to the current racial demographics that exist throughout the U.S. it is significantly less than expected for our overall dataset. This is likely due to the fact that the demographic information and tribal land data were linked with ZCTA overlays. While we necessarily expected to capture effects and communities that exist outside of non-reservation land, it

appears that a majority of the demographic information estimates values of regions off or away from tribal land.

On the other hand, labor force participation rate, unemployment rate, and poverty levels seem to be slightly skewed, potentially due to a proximity to tribal lands. The labor force participation rate is a little off, sitting at 55% in this dataset, whereas the national average is 61%. The labor force participation on tribal lands isn't much different at 60.5%, and so it is uncertain as to where this effect could be observed. Meanwhile the average poverty rate hovers around 12% in the U.S. it appears to be 15% in this dataset. This is still far off, from the 28% average on tribal lands, which seems to further corroborate that this dataset is mostly taking values of off-reservation demographics with a slight skew from tribal demographics. One more variable of note is the "Income" variable, which appears to be bimodal on the categories of earns 'Less than \$10,000' and 'Earns \$75,000-99,999'. We keep these results in mind when choosing dependent variable brackets as well as when interpreting the results in Section 5 of this paper.

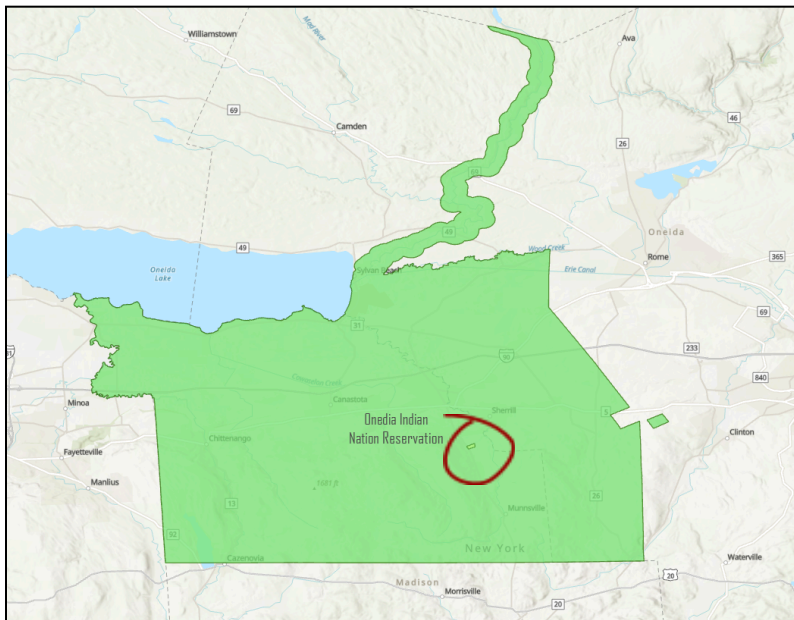
A lack of categorical levels describing Indigenous identity in both the endogenous and exogenous variables, makes for a serious analytical limitation. The length of time it would have taken to organize the data on ancestry, in addition to the fact that all African and American Indian ancestries were grouped together, resulted in the "Ancestry" grouping of variables being left out. Additionally, the fact that the 'Other' category of language use is grouped together with all Indigenous and African languages, poses another limitation, as we can only say what the effect land has on a very large group of unaffiliated languages.

Some other serious limitations in the analysis persisted due to the structure of the data. When attempting original regressions, some variables could not be regressed against, likely due to unobserved collinearities. In this way, we had to run our model without the measure of random and fixed effects. Future research might attempt to uncover these issues to support a better analysis of the data.

Land Back Case Analysis

Displayed below are the largest instances of both land gain and land loss between 2011 and 2021, where the darkest shade indicates a land gain and the lightest a land loss. In the first two images, one can observe how the Oneida Indian Nation's land extent expanded from the tiny patch of light green circled in red (and zoomed in on for further detail) to the large land area bordering Oneida Lake. In this instance, the change in land area was an increase of 1095.512 square kilometers.

Figure 3: Map displaying the success of land back for the Oneida Indian Nation



Source: AIANNH Shapefiles, Department of the Interior.

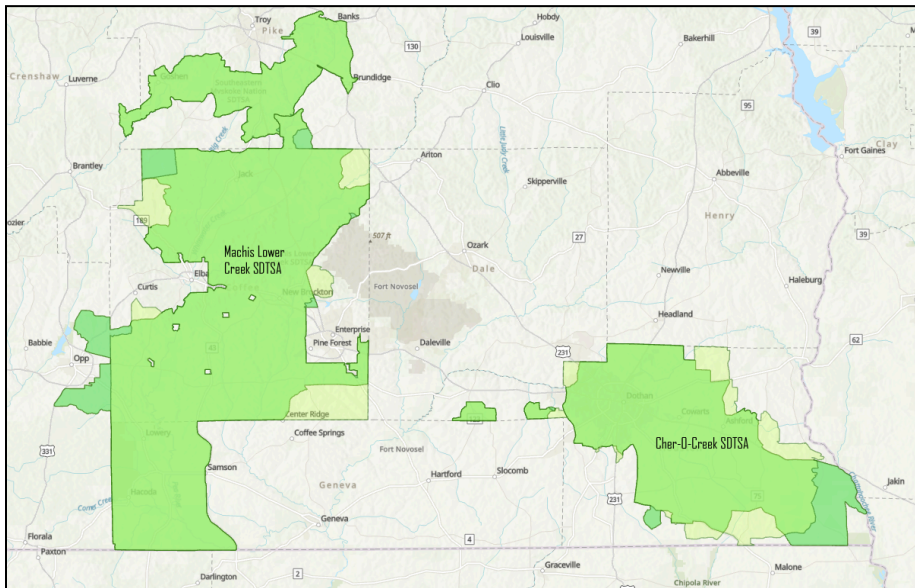
Figure 4: Original land extent of the Oneida Nation



Source: AIANNH Shapefiles, Department of the Interior.

In the third image, one can see the Machis Lower Creek and Cher-O-Creek State Designated Tribal Statistical Areas. While it may appear at first glance as if the difference between land lost and land gained is similar, these are the two nations with some of the largest land losses.

Figure 5: Map displaying cumulative land loss for the Machis Lower Creek and Cher-O-Creek SDTSA



Source: AIANNH Shapefiles, Department of the Interior.

While still arguably small, the Ma Chis Lower Creek nation lost about 49.88 square kilometers and the Cher-O-Creek nation about 36.22 square kilometers. As mentioned previously, however, these are just a few of the many State Designated Tribal Statistical Areas in which the legitimacy of the tribal status is in question. As reported on by the Los Angeles Times, members of these supposed nations have no proven Indigenous ancestry and have been profiting off of minority contracts for small business since their status has been recognized in the 1970s (Elmahrek, 2019). One theory as to why land has been lost is the possibility of it being shifted in and out of family hands, due to a lack of legitimate management and oversight. These outliers could almost certainly

be skewing the results, but a lack of ability to comprehensively pin down the illegitimate claims has resulted in these observations remaining in the dataset.

Analysis

Graphical Analysis

Overall, our results indicate a slight positive effect between land back and our quality of life indicators. With that being said, these relationships are highly variable and tend to be clustered in just a few distinct areas. This is graphically seen in Figures 6-9 which describe the relationship between changes in land area between 2011 and 2021 and two of our economic security variables: “Income” and “Occupants per Room”. The graphs for variables on “Educational Attainment” and “Unemployment Rates” were excluded, due to their similarity to the results seen in the two graphs describing Income. Based on the small correlation between the variables, these graphs indicate that the story of land back is more complicated than what is measured through the relationship with income, occupants per room, educational attainment, and unemployment rates.

As can be seen in Figures 6 and 7, a majority of the observations are clustered around the origin. We also note that there are more observations towards the top percentile in this range, due to the sheer number of observations around zero. The clusters between 500 and 1000 square kilometers of land change are interesting because they suggest that there are several nations receiving land back in a very similar amount. When comparing the two graphs, it appears that slightly more of the population is earning more than \$75,000 annually, as corroborated in the descriptive statistics of Table 1.

Figure 6: Land Change and Population Earning <\$15,999-\$19,999

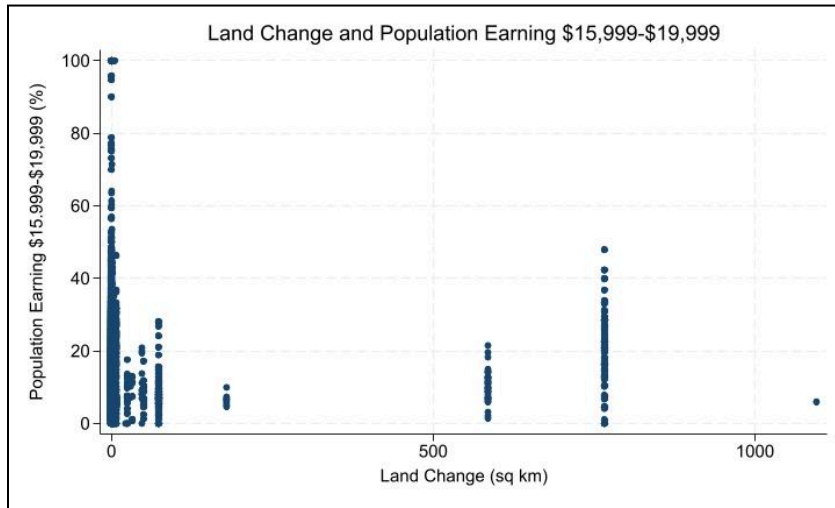
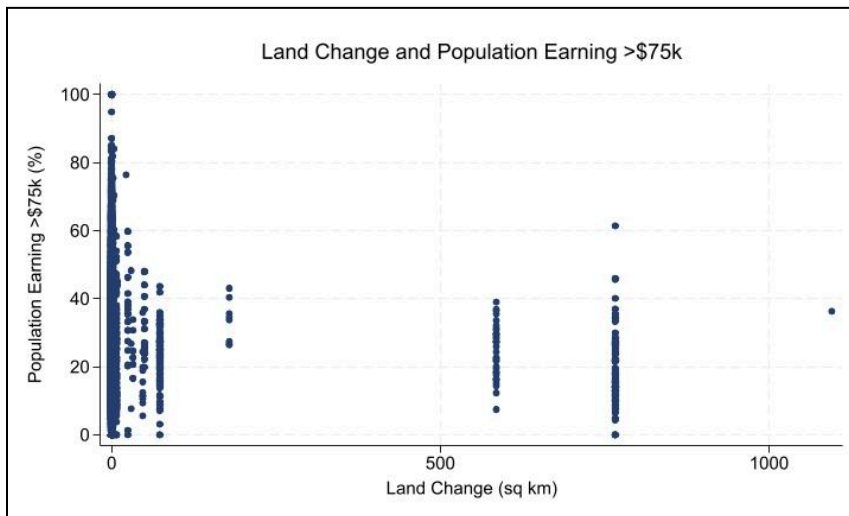


Figure 7: Land Change and Population Earning >\$75,000



Figures 8 and 9 have similar takeaways. One point of note is that in Figure 8 observations are more common in the top percentile, due to the much higher likelihood that individuals will have a living situation of less than 0.5 Occupants per Room. Strangely, based on figure 9 it appears that there is a slight negative correlation with a higher land change and experiencing less than 0.5 Occupants per Room. This is

corroborated in Table 3, though an explanation of this trend is inexplicable. The clusters around the lower percentiles in figure 9 demonstrate that, conversely, there is a low probability that an individual will live in a situation with more than 2.01 Occupants per Room.

Figure 8: Land Change and <0.5 Occupants per Room

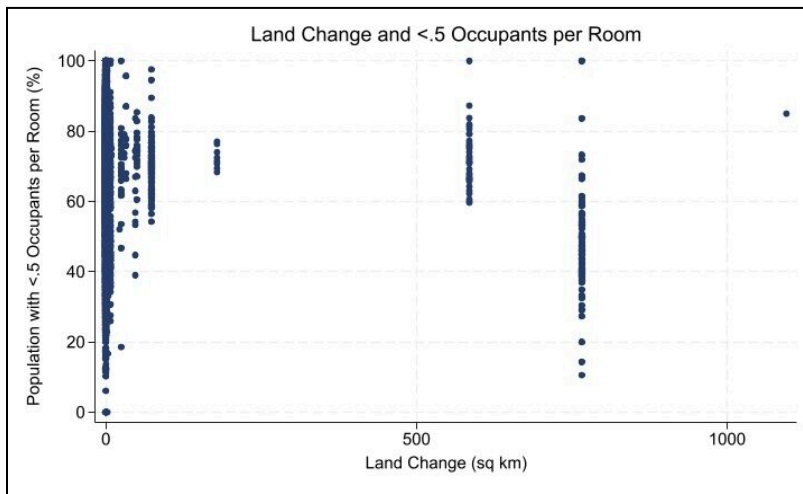
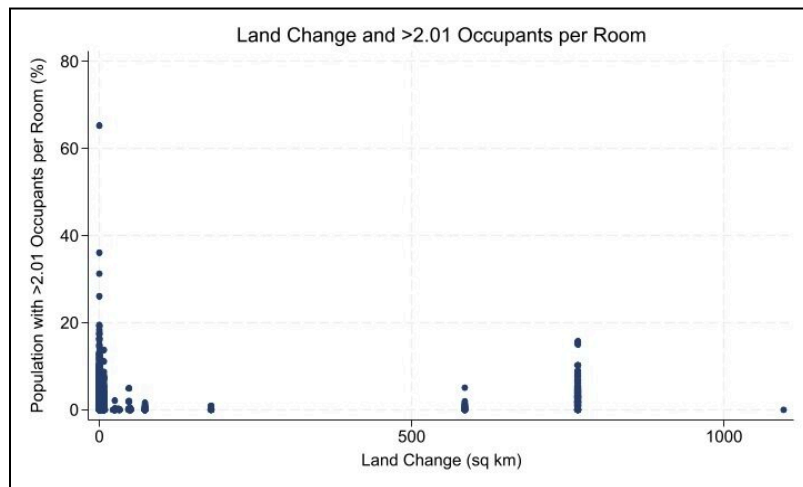


Figure 9: Land Change and >2.01 Occupants per Room



A final area of discussion with these graphs regards the outlier that has had an increase in land area over 1,000 square kilometers. This observation represents the Oneida Nation land back gain in 2019. Taking this observation as an expression of the best case scenario due to the Oneida Nation having the largest land back success of any other nation, there are two points of mention. For one, while the percentage of the population in the lowest income bracket is very low, hovering around 5%, the estimate of individuals in the highest inclusive income bracket is only at 45%. This is a strong illustration of the pattern observed in Table 3, where receiving land back seems to have a negative relationship with being in the lowest income bracket, but not necessarily a strong positive relationship with being in the highest income bracket. This relationship, if casual, could be described as one that lifts individuals out of poverty, but not into the highest income categories. Again, using the Oneida Nation's observation as an example, it appears that there is a much stronger relationship in receiving land back with Occupants per Room. Here we can see that there is a very high estimate of individuals experiencing less than 0.5 Occupants per Room and a very low estimate of individuals experiencing greater than 2.01 Occupants per Room.

Tabular Analysis

Economic Stability. Between the first and second regression, the values and significance levels differ significantly, likely due to *reg3* not capturing the panel data structure of the dataset. This calls into question the accuracy of the first regression which lacks a modeling of random and fixed effects. With that being said, this analysis will focus on the statistically significant estimates in the first regression.

Examining the effects of land back on “Income” it appears that only the effect of “Water Area” is significant. With the average water area gained across all tribal lands is 145.59 square kilometers, this effect is notably small. An increase in the average, here, would result in a .07% increased likelihood of someone earning between \$15,999 and \$19,999. The positive relationship between the water area and experiencing this outcome is questionable, but it was retained throughout all interactions of our model. This relationship holds true for the positive outcome income variables of earning more than \$75,000 annually, where an increase in the average water area would result in a .38% decreased likelihood of falling under that income category.

When it comes to “Educational Attainment”, several more variables are significant depending on whether we are referencing the negative or positive outcome category. “Water Area” is again significant at the 90% confidence interval, exhibiting the same inverse relationship with our dependent variable and a similar sized effect. On the positive side of this variable, “Change in Water Area” is also significant, corroborating the same previously described relationship. “Change in Land Area” is significant here, at the 95% level, where we see an expected negative relationship with the bad outcome variable. With an average land area change of 7,072 square kilometers the effect here would be a 12.39% decrease in the likelihood of dropping out of highschool. Likewise, the effect on the positive side of this variable is a 10.12% increased likelihood of gaining a graduate or professional degree.

Under the Unemployment Rate variable, all explanatory variables are significant except “Change in Water Area” in the positive outcome regression. Since this variable is not two-sided, and the effect sizes and significance levels are fairly consistent throughout

the two tables, we will be discussing only the first table. Beginning with “Land Area”, our first significant finding of this variable, we see a significance level at the 99% confidence interval, but a small effect size. We can interpret this variable's effect as a .43% decrease in the unemployment rate. While the effect of “Change in Land Area” and “Change in Water Area” is consistent with the previous variables’ discussion, with significance levels at the 95% and 90% confidence interval respectively, the effect of “Water Area” seems to have flipped. It appears that an increase in Water Area is correlated with a decrease in unemployment levels. This effect could be interpreted as a .72% decrease in the unemployment rate, using the average change in water area. This is a strange and ambiguous change, that can be explored in further studies.

Finally, a look at the “Occupants per Room” dependent variable reveals significance levels at the 99% confidence interval for both “Land Area” and “Water Area”. It appears that all of the variables here have signs opposite to the effect expected, except the “Land Area” under the negative outcome category. Overall, it appears here that more land area is correlated with worse outcomes related to the “Occupants per Room” variable. This was previously touched upon in discussion of Figures 8 and 9, and it remains unclear as to why this effect would be experienced.

Table 3 - Land Back Negative Outcomes

Earned \$15,999-\$19,999	Sureg Regression	Reg3 Regression	
Land Area	-.207e-6 (.343e-6)	.846e-5 (.386e-6)	**
Water Area	.0004985 *** (.0001408)	.0005026 (.000147)	***
Change in Land Area	.0006396 (.0007053)	.0013176 (.0007696)	*
Change in Water Area	-.0024946	-.0039646	

	(.0044764)		(.0045709)	
9-12 Grade No	(1)		(2)	
Diploma				
Land Area	-.714e-6		-.208e-5	*
	(.440e-6)		(.119e-5)	
Water Area	.0003953	*	.0004944	
	(.0001555)		(.0005174)	
Change in Land Area	-.0017522	**	-.0010617	
	(.0006214)		(.0023413)	
Change in Water Area	.0071851		.0075924	
	(.0047951)		(.0098078)	
Unemployment Rate	(1)		(2)	
Land Area	-.62e-6	***	-.453e-5	***
	(.626e-6)		(.753e-6)	
Water Area	-.0005513	**	-.0009139	***
	(.0001935)		(.0002352)	
Change in Land Area	-.0031856	**	-.0027683	***
	(.0010217)		(.000988)	
Change in Water Area	.0079589	*	.0071908	*
	(.0032017)		(.003892)	
Greater than 2.01	(1)		(2)	
Occupants Per Room				
Land Area	.237e-5	***	.258e-5	***
	(.192e-6)		(.196e-6)	
Water Area	-.0005792	***	-.0006211	***
	(.0000399)		(.0000514)	
Change in Land Area	.0004672		.0005577	
	(.0003403)		(.0003531)	
Change in Water Area	.001822		.0018341	*
	(.0009609)		(.0011141)	

Notes: *** p<.01, ** p<.05, * p<.1. Robust standard error is in parentheses.

Table 4 - Land Back Positive Outcomes

Earned > \$75,000	(1)		(2)	
Land Area	.235e-5		-.1057e-5	***
	(.000703)		(.151e-5)	
Water Area	-.0026365	***	-.0040784	***
	(.0003783)		(.000566)	
Change in Land Area	-.0024889		-.008174	***
	(.0009938)		(.0023941)	
Change in Water Area	-.0021199		.0131806	
	(.0056772)		(.0090249)	
Graduate or	(1)		(2)	
Professional Degree				

Land Area	-.307e-6 (.00000283)		.586e-6 (.00000281)	**
Water Area	.000454 (.0001858)	*	.000258 (.0001836)	
Change in Land Area	.0014322 (.0005025)	**	.0017064 (.0005269)	***
Change in Water Area	-.0054833 (.0026535)	*	-.0083721 (.0028193)	***
<hr/>				
Unemployment Rate	(1)		(2)	
Land Area	-.582e-5 (.653e-6)	***	-.501e-5 (.655e-6)	***
Water Area	-.0007473 (.0001971)	***	-.0014289 (.00021)	***
Change in Land Area	-.0032154 (.0010293)	**	-.0030501 (.0010093)	***
Change in Water Area	.0049924 (.0031613)		.0037282 (.0033708)	
<hr/>				
Less than 0.5 Occupants Per Room	(1)		(2)	
Land Area	.237e-5 (.192e-6)	***	-.839e-5 (.848e-6)	***
Water Area	.0005792 (.399e-5)	***	.779e-5 (.0003375)	
Change in Land Area	.0004672 (.0003403)		.0007849 (.0012749)	
Change in Water Area	.001822 (.0009609)		.0211134 (.0068613)	***

Notes: *** p<.01, ** p<.05, * p<.1. Robust standard error is in parentheses.

Interaction Terms and Indicators. In order to best understand the effect of the type of land tenure on economic stability outcomes, we will discuss the results of a few of the dependent variables. Beginning with the “Income” variable, the ‘Pueblo of’ land tenure tract was the only under this category that showed statistically significant for both the best-case and worst case-scenario outcomes. Based on these results it appears that gaining one square kilometer of land back under a ‘Pueblo of’ land tenure would reduce the chance of someone in the population earning \$15,999-\$19,999 by 117%, and earning

more than \$75,000 by 233%. This would seem to suggest that the majority of the population experiences a range of income somewhere between these two income ranges. However, due to the very small average changes and maximum values of these land designation variables, one must be careful in interpreting these values. The ‘Pueblo of’ land tenure, for example, only has a maximum value of .014976, so it wouldn’t ever be raised by a degree of magnitude 100 times larger. It also appears that the measurement of the ‘Trust Land’ designation is inaccurate, due to the large scale of the estimate which has an effect in the millions for each of our dependent variables. This effect should be ignored in this analysis, but given further attention in any further research.

Moving onto “Educational Attainment” two land designations show up as statistically significant. Looking at the ‘Community’ land designation, it appears that living under this type of land designation would increase the chance of any one individual; dropping out of high school by 2.02% and decrease the chance of earning a graduate or professional degree by 1.51%. As for the ‘Tribal Designated Statistical Area’ designation, it appears that the likelihood of falling into the category of “9th-12th No Diploma” decreases by 103% with a one square kilometer increase in land area. Whereas, the chance of falling under the “Graduate or Professional Degree” category increases by 361%. Again, this is an overestimate, due to these variables never increasing by one square kilometer of measure.

The same interpretations follow for the other two variables “Unemployment” and “Occupants per Room”. Clearly the results are variable across time and subcategory of our dependent variables. One thing that does remain apparent, however, is the fact that there are some reasonably large effects when it comes to the type of land designation

tract. This should be kept in mind when it comes to considerations about under what structures it is best to give land back.

Table 5 - Land Back Interaction Terms

Earned \$15,999-\$19,999		Earned >\$75,000	
Indigenous*Land Area	.211e-5 (.166e-5)		.409e-5 (.295e-5)
Colony	-18.6257400 ** (2.6733630) *		3.048022 (21.45473)
Community	-1.7653240 ** (.4293271) *		1.29416 (1.983932)
Indian Colony	42.08469 * (21.27932)		297.7872 (139.1075)
Indian Community	-4.0745860 (3.2835850)		.1979541 (5.501003)
Indian Rancheria	-3.5886910 (7.082094)		45.9193 (25.19345)
Indian Reservation	-.45198980 (.8183113)		-.7809367 (2.078291)
Off Reservation Trust Land	-270.2669 (138.0006458)		-186.3228 (362.251)
Oklahoma Tribal Statistical Area	-1.119858 ** (.3684477)		1.169134 (1.169134)
Pueblo	-1.1432010 ** (.368927)		1.153791 (1.890026)
Pueblo De	-25.989940 (43.92785)		-778.1487 (409.1393)
Pueblo Of	-117.928500 ** (13.843720) *		-233.8198 *** (31.85464)
Ranch Reservation	-7.7033940 ** (2.046981) *		15.1617 (12.87285)
Rancheria	-1.517660 ** (.370146) *		1.97034 (1.890895)
Reservation	-1.1208010 ** (.3685075)		1.161404 (1.889691)
State Designated Tribal Statistical Area	-1.117678 ** (.3685602)		1.159806 (1.889689)
Tribal Designated Statistical Area	-23.12498 (35.74939)		-434.9747 *** (94.89348)
Trust Land	7570674 ** (2606038)		-6236240 (5575103)
9-12 Grade No Diploma		Graduate or Professional Degree	
Indigenous*Land Area	.132e-5		-.423e-5

	(.165e-5)		(.256e-5)	
Colony	-56.54773	**	-16.87939	
	(8.267535)	*	(19.72483)	
Community	2.019869	**	-1.59396	**
	(.514095)	*	(.6068162)	
Indian Colony	-4.798319		-101.7315	*
	(23.41731)		(47.87695)	
Indian Community	-11.99531	**	-6.516699	*
	(1.15947)	*	(2.975301)	
Indian Rancheria	87.0072	**	-51.21216	
	(15.32258)	*	(57.6302)	
Indian Reservation	.1866561		-.6820388	
	(.9409357)		(.6275953)	
Off-Reservation Trust	201.7782	**	-144.7302	
Land	(172.3218)	*	(-144.7302)	
Oklahoma Tribal	1.462404	**	-.8407113	
Statistical Area	(.3844608)	*	(.5112761)	
Pueblo	1.411927		-.7985773	
	(.3855347)		(.5117656)	
Pueblo De	-218.4813	**	429.2424	
	(190.4356)	*	(247.7442)	
Pueblo Of	-66.23069		535.3755	***
	(15.35221)		(16.63399)	
Ranch Reservation	8.480513	**	-8.195472	
	(3.758459)	*	(5.49833)	
Rancheria	.9231727		-1.135945	*
	(.3873053)		(.5135886)	
Reservation	1.453865	**	-.8385798	
	(.3844834)	*	(.5112725)	
State Designated Tribal	1.453917	**	-.8406165	
Statistical Area	(.384502)	*	(.5112553)	
Tribal Designated	-103.463	**	361.0552	***
Statistical Area	29.52538	*	(43.37384)	
Trust Land	-3887646	**	4937453	
	(305678)	*	(4725685)	
Unemployment Rate				
Indigenous*Land Area	-.8963e-5	**	-.85e-5	**
	(.251e-5)	*	(.248e-5)	
Colony	7.179275		7.163349	
	(4.02003)		(3.838991)	
Community	-.9670259		-.9995793	
	(1.068058)		(.9987682)	
Indian Colony	30.30329		46.66451	
	(36.85516)		(32.91695)	
Indian Community	9.178703		8.197691	
	(7.287788)		(7.084704)	
Indian Rancheria	-67.77361	**	-69.02764	***
	(12.05514)	*	(16.49935)	

Indian Reservation	-1.53631 (1.120281)		-1.542284 (1.064026)	
Off Reservation Trust Land	-145.0064 (332.4299)		-195.0869 (338.675)	
Oklahoma Tribal Statistical Area	-8546839 (.9939611)		-7351749 (.9292106)	
Pueblo	-7718011 (.9956508)		-6592988 (.9311212)	
Pueblo De	-246.5657 (135.0257)		-289.8488 (133.9055)	*
Pueblo Of	-165.2148 (20.0218)	** *	-170.0687 (20.09301)	***
Ranch Reservation	-1.076933 (1.498886)		-1.600014 (1.373366)	
Rancheria	.4415516 (.9963226)		.5204399 (.9316557)	
Reservation	-.8569747 (.9939645)		-.7383337 (.9292142)	
State Designated Tribal Statistical Area	-.8659864 (.9939576)		-.747336 (.929203)	
Tribal Designated Statistical Area	-36.1051 (27.80714)		-50.36928 (30.89342)	
Trust Land	800665.5 (4258788)		860040.2 (4150534)	

Greater than 2.01 Occupants Per Room			Less than 0.5 Occupants Per Room	
Indigenous*Land Area	.221e-5 (.923e-6)	*	-171e-5 (.661e-6)	
Colony	-1.489697 (.7678125)		-9.542269 (40.33002)	**
Community	-.0455908 (.0392137)		3.925957 (1.421121)	**
Indian Colony	3.730756 (2.572224)		-102.3141 (30.93524)	
Indian Community	.0874494 (.6376668)		.6594924 (14.3279)	
Indian Rancheria	-2.385729 (.9556159)		181.0408 (134.7378)	
Indian Reservation	-.3924739 (.0853355)	***	3.215111 (1.593301)	*
Off Reservation Trust Land	-27.95704 (24.33388)		1.593301 (445.3636)	*
Oklahoma Tribal Statistical Area	.000453 (.0290915)		1.896795 (.9103974)	*
Pueblo	-.0011896 (.0298601)		1.960876 (.9120183)	

Pueblo De	-38.57918 (20.4155)		190.3768 (166.9934)	
Pueblo Of	2.52199 (3.767393)		287.3014 (30.8506)	***
Ranch Reservation	-1.239671 (.3402055)	***	23.09994 (6.406461)	***
Rancheria	-.0095369 (.0320704)		3.056153 (.919581)	**
Reservation	.0008684 (.0290892)		1.912081 (.9104353)	*
State Designated Tribal Statistical Area	.0019794 (.0290585)		1.915617 (.9103611)	*
Tribal Designated Statistical Area	42.87708 (4.952885)	***	-312.5949 (78.14601)	***
Trust Land	-263687 (95601.13)	**	-1139668 (1351518)	

Notes: *** p<.01, ** p<.05, * p<.1. Robust standard error is in parentheses.

Cultural Strength. None of the explanatory variables relating land back movements in Table 6 are statistically significant. This is likely due to both omitted variables and the structure of the data. As mentioned previously, due to a lack of tribal level data for both the “Language” and “Ancestry” variables, there is a serious limitation to this model. Due to this lack of specificity within the “Ancestry” variable it was not used in this model, which could be leading to a lack of significance in addition to an over/underestimation of the coefficient estimates.

In addition to the estimates below, this regression also includes estimates of the effect segregated down to the tribal level. While most of these are not significant, there are some that provide a view into which tribal lands have a strong likelihood of speaking a language in the “Other” category and which do not. San Felipe Pueblo and Zuni Pueblo, for example, are 34.80% and 22.31% more likely to speak a language in the “Other” category at home. This aligns with research into these nations, which have made a concerted effort to maintain the strength of their native languages. On the other hand, the

Crow Creek Reservation, Duck Valley Reservation, and the Hoopa Valley Reservation are 15.95%, 22.47%, and 25.11% less likely to speak a language in this “Other” category. It is unclear as to why these results are statistically significant in the opposite direction, especially when most reservations do not have a strong history of language revitalization.

Table 6 - Land Back & Language

Other Language	Coefficient	Robust Std. Error	t	P>t	[95% Confidence Interval]
Land Area	-.0044367	.0059896	-0.74	0.459	-0.016 0.007
Water Area	.0071203	.0047224	1.51	0.132	-0.002 0.016
Change in Land Area	.0034442	.0061565	0.56	0.576	-0.008 0.016
Change in Water Area	-.0059800	.0080514	-0.74	0.458	-0.022 0.010
Constant	12.9310000	19.4800000	-0.660	0.507	-51.114 25.252

Conclusion

This study originally aimed to decompose the effects of land back movements within a ten year time span (2011-2021). This is the first economic analysis of this issue. While the original scope was to understand these effects through several indicators of well-being, the dependent variables were narrowed down to purely economic indicators.

As expected, there is a positive relationship between land back movements and our suite of economic stability variables. Although the effect of gaining one square kilometer of land back is noticeably small, this must be taken with the understanding that land is typically gained in larger increments than one square kilometer of land; and what is being gained back is much less than what is being asked for.

One explanation for this small effect is that the land on and around Indigenous reservations is not as economically valuable. This is, in effect, reaffirming an issue that was already known. As displayed in Farrell's study on the effects of land dispossession on North American Indigenous peoples, tribal land experiences higher exposure to climate risks, reduced mineral value and agricultural integrity, and is often proximal to highly bureaucratic land that restricts expansion and traditional practice. One implication is that if land were taken back in more economically productive and culturally significant regions (such as federally managed park lands and wilderness areas) more gains would be made.

Another limitation in the available data is that we cannot reasonably assume there is a one-sided effect of gaining land back on measures of economic stability. In reality, it is likely that the effect measured in the coefficients exhibits a two-sided correlation. One way this might be true is that the level of tribal resources acts as a confounder variable

correlated with both improvement in economic outcomes and in increased buy back initiatives. Further research, then, should attempt to disaggregate these effects by adding a variable that describes the economic resources of a tribal nation or one that details how the land was gained back.

The cultural strength indicators, as measured through language use, returned non-statistically significant results. This question warrants further analysis, however, due to the limitation in the data available.

There are several other areas in which future research can improve upon the model put forward in this paper. For one, the regression tool used did not fit the structure needed to most accurately analyze the data, due to a challenge in making the *xtsur* module run. Another point of issue is that the tools we used assume normal distribution of our variables, when this was not the case. We also might anticipate that land back movements take some time to stimulate effects in the economy, and so lagged effects would have been a suitable choice for analysis as well. In any case, limitations in how the data was structured and tools that were used in the analysis, should be kept in mind during further research to improve the closeness of these estimates.

These limitations should not be taken to mean that land back initiatives are not valuable in their own right. While economic stability is one measure that can be used to represent quality of life, other indicators such as cultural strength, and regional environmental health are likely to be more representative of the value added through land back movements.

Unfortunately, there was a lack of data to accurately answer these questions at this time. Though deeply disappointing, it is not surprising that Indigenous groups in North

America were simply not represented in the data. In both the “Ancestry” and “Language Spoken at Home” tables of the ACS, there were no categories that represented Indigenous ancestral or language groups. There is something to be said here about the ways in which data has and continues to dehumanize and other marginalized communities, as opposed to working to support them. In this way, this study reaffirms this problem as one that needs to be addressed in future research and data organization initiatives.

References

- Anderson, T. L., & Lueck, D. (1992, October). Land Tenure and Agricultural Productivity on Indian Reservations. *The Journal of Law and Economics*, 35(2), 427–454.
<https://doi.org/10.1086/467261>
- Anderson, T. L., & Parker, D. P. (2008, December 22). Economic development lessons from and for North American Indian economies*. *Australian Journal of Agricultural and Resource Economics*, 53(1), 105–127.
<https://doi.org/10.1111/j.1467-8489.2007.00426.x>
- Anderson, T., & Parker, D. (2008, November). 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>
- Aragón, F. M., & Kessler, A. S. (2020, May). Property rights on First Nations reserve land. *Canadian Journal of Economics/Revue Canadienne D'économique*, 53(2), 460–495. <https://doi.org/10.1111/caje.12434>
- Aragón. (2015, March 14). Do better property rights improve local income?: Evidence from First Nations' treaties. *Journal of Development Economics*, 116(2015), 43–56.
<https://doi.org/10.1016/j.jdeveco.2015.03.004>
- Bauder, H., & Mueller, R. (2021, May 5). Westphalian Vs. Indigenous Sovereignty: Challenging

Colonial Territorial Governance. *Geopolitics*, 28(1), 156–173.

<https://doi.org/10.1080/14650045.2021.1920577>

Bender, A. (2022, January 19). *Landback is leading to real victories*. Communist Party USA.

<https://cpusa.org/article/landback-is-leading-to-real-victories/>

Cornell, S., & Kalt, J. P. (1994, May). What Can Tribes Do? Strategies and Institutions in American Indian Economic Development. *The American Indian Quarterly*, 18(2).

<https://doi.org/10.2307/1185252>

Cornell, S., & Kalt, J. P. (2000, January). Where's the glue? Institutional and cultural foundations

of American Indian economic development. *The Journal of Socio-Economics*, 29(5), 443–470. [https://doi.org/10.1016/s1053-5357\(00\)00080-9](https://doi.org/10.1016/s1053-5357(00)00080-9)

Deloria, P. J., Lomawaima, K. T., Brayboy, B. M. J., Trahant, M. N., Ghiglion, L., Medin, D., &

Blackhawk, N. (2018, March). Unfolding Futures: Indigenous Ways of Knowing for the Twenty-First Century. *Daedalus*, 147(2), 6–16.

https://doi.org/10.1162/daed_a_00485

Elmahrek, Adam, and Paul Pringle. “Two Tribes Aren’t Recognized Federally. yet Members

Won \$500 Million in Minority Contracts.” *Los Angeles Times*, Los Angeles Times, 31 Dec. 2019,

www.latimes.com/california/story/2019-12-31/native-american-tribes-alabama-minority-contracts.

Farrell, J., Burow, P. B., McConnell, K., Bayham, J., Whyte, K., & Koss, G. (2021, October 29).

Effects of land dispossession and forced migration on Indigenous peoples in North America. *Science*, 374(6567). <https://doi.org/10.1126/science.abe4943>

First Nations Property Ownership Initiative. (2010, March). *Clearing the Path*.

George, P., & Kuhn, P. (1994, February). The Size and Structure of Native-White Wage

Differentials in Canada. *The Canadian Journal of Economics*, 27(1), 20.

<https://doi.org/10.2307/135800>

Goodluck. (2023, September 11). *How the Land Back Movement Is Unraveling Manifest Destiny*. Sierra Club. Retrieved November 13, 2023, from <https://www.sierraclub.org/sierra/2023-3-fall/feature/how-land-back-movement-unraveling-manifest-destiny>

Guiso, L., Sapienza, P., & Zingales, L. (2006, May 1). Does Culture Affect Economic Outcomes? *Journal of Economic Perspectives*, 20(2), 23–48.

<https://doi.org/10.1257/jep.20.2.23>

Indian Land Tenure Foundation. (n.d.). *Issues – ILTF*. ILTF. Retrieved November 13, 2023, from

<https://iltf.org/land-issues/issues/>

ILTF, 2016, timeline

Kennedy. (2022, January 5). This Land Is Not Our Land, This Land is Their Land: Returning

National Park Lands to Their Rightful Protectors. *American Indian Law Journal*, 10(1), Article 3. <https://digitalcommons.law.seattleu.edu/ailj/vol10/iss1/3>

Kiiwetinepinesiik Stark, H. (2012). Marked by fire: Anishinaabe articulations of nationhood in treaty making with the United States and Canada. *American Indian Quarterly*, 36(2), 119. <https://doi.org/10.5250/amerindiquar.36.2.0119>

Lee, A. (2021, September 21). *Decolonize the Parks*. Anti-Racism Daily. <https://the-ard.com/2021/07/14/decolonize-the-parks-anti-racism-daily/>

McDermott, R., O’Dea, K., Rowley, K., Knight, S., & Burgess, P. (1998, October). Beneficial impact of the Homelands Movement on health outcomes in central Australian Aborigines. *Australian and New Zealand Journal of Public Health*, 22(6), 653–658. <https://doi.org/10.1111/j.1467-842x.1998.tb01464.x>

Mitchell, & Enns. (2014, April). The UN declaration on the rights of indigenous peoples: Monitoring and realizing indigenous rights in Canada. In *JSTOR*. Centre for International Governance Innovation. Retrieved November 13, 2023, from <https://www.jstor.org/stable/pdf/resrep05227.pdf>

National Institutes of Health. (n.d.). *1838: Cherokee die on Trail of Tears*. U.S. National Library of Medicine. <https://www.nlm.nih.gov/nativevoices/timeline/296.html>

Native Land Information System. (2023, November 1). *Data Sovereignty - Native Land Information System*. Retrieved November 14, 2023, from <https://nativeland.info/about/data-sovereignty/>

Native Plains Reservation Aid. (n.d.). *History and Culture: Allotment Act - 1887 - American*

Indian Relief Council is now Northern Plains Reservation Aid. Native Partnership. Retrieved November 13, 2023, from http://www.nativepartnership.org/site/PageServer?pagename=airc_hist_allotmentact

Nesterak, M. (2022, January 6). *The 1950s plan to erase Indian country.* Uprooted | APM Reports. <https://www.apmreports.org/episode/2019/11/01/uprooted-the-1950s-plan-to-erase-indian-country>

Oliff, H. (2011, March 3). *Treaties Made, Treaties Broken.* Partnership with Native Americans.

<http://blog.nrcprograms.org/treaties-made-treaties-broken/>

Pieratos, N. A., Manning, S. S., & Tilsen, N. (2020, December 8). Land Back: A meta narrative

to help indigenous people show up as movement leaders. *Leadership*, 17(1), 47–61. <https://doi.org/10.1177/1742715020976204>

Robbins, J. (2021, June 3). *How returning lands to Native Tribes is helping protect nature.* Yale E360.

<https://e360.yale.edu/features/how-returning-lands-to-native-tribes-is-helping-protect-nature>

Sams, C. F. (2022, March 10). *Tribal Co-Management of Federal Lands.* U.S. Department of the

Interior. <https://www.doi.gov/ocl/tribal-co-management-federal-lands>

Slattery, B. (1991). Aboriginal Sovereignty and Imperial claims. *Osgoode Hall Law Journal*, 29(4), 681–703. <https://doi.org/10.60082/2817-5069.1734>

Trosper. (1978, September). American Indian Relative Ranching Efficiency. *The American Economic Review*, 68(4), 503–516.

https://www.jstor.org/stable/1808922?casa_token=lvM74xDJMjUAAAAA%3AmWSRsc0CKnn7EoBiEg43fswPHVd0QKR_7pBEMRGR8_RitnSK786TOvbx45w9e_scDvn1YoXWAdQgElcNGO9bbdKSGPzjoHaS0bpLluqvqq_0TM9Zw

Three million acres of land returned to tribes through Interior Department's Land Buy-Back Program for tribal nations. U.S. Department of the Interior. (2023, December 4). <https://www.doi.gov/pressreleases/three-million-acres-land-returned-tribes-through-interior-departments-land-buy-back>

U.S. Government Accountability Office. (2012, April 12). *Indian Issues: Federal Funding for Non-Federally Recognized Tribes*. U.S. GAO. Retrieved November 13, 2023, from <https://www.gao.gov/products/gao-12-348#:~:text=Of%20the%20approximately%20400%20non,fiscal%20years%202007%20through%202010>.

UN Department of Economic and Social Affairs Indigenous Peoples. (n.d.). *Health | United*

Nations For Indigenous Peoples. UN. Retrieved November 13, 2023, from
<https://www.un.org/development/desa/indigenouspeoples/mandated-areas1/health.html>

United Nations. (2012, May 8). *“doctrine of Discovery”, used for centuries to justify seizure of*

indigenous land, subjugate peoples, must be repudiated by United Nations, permanent forum told | UN press. United Nations.

<https://press.un.org/en/2012/hr5088.doc.htm>

Appendix

Variable Definitions

Age of Population. This data was obtained from the American Community Survey Subject Table S0101, titled “Age and Sex” from years 2011 through 2021. The table records an estimate of the population that falls under sex categories as grouped by specified age categories. All data under the ‘Age’ label was preserved by adding the number of recorded males and recorded females within their respective categories. Each age range is expressed in terms of percentages of the total population. The total population responding to this question by Zip Code, is also preserved as a variable. The age categories are as follows:

Under 5 years	45 to 49 years
5 to 9 years	50 to 54 years
10 to 14 years	55 to 59 years
15 to 19 years	60 to 64 years
20 to 24 years	65 to 69 years
25 to 29 years	70 to 74 years
30 to 34 years	75 to 79 years
35 to 39 years	80 to 84 years
40 to 44 years	85 years and over

Educational Attainment of Population. This data was obtained from the American Community Survey Subject Table S1501, titled “Educational Attainment” from years 2011 through 2021. The table records an estimate of the population that falls under several demographic categories as grouped by specified educational attainment categories. All data under the ‘Age by Educational Attainment: Population 25 years or Over’ label was preserved. Each level of education is expressed in terms of percentages of the total population. The

total population responding to this question by Zip Code, is also preserved as a variable. The educational attainment categories are as follows:

- Less than 9th grade
- 9th to 12th grade, no diploma
- High school graduate (includes equivalency)
- Some college, no degree
- Associate's degree
- Bachelor's degree
- Graduate or professional degree
- High school graduate or higher
- Bachelor's degree or higher

Citizenship Status of Population. This data was obtained from the American Community Survey Detailed Table B25014, titled “Place of Birth by Nativity and Citizenship Status” from years 2011 through 2021. The table records an estimate of the population that falls under specific citizenship as grouped by place of birth. All data at the level of the ‘Native’ label was preserved. All data directly nested underneath the ‘Foreign’ label was preserved. Each category of citizenship is expressed in terms of percentages of the total population. The total population responding to this question by Zip Code, is also preserved as a variable. The citizenship categories are as follows:

- Native
- Foreign born: naturalized U.S. citizen
- Foreign born: not a U.S. citizen

Change in Land Area. The source data of this calculated variable was obtained from the AIANNH Areas Shapefile from years 2011 through 2021. Land area

from year y_{i+1} was subtracted from y_i to obtain the change in land area between those two years.

Change in Water Area. The source data of this calculated variable was obtained from the AIANNH Areas Shapefile from years 2011 through 2021. Water area from year y_{i+1} was subtracted from y_i to obtain the change in water area between those two years.

Fertility of Women in the Population. This data was obtained from the American Community Survey Subject Table S1301, titled “Fertility” from years 2011 through 2021. The table records an estimate of the number of women in the population who have given birth in the past 12 months against several demographic categories. All data under the ‘Women with births in the past 12 months’ label was preserved. This variable is expressed in terms of percentage of the total population who would be labeled fertile under this definition. The total population responding to this question by Zip Code, is also preserved as a variable.

Income of Population. This data was obtained from the American Community Survey Detailed Table B19001, titled “Household Income in the Past 12 Months (in Inflation-Adjusted Dollars)” from years 2011 through 2021. The table records an estimate of the population that falls under specified income categories. Each level of income is expressed in terms of percentages of the total population. The

total population responding to this question by Zip Code, is also preserved as a variable. The income categories are as follows:

Less than \$10,000	\$45,000 to \$49,999
\$10,000 to \$14,999	\$50,000 to \$59,999
\$15,000 to \$19,999	\$60,000 to \$74,999
\$20,000 to \$24,999	\$75,000 to \$99,999
\$25,000 to \$29,999	\$100,000 to \$124,999
\$30,000 to \$34,999	\$125,000 to \$149,999
\$35,000 to \$39,999	\$150,000 to \$199,999
\$40,000 to \$44,999	\$200,000 or more

ID. The source data of this calculated variable was obtained from the AIANNH Areas Shapefile and the LODS crosswalk file from years 2011 through 2021. This variable is a unique identifier used to uniquely describe each observation. It is an encoded string variable combining the Zip Code, Reservation Description, and State variables.

Language Spoken at Home within Population. This data was obtained from the American Community Survey Subject Table S1601, titled “Language Spoken at Home” from years 2011 through 2021. The table records an estimate of the population that falls under several age/citizenship categories as grouped by those that speak specific language categories. All data directly nested under the ‘Population 5 years and over: Speak a language other than English’ label was preserved. The ‘Speaks only English’ variable was also preserved. Each category of language spoken is expressed in terms of percentages of the total population.

The total population responding to this question by Zip Code, is also preserved as a variable. The language categories are as follows:

- English Only
- Spanish
- Other Indo-European Languages
- Asian and Pacific Island Languages
- Other languages

Land area. This data was obtained from the AIANNH Areas Shapefile from years 2011 through 2021. It records the land area of each tribal land designation in square kilometers.

Marital Status of Population. This data was obtained from the American Community Survey Subject Table S1201, titled “Marital Status” from years 2011 through 2021. The table records an estimate of the population that falls under several demographic categories as grouped by specific marital status categories. All data at the level of the ‘Population 15 years and over’ label was preserved against our marital status categories. Each category of marital status is expressed in terms of percentages of the total population. The total population responding to this question by Zip Code, is also preserved as a variable. The marital status categories are as follows:

- Now married (except separated)
- Widowed
- Divorced
- Seperated
- Never married

Occupants per Room within Population. This data was obtained from the American Community Survey Detailed Table B25014, titled “Tenure by Occupants per Room” from years 2011 through 2021. The table records an estimate of the population that falls under specific tenure categories as grouped by ranges of occupants per room. All data was preserved by adding the number of owner occupied and renter occupied estimates within their respective categories. Each range of occupants per room is expressed in terms of percentages of the total population. The total population responding to this question by Zip Code, is also preserved as a variable. The occupants per room categories are as follows:

- 0.50 or less occupants per room
- 0.51 to 1.00 occupants per room
- 1.01 to 1.50 occupants per room
- 1.51 to 2.00 occupants per room
- 2.01 or more occupants per room

Poverty Rate of Population. This data was obtained from the American Community Survey Subject Table S1702, titled “Poverty Status in the past 12 Months of Families” from years 2011 through 2021. The table records an estimate of the population that falls under several demographic categories as grouped by poverty rate. All data in the ‘Percent Below Poverty level’ category was preserved. The total population responding to this question by Zip Code, is also preserved as a variable.

Race of Population. This data was obtained from the American Community Survey Detailed Table B02001, titled “Race” from years 2011 through 2021. The

table records an estimate of the population that falls under specified racial categories. In addition to the ‘[Race] alone’ categories all data at the level of the ‘Two or More Races’ label was preserved. Each racial group is expressed in terms of percentages of the total population. The total population responding to this question by Zip Code, is also preserved as a variable. The racial categories are as follows:

- White alone
- Black or African American alone
- American Indian and Alaska Native alone
- Asian alone
- Native Hawaiian and Other Pacific Islander alone
- Some Other Race alone
- Two or More Races

Reservation Description. This data was obtained from both the AIANNH Areas Shapefile and the LODES crosswalk file. It was used to merge the variables of interest from the AIANNH file with Zip Codes, for the purpose of later merging on Zip Code with the American Community Survey data.

Sex of Population. This data was obtained from the American Community Survey Subject Table S0101, titled “Age and Sex” from years 2011 through 2021. The table records an estimate of the population that falls under sex categories as grouped by specified age categories. All data under the ‘Male’ and ‘Female’ labels were preserved. Each sex variable is expressed in terms of percentages of the total population. The total population responding to this question by Zip Code, is also preserved as a variable. The sex categories are Male and Female.

Unemployment Rate of Population. This data was obtained from the American Community Survey Subject Table S2301, titled “Employment Status” from years 2011 through 2021. The table records an estimate of the population 16 and over that falls under employment status categories as grouped by several demographic categories. All data under the ‘Unemployment Rate’ label was preserved, and is naturally expressed in terms of percentage of the total population that is unemployed. The total population responding to this question by Zip Code, is also preserved as a variable.

Veteran Status of Population. This data was obtained from the American Community Survey Subject Table S2101, titled “Veteran Status” from years 2011 through 2021. The table records an estimate of the population that falls under veteran status categories as grouped by several demographic categories as grouped. All data under the ‘Veterans’ and ‘Nonveterans’ labels were preserved. Each veteran status variable is expressed in terms of percentages of the total population. The total population responding to this question by Zip Code, is also preserved as a variable. The veteran status categories are Veteran and Nonveteran.

Water area. This data was obtained from the AIANNH Areas Shapefile from years 2011 through 2021. It records the water area of each tribal land designation in square kilometers.

Year. This variable is a common identifier of all datasets. It was used to uniquely merge each of the data sets. The range of years within this variable are 2011 through 2021.

Zip Code. This data was obtained from both the American Community Survey data and the LODES crosswalk file. It was used to merge the demographic information from the ACS with the newly merged dataset between the LODES crosswalk file and the AIANNH Areas Shapefile.

Summary Statistics

Age of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
<5 years old (%)	18218	2.922	3.74	0	130.69
5-9 years old (%)	18218	3.106	3.817	0	92.778
10-14 years old (%)	18218	3.227	3.846	0	88.667
15-19 years old (%)	18218	3.124	4.034	0	136.19
20-24 years old (%)	18218	2.916	19.015	0	2500
25-29 years old (%)	18218	2.789	3.981	0	118.966
30-34 years old (%)	18218	2.75	4.081	0	208.333
35-39 years old (%)	18218	2.692	3.604	0	156.129
40-44 years old (%)	18218	2.668	4.132	0	330.909
45-49 years old (%)	18218	3.383	32.463	0	3333.333
50-54 years old (%)	18218	3.586	10.469	0	815.714
55-59 years old (%)	18218	4.504	76.675	0	10000
60-64 years old (%)	18218	3.866	9.244	0	473.077
65-69 years old (%)	18218	3.202	8.609	0	909.091
70-74 years old (%)	18218	2.707	16.305	0	2000
75-79 years old (%)	18218	1.792	3.674	0	158.571
80-84 years old (%)	18218	1.176	5.998	0	555.556
>85 years old (%)	18218	1.023	4.084	0	311.333

Educational Attainment of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
----------	-----	------	-----------	-----	-----

<9th grade	18218	3.491	5.811	0	192
9th-12 No Diploma	18218	6.746	12.279	0	909.091
High School	18218	24.085	20.422	0	612.857
Some College	18218	17.475	105.9	0	10000
Associate's	18218	6.048	9.129	0	815.714
Bachelor's	18218	8.27	10.716	0	666.667
Graduate/Professional	18218	3.98	5.535	0	300

Citizenship Status of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Native (%)	18218	96.004	6.502	0	100
Foreign: Naturalized (%)	18218	1.624	2.694	0	49.254
Foreign: Not Naturalized (%)	18218	2.374	4.692	0	100

Change in Land Area

Variable	Obs	Mean	Std. Dev.	Min	Max
Change in Land Area	18281	5.44	58.459	0	1095.456

Change in Water Area

Variable	Obs	Mean	Std. Dev.	Min	Max
Change in Water Area	18281	.175	3.397	0	150.531

Fertility of Women in the Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Women with Births in the Past 12 Months (%)	18082	5.994	5.53	0	100

Income of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
<\$10,000 (%)	18222	9.413	7.61	0	100
\$15,000-19,999 (%)	18222	6.494	4.725	0	100
\$20,000-24,999 (%)	18222	6.33	4.126	0	76.19
\$25,000-29,999 (%)	18222	6.063	4.583	0	100
\$30,000-34,999 (%)	18222	5.847	4.194	0	100
\$35,000-39,999 (%)	18222	5.283	3.8	0	100

\$40,000-44,999 (%)	18222	5.132	3.898	0	100
\$45,000-49,999 (%)	18222	4.457	3.228	0	100
\$50,000-59,999 (%)	18222	8.258	4.795	0	100
\$60,000-74,999 (%)	18222	9.903	5.061	0	100
\$75,000-79,999 (%)	18222	10.81	5.574	0	100
\$100,000-124,999 (%)	18222	6.359	4.593	0	75
\$124,000-149,999 (%)	18222	3.406	3.225	0	60
\$150,000-199,999 (%)	18222	3.026	3.717	0	100
>\$200,000 (%)	18222	2.428	3.504	0	100

Language Spoken at Home within Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
English Only	18243	85.97	19.742	0	100
Spanish	18243	6.042	12.008	0	95.203
Indo-European	18238	1.09	2.352	0	59.7
Asian or Pacific Islander	18238	.735	2.435	0	91.045
Other	18243	6.026	16.358	0	100

Land area

Variable	Obs	Mean	Std. Dev.	Min	Max
Land Area	18281	8134.581	13336.438	.006	58370.566

Marital Status of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Married	18218	49.964	12.668	0	100
Widowed	18218	7.08	3.993	0	100
Divorced	18218	12.103	5.456	0	100
Separated	18218	1.902	2.071	0	95.8
Never Married	18218	28.951	11.975	0	100

Occupants per room of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Less than .05 (%)	18211	69.765	13.128	0	100
0.51 to 1.0 (%)	18211	25.662	9.615	0	100
1.01 to 1.5 (%)	18211	3.168	4.301	0	100

1.51 to 2.0 (%)	18211	.983	2.094	0	32.258
Greater than 2.01 (%)	18211	.421	1.445	0	65.263

Poverty Rate of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Poverty Rate (%)	18156	15.202	11.738	0	100

Race of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
White Only (%)	18218	67.885	27.753	0	100
Black Only (%)	18218	4.586	11.208	0	100
American Indian/Alaskan Native Only (%)	18218	19.056	28.098	0	100
Asian Only	18218	.951	2.227	0	91.045
Native Hawaiian/Pacific Islander Only (%)	18218	.143	.79	0	57.143
Other	18218	2.343	5.491	0	74.271
Two or More Races	18218	5.035	5.271	0	77.778

Sex of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Male (%)	18218	50.328	5.197	0	100
Female (%)	18218	45.65	13.515	0	166.667

Unemployment rate of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Unemployment Rate	16434	9.276	8.119	0	100

Veteran Status of Population.

Variable	Obs	Mean	Std. Dev.	Min	Max
Veterans (%)	18218	10.293	5.071	0	81.818
Non Veterans (%)	18218	89.707	5.071	18.182	100

Water area.

Variable	Obs	Mean	Std. Dev.	Min	Max
----------	-----	------	-----------	-----	-----

Water Area	18281	183.641	284.699	0	1407.813
------------	-------	---------	---------	---	----------