

**The Role of Tribal Colleges and Universities in the Improving
Native American Post-secondary Education**

A THESIS
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE

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MAY 2011

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Acknowledgements

This thesis would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of Master's degree.

First and foremost I offer my sincerest gratitude to my supervisor, Dr. Elton Mykerezi, who has fully supported me to finish my thesis with his patience and knowledge. Without his effort, this thesis would not be completed or written. I would also want to thank my committee members, Dr. Judy Temple and Dr. Laura Kalambodkidis, who provided valuable discussions for complete this thesis.

My time at University of Minnesota was made enjoyable due to the many friends and groups that became a part of my life. I am appreciative of my fellow graduate students in Applied Economics and Koreans friends in APEC who help me in both academic and personal life. I would also like to thank Korean graduate students who came to Minnesota with me in 2008 and students from MELP who gave me great friendship which will last forever. I am grateful to Minnesota Graduate Club that was my family in America for past 2 years. They gave me an invaluable experience of living together with people who have diverse nationalities and background which I could never get from anywhere else. Without these friends, my life in U.S. would have been a very stressful all the time as a lonely foreign student.

Many thanks go to my friends in Korea for encouraging me from the distance to pursue this degree. I would also like to thank all members of "Momburim" (means body shakers), the club from my undergraduate years, that still give me endless joy and happiness just like 10 years ago. Among them, special thanks to Kye Taek Lee and Momburim00, who encouraged and instilled confidence in me with immortal friendship. Thank all of my friends in Korea for make me feel that I am still their best friend regardless of where I am.

I would like to thank all of my family members for supporting me to pursue this degree. Without their support, I would not have finished the degree.

Finally, I would like to thank everybody who was important to the attaining Master's degree in University of Minnesota, as well as expressing my apology that I could not mention personally one by one.

Thank you all.

May 2011

HyunKoo Lee

Abstract

This thesis examines the role of Tribal Colleges and Universities (TCUs) in improving Native American post-secondary education in counties that Native Americans comprise 5 percent or more of the population, or that they have more than 500 Native Americans in their populations. This thesis presents evidence that increased access to TCUs, using distances to measure access, helps post-secondary education of Native Americans. As a community college, TCUs have both democratization and diversion effects, and the thesis indicates that democratization effects outweigh diversion effects.

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Section 1.

Introduction

It is well known that there are vast disparities in postsecondary educational attainment and labor market outcomes between racial and ethnic minorities and whites. Improving education of minorities has been actively discussed as a solution to reducing disparities in U.S. In particular, several institutions of higher education have received special funding to target the education of minority groups. For instance, Historically Black Colleges and Universities (HBCUs) were first created in the 1890s to serve African Americans who were at the time de facto excluded from four year colleges. But de jure or de facto exclusion has only been part of the rationale for funding colleges with an explicit demographic target. Hispanic Serving Institutions (HSIs) were defined in the 1990s as institutions that matriculate high shares of Hispanic students from low income households. Although several studies have addressed issues relating to the education of Blacks at HBCUs (Ehrenberg and Rothstein 1994; Constantine 1995; Kim and Conrad 2006; Mykerezzi and Mills 2008; Fryer and Greenstone 2010) and Hispanics at HSIs (Ganderton and Santos 1995; Laden 2000; Gonzalez and Hilmer 2006), issues relating to the education of Native Americans (including Eskimo and Aleut), a group with historically low educational achievement, have received relatively less attention. In particular, the role that Tribal Colleges and Universities (TCUs), institutions that are specifically designed to address the unique educational needs of Native Americans, may have on educational outcomes remains to date nearly unexamined. This thesis conducts an empirical evaluation of the impact that TCUs have on the educational attainment of Native Americans.

Important for this study is the literature that examines the relationship between proximity and access to educational institutions (Card 1993; Mykerezzi, Mills, and Gomes 2003; Frenette 2004; Turley 2009.) These studies have shown that the proximity to college increases college enrollment and education attainment of young adults. In particular, proximity is hypothesized to reduce both the financial and social burdens of enrolling in college by allowing students to enroll without the major disruptions associated with moving to a different area to attend college. Proximity is, however, likely to have its greatest impact on “marginal students”, those that are “undecided” on whether to attend college.

Since the impact of access to educational institutions on the education of Native Americans remains under-examined, this study examines whether proximity to Tribal Colleges, which were built with an explicit mission to increase Native Americans’ access to education, has an impact on the post- secondary educational attainment of Native American communities using nationally representative Census data.

Native Americans have low levels of economic wellbeing and education. Data from the U.S. Census (2000) indicate that Native Americans have lower economic wellbeing relative to whites. For instance, their per capita income was well below the U.S. average (\$12,893 relative to \$21,587). Poverty rates among Native Americans are significantly higher than the U.S. average, with 25.7 percent of Native American individuals living in poverty as opposed to 12.4 percent among the general US population. Also, 21.8 percent of Native American families lived in poverty in 2000. but only 9.2 percent of all US households did so.

Lower levels of educational attainment among Native Americans is a concern because it is well known that post-secondary educational attainment leads to higher incomes and lower poverty rates among individuals (e.g. Card, 2001). Society is affected by low education levels of Native Americans because in addition to these “private returns” higher education has been shown to lead to a myriad of positive external effects. Differentiating between private and public returns to education is important as private returns (such as higher incomes) accrue to the individuals attending themselves, thus private citizens may have incentives to invest in education in response to potential increases in private returns. There are, however, returns that are “external” to the individual and are unlikely to be factored in to the college attendance decision. For instance, education can lead to better health, lower crime, increased political and civic involvement, and lower participation in social assistance. These outcomes, while desirable from a societal stand point, are likely not what drives individuals to pursue college careers. These positive external effects are thus, to a large extent, what motivates public sector investments in education.

Increasing education can, thus, constitute an important component of development policy for Native American communities. Native Americans trail the general U.S. population in terms of post-secondary educational attainment, with only 12% of Native Americans having a B.S. or graduate degree as opposed to 25% among the general U.S. population. The disadvantage is apparent at the lower end of the education distribution as well with 29 percent of Native Americans not having a high school diploma relative to only 20 percent in the general U.S. population.

For those Native Americans who are geographically isolated and have no means to access education beyond a high school level, Tribal Colleges and Universities (TCUs) were created to help increase the education of Native Americans. Since TCUs were designed to help increase the education of Native Americans, it is natural to ask: Has access to TCUs increased the higher education achievement of Native Americans, and to what extent? This thesis quantitatively examines the role of TCUs in increasing higher educational attainment among Native Americans.

Section 2. Literature Review

2.a Native Americans in the U.S.: Education, Well-Being, and geographic distribution

The U.S. Census Bureau defines a Native American as an American Indian or Alaska Native- a person having origins in any of the original peoples of North and South America (including Central America) and who maintain tribal affiliation or community attachment (U.S. Census 2000). Approximately 2,500,000 natives live in diverse locations around the U.S.; 43 percent live in the Western U.S. region, 17.4 percent live in the Midwest region, 30.6 percent in the South region, and 9.1 percent are live in the Northeast region. In 2000 Native Americans comprised about 0.9 percent of the U.S. population. (U.S. Census 2000)

The eleven states with the largest Native American population in 2000 were California, Oklahoma, Arizona, Texas, New Mexico, New York, Washington, North Carolina, Michigan, Alaska, and Florida in order. (U.S. Census 2000) These eleven states were the states with more than 100,000 Native Americans. These eleven states account for 62 percent of the total Native American population, and California and Oklahoma combined account for 25 percent of the total Native American population. (U.S. Census 2000).

The nine places with the largest Native American population in 2000 were New York, Los Angeles, Phoenix, Anchorage, Tulsa, Oklahoma, Albuquerque, Tucson, Chicago, and San Antonio in order (U.S. Census 2000). All of these metropolitan areas had at least 10,000 Native Americans living there. The tenth place with the largest Native American population was Houston with 9,584 Native Americans and these ten largest

places for Native Americans comprise about 8.2 percent of the total U.S. Native American population (U.S. Census 2000). So, overall there is some geographic concentration of Native Americans in the U.S.

2.b Description of TCUs

American Indian Higher Education Consortium (AIHEC) defines Tribal Colleges and Universities (TCUs) as institutions that “were created in response to the higher education needs of American Indians and generally serve geographically isolated populations that have no other means at accessing education beyond the high school level.”

Like other Minority Serving Institutions (MSIs), TCUs are designed to provide increased access to education to Native Americans and may be essentially the only postsecondary institutions for students in some of the poorest and most isolated areas in the U.S., providing education that combines personal attention with cultural relevance. Especially, since some Native Americans live on Native American reservations, they have had more difficulties in obtaining higher education. Pavel, Inglebret, and Bank (2001) suggest that TCUs are giving hope to Native Americans by encouraging a new mindset that is leading to renewed economic, social, political, cultural, and spiritual vitality through education. TCUs serve a wide range of students from young adults to seniors. O’Brien and Zudak (1998) report that TCUs mostly serve members of their own tribes, but also serve Native American students from other tribes as well as nearby non-Native students.

According to U.S. Department of Education - White House Initiative on Tribal Colleges and Universities, there are 36 federally recognized TCUs in the United States.

Overall, there are 36 TCUs in the United States and one in Canada. They are located in Alaska, Arizona, Kansas, Michigan, Minnesota, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Washington, Wisconsin, and Wyoming. TCUs serve approximately 30,000 full- and part-time students. They offer two-year associate degrees in over 200 disciplines with some providing a bachelor's and master's degree. They also offer 200 vocational certificate programs.

TCUs are Minority Serving Institutions that mostly provide two year and technical degrees. The overall literature on higher education has previously called into question the role of both two year colleges and MSIs. Two year colleges are designed to increase access to postsecondary education for young adults and to provide a path into possible four year degrees (through transfer functions). However, they may also divert individuals away from four year colleges, thus their overall role in education has been extensively examined empirically (e.g. Mykerezzi, Kostandini and Mills, 2009).

Minority Serving Institutions, on the other hand, have been subject to scrutiny because they are likely to compete with other colleges for students. The two most important questions have been on whether they attract new students into a postsecondary path (rather than divert from other colleges) and whether students who attend them see similar educational and labor market outcomes.

TCUs are both MSIs and mostly community colleges; their role as community colleges could come into question. They may divert individuals away from four year degrees. In addition, TCUs are also MSIs for Native Americans. As such they may matriculate individuals who would otherwise attend other colleges and universities, so an understanding of the effect that these institutions have on the overall educational

attainment of Native Americans would help shape the discussion on their role in today's educational climate. The next section provides a review of the literatures of community colleges and MSIs.

2.c Role of Community Colleges

Community colleges were designed in the 19th century for students who would not have been able to obtain any college education by providing easy geographic access and lowering the cost of post-secondary education. Since then, the role that community colleges play in enhancing higher educational opportunities has been subject to much controversy and debate. The issue is that, while these colleges were intended to provide a pathway to higher education to individuals that would otherwise not attend college, they may also attract individuals who would otherwise go to a four year college (Rouse, 1995; Leigh and Gill, 2003 ; Mykerezi, Kostandini and Mills, 2009). It has been shown that individuals who start at two year colleges get less education than comparable individuals that start at four year colleges; this has been labeled as the "diversion effect" (Rouse, 1995; Leigh and Gill, 2003 ; Mykerezi, Kostandini and Mills, 2009). The extent to which community colleges increase education by attracting individuals who would otherwise not attend college has been labeled the "democratization effect." The democratization-diversion ratio has been subject to some debate, but most recent studies find that democratization is larger (Rouse, 1995; Leigh and Gill, 2003 ; Mykerezi, Kostandini and Mills, 2009).

For instance, Rouse (1995) finds that democratization outweighs diversion in her Ordinary Least Squares (OLS) specifications that relate the type of institutions first attended to years of education, using the sample that consists of 6,786 individuals from

the High School and Beyond (HS&B) senior cohort. She also estimates instrumental variable models to account for the fact that college choice between a two or a four year college may be endogenous. There may be unobserved factors that affect both college choice and educational attainment, and if so OLS provides a biased estimate of the diversification diversion ratio. Rouse (1995) addresses endogeneity by using distance to colleges as an instrumental variable. The idea is that college proximity affects college choice but is not correlated with unobserved personal attributes of individuals. She does not find a convincingly larger democratization effect with her IV estimates.

Leigh and Gill (2003) assess that perhaps the most important unobservables in the HS&B dataset which Rouse (1995) used are educational intentions. Instead, they use data from the National Longitudinal Survey of Youth (1979) (NLSY79) to estimate the democratization-diversion balance. The NLSY asks youth to report the number of years of education they would like to obtain in the 1979 wave, when most youth are still in high school. The study concludes that after controlling for desired schooling, diversion is much smaller than previously computed in Rouse (1995). They, however, recognize that intentions may not be the only unobservables at play. Also, self-reported intentions at a relatively young age may not be reliable and may suffer from measurement error. They do not have a suitable instrument, as the NLSY does not ask respondents how close to colleges they reside.

Mykerezi, Kostandini and Mills (2009) use geo-referenced NLSY data to compute distances from the respondent's residence to the nearest public two and four year colleges. Using both data on self-reports of educational intentions (as in Leigh and Gill (2003)) and IV models (as in Rouse (1995)), they find the democratization-diversion

ratio to be close to the one estimated by Leigh and Gill for the nation overall. By comparison, their estimates of democratization effects are larger in magnitude and the diversion effect is smaller than estimation of Leigh and Gill (2003). They also examine if rural colleges play a special role in education given the fact that rural areas may have limited access to four year colleges. The study finds democratization-diversion ratios in rural colleges to be no different than their urban counterparts. The impact is present in both rural and urban areas.

Overall, studies find that proximity to two year colleges increases the odds of attending one, and proximity to four year colleges decreases the odds of attending a two year college (e.g. Mykerezi Kostandini and Mills 2009). Rouse (1995) argues that those who live near a community college have a tendency to complete more years of education than those who live farther away from a community college. Using a sample of 6,786 High School seniors from the High School and Beyond dataset, Rouse finds that increasing accessibility to both two year college and four year college increases probability of attending college. With the same data set, Hilmer (1997) finds that community colleges may also provide a pathway to a quality four year education to some students who would not get a chance immediately after high school. He finds that if students attend community college first, they are able to attend higher quality universities than students of similar ability and high school performance who didn't attend community college first with the largest quality increases being observed for students who had poor performance in high school.

2.d Minority Serving Institutions

Minority Serving Institutions (MSIs) have historically played a critical role in serving many students, especially in times of de jure or de facto exclusion of minorities from higher education. Even in today's desegregated society they may still play a role in serving those from lower-income families, since MSIs are less expensive, tend to have more lenient admissions requirements, and are located in areas where low-income minorities are concentrated, compared to Traditionally White Institutions (TWIs). Historically Black Colleges and Universities (HBCUs), Hispanic-serving institutions (HSIs), and Tribal Colleges and Universities (TCUs) are the main MSIs. Some studies show that MSIs play an essential function in the higher education of minorities, but the overall role is still subject to substantial debate.

Historically Black Colleges and Universities (HBCUs) were established to provide enhanced educational opportunities to Blacks in the 1890s. The Higher Education Act of 1965, as amended, defines an HBCU as: "...any historically black college or university that was established prior to 1964, whose principal mission was, and is, the education of black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation." (U.S Department of Education: White House Initiative on Historically Black Colleges and Universities.)

Some studies find that HBCUs have produced higher wages for Blacks who attend them relative to counterparts at TWIs, particularly in the 70s and 80s. Kim and Conrad (2006) argue that, in producing African-American college graduates, HBCUs are

doing as well as Historically White Colleges. Considering that HBCUs are significantly underfunded relative to TWIs, the authors argue that HBCUs contribute significantly to higher education.

Ehrenberg and Rothstein (1994) find no particular wage advantage but find enhanced graduation rates. Constantine (1995) finds a definite wage advantage with the same dataset but with wages observed several years later. Constantine (1995) found that, for the average black student graduating from high school in 1972, the value added in future wages from attending HBCUs was 38% higher than that from attending traditionally white or mixed institutions.

The differential findings between the two studies may appear conflicting but Mykerezzi and Mills (2008) observe that the first study compared individuals about 5 years after college while the second did so 12 years after college. Using data from the NLSY 1979, they show that HBCU attendees do not appear to obtain different wages relative to black men who attended TWIs up until 5 years after college, but the same cohort is at an advantage 15 years later. This finding reconciles the apparent conflict in findings with data from the NLS72.

Fryer and Greenstone (2010) also find that HBCUs provided a unique educational service for Black students in the 1970s. They, however find that HBCU students were at a disadvantage in the 1990s. This is partially due to improvement of TWIs' effectiveness at educating Blacks. Overall they find a 20% decline in the return to an HBCU education between the 70 and 90s. Fryer and Greenstone state that Mykerezzi and Mills (2008) indicate that returns to HBCU attendance does not decline until the mid 80s, so the

decline was likely all after the mid 80s. This finding indicates that the role of MSIs has been rapidly changing and that an examination with recent data is very important.

Wages are, however, not the only outcome of interest; HBCU students are relatively more likely to be engaged in social, political, and philanthropic activities than students attending TWIs. Ehrenberg and Rothstein (1993) present that attending a HBCU significantly enhanced the probability that a black student received a bachelor's degree within seven years. They also found that Black students who attended HBCUs were more likely than Black students at TWIs to receive a bachelor's degree. Fryer and Greenstone (2010) also find that the advantage that HBCUs had in graduating youth as well as self-reported satisfaction has eroded.

The identification of a set of institutions as HSIs originated in the 1990s and placed the emphasis on large Hispanic student enrollment. HSIs are defined in federal legislation as public or not-for-profit institutions of higher education that enroll 25 percent or more undergraduate Hispanic full-time equivalent students, have low educational and general expenditures, and a high enrollment of needy students (Higher Education Act, 1998).

Ganderton and Santos (1995) realize Hispanics' failure to attain post-secondary education indicates a main obstacle to their economic improvement and find predictors of higher educational outcome for Hispanics. They find that socio-economic status and traditional academic measures are strong predictors using the post-high school experiences of seniors in the High School and Beyond survey of 1980. Laden (2000) suggests that many HSIs offer a variety of academic and student support programs and holistic approaches that are specifically designed to raise Hispanic student aspirations and

enhance their retention and completion rates. Using data from the sophomore cohort of the High School and Beyond (HSB), Gonzalez and Hilmer (2006) find that two year colleges have a significant positive effect on the educational attainment of Hispanics. They find that Hispanics appear much more likely to either start their higher education at two year colleges or attend no postsecondary compared to Whites.

TCUs have much in common with other MSIs. They have a particular ethnic designation, are mostly two year colleges (like many HSIs) and are concentrated in areas with large Native populations. They can, therefore, also be subject to the same scrutiny as other MSIs.

2.e College Proximity

Increasing proximity to college is reportedly a significant way to increase access to college. There is literature using college proximity to represent access to college. Card (1993) used geographic variation in college proximity to estimate the return to schooling. By analyzing the National Longitudinal Survey Young Men Cohort, this research found that the men who grew up nearer college have significantly higher education. Turley (2009) investigated the effect of college proximity, by measuring the number of colleges within commuting distance, on the college application and enrollment decisions of a national sample of high school seniors. This study finds that an increase in the number of colleges in proximity is associated with an increase in applying to and enrolling in any type of college. Frenette (2004) shows that increased distance to a university is related to lower university attendance, and a larger tendency to attend the local college instead. Specifically, students who live beyond commuting distance from a college are 37 percent less likely to attend than those who live closer.

Proximity to colleges and universities have been found to not only affect if one attends some postsecondary institution but even what kind. Mykerezi and Mills (2008), for example found that proximity to HBCUs affects positively Blacks' propensity to attend one while it reduced the odds of attendance at a TWI. Similarly, Mykerezi, Mills and Kostandini (2009) found that proximity to two year colleges increased the odds of two year college attendance and decreased the odds of a four year college attendance. While the opposite was true for four year colleges, being close to one increased the odds that one is attended while the odds of a two year college attendance were decreased by proximity to four year colleges. These studies, however, have used individual level data that were geo-coded to reveal individual locations (county of residence). Mykerezi, Mills, and Gomes (2003) suggest that improved access to HBCUs by distance increased the share of Black adults in racially diverse rural counties (defined as rural counties with a high share of blacks) with college degrees using county level census data.

2.f Research Objective

Although HSIs have been shown to serve an important function in postsecondary education of minorities, comparatively little research has been conducted for TCUs. Especially, since there is evidence that proximity to college significantly affects educational attainment of students, this paper examines the impact that increased access, using distance to measure access, to TCUs has on the higher education of Native Americans.

Section 3. Data and Model Specification

3.a Data

This study will examine the variation across counties in the share of Native Americans with post-secondary education. Specifically, the percentage of Native Americans with any post-secondary education and the share with bachelors or better will be modeled. These will then be related to access to TCUs. Data on college locations are also used. County level data of Native Americans and Whites collected from the 1990 and 2000 U.S. Census. Summary file 3 (SF3) for Census 1990 and 2000 are used for the paper. Locations of TCUs and other colleges and universities are collected from Integrated Postsecondary Education Data System.

The base U.S. Bureau of Census STF3C data for 1990 contains 3,141 counties, and data for 2000 contains 3,223 counties. Among these counties, we designate Native American Counties (NACs) as those counties where either the Native Americans population is 500 or more, or Native Americans comprise 5 percent or more of the population. U.S. Census data indicates that under this definition there were 629 NACs in 1990 and 627 NACs in 2000.

The purpose of selecting NACs was to exclude counties with no or few Native Americans to avoid diluting the sample with counties with no Native American populations, which would contribute to a great preponderance of zeroes in the dependent variable. Also, including counties with small number of populations could cause heteroskedasticity concerns. We do this in order to avoid including counties that have too few Native Americans. The outcome variable of interest here is the average educational attainment of Native Americans. If all counties are included, then, for a number of

counties, the outcome variable would be computed based on the experiences of few people. There are also two problems with this. First, the variance of these additional observations would be disproportionately high, compounding heteroskedasticity problems. Second, areas with small ethnic groups most likely have very “atypical” members of that group. Mills and Hazarika (2001) find that highly educated individuals are more likely to migrate. So areas with small Native American populations are likely to have educated Native Americans.

3.b Descriptive Statistics on NACs

In this section, I report descriptive statistics on the NACs and the U.S. average. The total population of NACs was 190,000,000 in 2000. Compared to total population for all counties in the U.S., NACs comprise about two thirds of that total population. The conditions that define NACs are that Native Americans comprise 5 percent or more of the population, or that they have more than 500 Native Americans in their populations. The second condition causes many big counties with large populations to fall into the NAC category. This might explain why the population of 627 NACs takes almost two thirds of total U.S. population. For the Native American population, NACs include 2,118,448 persons. This means about 86% of total Native Americans are living in the NACs (Table 1). So this analyses excludes only less than 15% of the Native American populations.

Table 1. Population

	NACs	All counties
Total Population	190,000,000	285,000,000
NA Population	2,118,448	2,459,814

Source : 2000 U.S. Census bureau

The average per capita income for all counties in the U.S. was \$21,407.9, and for NACs, it was \$22,808.6 in 1999. Per capita income for NACs is slightly higher than all counties for whole U.S. overall. For Native Americans, per capita income was \$12,871.5 which was about half of that for overall U.S. Per capita income. Per capita income for Native Americans in NACs was nearly the same as per those for Native Americans in all counties, which was well below the U.S. average. (Table 2).

Table 2. Per capita income in 1999

	NACs	All counties
Per capita income for all	22808.6	21407.9
Per capita income for NA	12634.6	12871.5

Source : 2000 U.S. Census bureau

Poverty rates clearly show how many Native Americans have a low level of economic wellbeing. In the introduction, we briefly showed that poverty rates among Native Americans are higher than the general U.S. population (25.7% relative to 12.4%). When compared to the White population, Native Americans' poverty rates are relatively higher. The poverty rate among Native Americans was 25.8% in 2000, which was much higher than the poverty rate among Whites (9.7%). The poverty gap between Native Americans and Whites is even bigger in the NACs. In NACs, poverty rates among Native Americans are about 0.5% higher than for Native Americans in all other counties, while poverty rates among Whites are about 1% lower for Whites living in the NACs than their general population living in all other counties in 2000. To sum up, poverty rates among Native Americans in NACs were 26.3% in 2000, which is much higher than those of Whites, at 8.6% in 2000.

Table 3. Poverty rate

	NACs	All counties
Poverty rate for White	8.6%	9.7%
Poverty rate for NA	26.3%	25.8%

Source : 2000 U.S. Census bureau

Education levels of Native Americans are also below the education levels of Whites. Native Americans have about double the percentage of adults age 25 years old or over with no high school diploma, and have less than half the percentage of adults 25 years old or over with bachelor or graduate degree. In NACs, 29.4% of Native Americans have no high school diploma (as opposed to only 14.9% for Whites), and 11.3% of adult Native Americans have a bachelor or graduate degree (as opposed to 29.7% for Whites). Surprisingly the share of Native Americans with some postsecondary education but no BS degree is nearly at par, if not a little higher than for whites. In the NACs, 30.2% of adults had some college while only 29.1% of adult whites had some postsecondary education. TCUs may, in part, be responsible for this parity, keeping in mind that they matriculate a highly disproportional share of Native Americans and they are almost exclusively two year institutions.

The educational attainment of Native Americans in NACs is very similar to Native Americans elsewhere across all educational categories. For Whites, those living in the NACs had slightly higher high school drop-out rates but also higher rates of BS attainment.

Table 4. Educational Attainment

	NACs	All counties
% of White adults age 25 or over		
No High School Diploma	14.9%	16.7%
High School Diploma	26.2%	29.4%

Some College No B.S.	29.1%	27.9%
B.S. and Graduate Degree	29.7%	26%
<hr/>		
% of NA adults age 25 or over		
No High School Diploma	29.4%	29.2%
High School Diploma	29.1%	29.2%
Some College No B.S.	30.2%	30.1%
B.S. and Graduate Degree	11.3%	11.5%

Source : 2000 U.S. Census bureau

3.c NACs v.s. All Other Counties: Population and Well-Being

Table 5 presents some descriptive statistics for Native Americans in both NACs and all other counties (non- NACs), which are counties where the Native American population is 499 or less, and Native Americans comprise 4.9 percent or less of the total population. There are 2594 non-NACs which host only 341,366 Native Americans, while the 627 NACs have 2,118,48 Native Americans living there.

Per capita income for Native Americans in non- NACs is \$14,341.59 which is higher than those in NACs of \$12,634.63. Poverty rate of Native Americans in non-NACs is 23.0% which is lower than 26.3% of those in NACs.

Table 5. Descriptive statistics for Native Americans in NACs v.s. All Other Counties

	All Other Counties	NACs
Number of counties	2594	627
Native American population	341366	2118448
Per capita income	14341.59	12634.63
Poverty Status	23.0%	26.3%

Source : 2000 U.S. Census bureau

3.d Measuring Access

Improvement in “access” to postsecondary education can be made in many dimensions. The existence of TCUs may improve the social, financial, and physical dimensions of access to postsecondary education among Native Americans. TCUs may reduce the social distances of going to college by providing an educational environment where post-secondary education can be attained among others with similar Native American cultural background, making it easier for them to talk to colleagues, alumni and faculty and obtain information. TCUs may give the perception that a post-secondary degree is a feasible and desirable goal for Native American students, since TCUs are comprised of a majority Native American board and student body. TCUs may make postsecondary education financially possible by providing not only relatively low-cost college tuitions but also scholarships.

According to the American Indian College Fund, the average tuition cost at a tribal college is approximately \$2,500, and nearly 6,000 scholarships were awarded to Native American students in 2009. It is intuitively clear that living close to more colleges may increase students’ educational opportunities to go to college. The TCUs may decrease physical distance for Native American students who live in a remote area, who otherwise must travel in order to attend a college or university. Social and financial costs of post-secondary education for Native Americans are likely to decrease with this reduction in physical distance as well. Social costs can be reduced with reduced physical distance of post-secondary education for Native Americans through the emotional benefit that they do not need to leave their community. So in this thesis I use geographic distance to the nearest TCU to quantify access to tribal education, as well as distances to the

nearest private and public two and four year colleges to account for alternative educational opportunities.

Distances from counties to colleges are also desirable because they provide some variation in access across individuals. Strictly speaking individual access to education would depend on whether one is able to be admitted to college, whether they are able to procure financial aid and on whether they have other resources to pay for college. All of these factors are, however, closely tied to individual and family attributes so it is not possible to generate exogenous variation in individual access due to these measures. In other words even if one could observe an individual's actual admissions and financial aid, such information does little to help study how investing in college infrastructure and access affects college enrollments. This is because the actual outcomes (admission and financial resources) cannot be separated from other individual and family attributes. Distance to the nearest college, however, depends on what county individuals were located, a decision that is unlikely to be correlated with access to colleges. In on-going work Mykerezi and Kostandini (2011) have shown that decisions of families in the National Longitudinal Survey of Youth to migrate are not correlated with distance to two year colleges.

3.e Distance Measures

In this paper, geographic information software (ARC-VIEW), along with data on colleges and university zip codes and census tract center coordinates are used to generate measures of county proximity to the nearest college of each kind (TCU, private two year, private four year, public two year and public four year). Data on census tracts is used because that is the smallest denomination for which census geographic summary files are

available. First, the distance from each census tract to the nearest college of each kind is computed, and then a weighted average is taken for each county whereby each distance is weighted by the tract population of 16-19-year olds. The idea behind the computation is to generate distances that are close to the average distance that the average college age adult would have to travel to get to each kind of college. Previous studies have used distances from the county center to the center of the zip code where colleges are located (e.g. Mykerezzi Mills and Gomes, 2003). Consider the following example as an illustration of the improvement in distance computations.

Average distance from counties to a TCU was 484.6 miles. Average distance from counties to public two year college and public four year college was 34.2 miles and 41.5 miles, respectively, and average distance from counties to private two year college and private four year college was 136 miles and 48.7 miles, respectively. Although a weighted average straight-line distance measure is not only way to measure the access to post-secondary education, we expected this to be strongly correlated with transport, social and physical costs associated with TCU attendance.

3.f Marginal Influence of TCUs

Sometimes TCUs are not the only or the closest college or university available to Native Americans students. Mykerezzi, Mills, and Gomes (2003) isolated the effect of access to other nearest post-secondary institution by adding distances to other nearest postsecondary colleges and universities as a separate independent variables to measure the unique impact of HBCUs. I follow this same approach in this thesis. I include distance to the nearest two year public college, four year public college, two year private college, four year private college in the analysis. Considering that TCUs are primarily

two year colleges, the impact on two year colleges and four year colleges are separately examined.

There is a question of whether distance to a private college is endogenous. Private colleges might be placed where there had been high desire for education in ways that are not observed in the data, which might cause an endogeneity problem. To see whether this endogeneity issue arises, we run linear regression models with and without private colleges and compare the results.

Additionally, the location of colleges may not be random in several other respects. For instance if colleges were located in areas with higher incomes or lower poverty rates, then OLS estimates with no well-being measures as controls would yield parameter estimates that are biased upwards (assuming income and education are positively correlated). Alternatively, if policy action was taken to address particular deprivation in remote areas and income or poverty was unobserved parameter estimates would be biased downwards. This is however, not a large concern as these would provide a conservative impact estimate. To avoid bias I control for a large number of observed county attributes, that include income, poverty, travel time to work for residents, industrial sector employment shares, etc.

In the same sense with distance to private colleges, distance to all colleges may be endogenous. Perhaps all colleges were placed in the area where they are most likely to attract the student, in ways that are not directly observable in the data. For instance, areas that lobbied to obtain funding to build TCUs may be more prone to encourage education in ways that are not observed directly. We have no reliable data on the process that ensured the establishment and growth of TCUs and other colleges. I address this

endogeneity concern, by estimating additional models that include the lagged dependent variable as a control; this is sometimes referred to as the value-added specification. I present estimates with and without lagged education measures and compare the results. These lagged variables may account for historical factors that cause current differences in the dependent variables. Location of colleges may have been endogenously chosen however the correlation of location factors is likely stronger with past education, rather than with current education because colleges were founded decades ago. Hence, putting lagged variables may control for the endogeneity, at least insofar as the omitted factors are time-invariant and maintain a stable relationship to education attainment. The value added models are still susceptible to omitted time-varying unobservable factors that are correlated with college location as well as education.

To further test that we are measuring a causal effect I present falsification tests. TCUs are expected to have the largest effect on Native Americans, although many matriculate up to 40% whites. I estimate the models for the white population only expecting to find much lower partial correlations between the education of whites and TCU distance.

3.g Basic Empirical Model

First, linear regression equations are specified and estimated to focus obtain estimates of the impact that distance to colleges has on educational attainment. In an effort to correct heteroskedasticity, weighted least squares estimation is used, using the appropriate populations over which the dependent variables are defined as weights. For instance, regressions that model the share of adult Native Americans with degrees by the Native American population aged 25 years or older. As noted, the dependent variable is

an average across people and its variance is expected to be proportional to the population over which it was computed. The data on the share of the population with a post-secondary education from U.S. Census consist of averages of data across individuals within counties for different racial and ethnic groups and we designed all dependent variables and most independent variables as the percentage of target population. For some of the variables used as controls the Native American-specific measures are not provided so county averages for the general population are used instead. For example, the study is able to control for Native American income and poverty but not for the average time individuals travel to work. The latter is only available for the general population. The basic empirical model to be estimated is then

$$w_i y_i = w_i X_i B + D_i \gamma + \lambda TCU_i + e_i$$

where

w_i is a weight that equals the appropriate population size for each county. y_i is a measure of the percentage of Native Americans or Whites 25 years of age or older with any post-secondary degree (associate or better) under some specifications or bachelor degree or more under other specifications in NAC_I , X_i is a vector of the independent variables, including other county level variables such as, whether county is urban or rural, household type, travel time to work, employment status, industry, per capita income, poverty status, and housing tenure are also included in the empirical model to control for factors might affect educational attainment of Native Americans or Whites. Descriptive statistics for the controls are presented in appendix table 2.

D is a vector that includes distance to the nearest two year private college, distance to the nearest four year private college, distance to the nearest two year public

college, and distance to the nearest four year public college. Finally distance to nearest TCU is included. ei is an error term that is assumed to be normally, independently, and identically distributed.

In the baseline specifications the parameter estimate for λ is interpreted as the impact that a mile reduction in distance to the nearest TCU has on the percent of the adult population with associate or better for the first set of regressions and the impact on BS or better for the second. As noted, TCUs are two year colleges, so they could attract individuals into college that would otherwise attend no postsecondary institution at all (democratization) or they could divert away from four year colleges. A negative impact of TCU proximity (or positive impact of distance) on BS and above could approximate a diversion effect. The impact on any postsecondary degree provides the net effect of democratization and diversion.

3.h Model Descriptions

Since numerous estimation models have been proposed, clarification of these models would help to interpret the results. First group of regression models use the percentage of Native American adults 25 years of age or older with an any postsecondary degree including some college, associate, bachelor, and graduate or professional degree in NACs as a dependent variable.

There are four models, the baseline model, two more that include distance to the nearest private institutions only and lagged dependent variables only, and one that includes both, private institutions and lags. The second group of regression models uses the percentage of Native American adults 25 years of age or older with only bachelor, and graduate or professional degree as a dependent variable. The same four specifications

are presented for the share of BS or better as well. The third group of regression models analyzes the effect of the distance to the nearest TCUs on Whites educational attainment as a robustness check.

Section 4. Results.

4.a Results for Native American with Any Post-Secondary Degree

Regression results from linear regression models for the percentage of Native American adults 25 years of age or older with an any post-secondary degree including some college, associate, bachelor, and graduate or professional degree in NACs are presented in Table 6. In model 1, the percentage of Native American adults with an any college degree in NACs is regressed on distance to the nearest two year public college, distance to the nearest four year public college, the distance to the nearest TCU, and other county level controls. Since controlling for private colleges might present endogeneity issues because some colleges may have been located where they are most likely to attract students, we run the model 1 without private colleges first, and then compare with model 2 which is with distance to private colleges included. The negative significant effect of the distance to the nearest TCU on the share of Native Americans with any post-secondary degree shows that if the distance from counties to TCUs increases, then percentage of Native American adults with a post-secondary degree in NACs will drop. To be specific, a parameter estimator -0.0066 indicates that if the 100 mile increase in distance from nearest TCU is associated with a 0.66 percentage point decrease in share of Native Americans with any post-secondary degree in the NACs. Parameter estimates of the distance to the nearest two year public college and four year public college on the percentage of Native Americans holding any post-secondary degree are not significant which indicates only distance to the nearest TCU affects the post-secondary education of Native Americans. Proximity to other colleges does not appear to affect Native American education in NACs.

Linear regression model 2 uses the percentage of Native American adults 25 years of age or older with any post-secondary degree as a dependent variable, and same set of variables as model 1, but distances to the nearest two year private colleges and four year private colleges are now added as independent variables. Distance to the nearest TCU show a negative significant relationship as well as the result of model 1 which means as distance to the nearest TCU increases, the share of Native Americans with any post-secondary degree holder will decrease. Other distances to the nearest colleges still do not show significant impacts on Native American education. After include distances to nearest private colleges in the model, parameter estimates of the distance to the nearest TCU drops from -0.0066 to -0.0057. This indicates that the distance to private colleges may be positively correlated with distance to TCUs.

Linear regression model 3 regresses the same dependent variable on the same set independent variable used in model 1, but with lagged dependent variables used as controls. Not only private colleges, but all other colleges can have endogeneity problem in sense that colleges could have been located in place where a high desire of education exists (for any given level of wellbeing and industrial structure). Controlling for lagged dependent variables in the model accounts for any time-fixed unobservable attributes that are correlated with college location and educational attainment. Parameter estimates on the distance to the nearest TCU still shows a significant negative partial correlation with share of Native Americans with post-secondary degree, but the magnitude of coefficient drops from 0.0066 to 0.0031. This means that some of the impact of distance to the nearest TCU estimated in model 1, which estimates without the lagged dependent variable, may be due to unobserved time fixed factors. Parameter estimates of the

distance to the nearest two year public college and four year public college on the percentage of Native Americans holding any post-secondary degree are not significant, even after accounting for lagged education. Lagged education, does however have a positive partial correlation with current education, as expected.

Since we find private colleges to play a role in Native Americans' post-secondary education in model 2 and lagged variables in model 3 appear to affect findings, including both private colleges and lagged variables is the most reasonable approach. So model 4 regress the percentage of Native American adults 25 years of age or older with an any post-secondary degree in NACs on distance to the nearest two year private college, distance to the nearest four year private college, distance to the nearest two year public college, distance to the nearest four year public college and the distance to the nearest TCU, lagged variables, and other socio-economic variables used in other models. Like other models, the distance to the nearest TCU has significant negative relationship with the percentage of Native Americans with any post-secondary degree, which implies that if the distance from counties to TCUs increases, then percentage of Native American adults with a post-secondary degree in NACs will drop. In this case, living 100 miles closer to a TCU results 0.25 percentage point increase in Native Americans' post-secondary education in NACs. Distance to the nearest two year private colleges, distance to the nearest four year private college, distance to the nearest two year public college, and distance to the nearest four year public college do not show any statistically significant relationship with Native Americans' post-secondary education.

Table 6. Regression Models Use the Percentage of Native American Adults 25 Years of Age or Older with Any Post-Secondary Degree

Variables	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Percent of persons in area								
UrbanInside	-0.0178	0.0229	-0.0180	0.0229	-0.0394	0.0168 *	-0.0390	0.0168 *
UrbanOutside	-0.0298	0.0264	-0.0230	0.0271	-0.0348	0.0195	-0.0331	0.0195
RuralFarm	0.6245	0.1946 **	0.7001	0.1967 **	0.2586	0.1432	0.2871	0.1454 *
Family Households								
Age 15-24	0.2477	0.4285	0.5220	0.4461	-0.0644	0.3318	0.0388	0.3421
Age 25-64	-0.3612	0.1996	-0.2441	0.2153	-0.2299	0.1445	-0.1966	0.1493
Age 65 and up	-0.5818	0.3597	-0.4520	0.3715	-0.4114	0.2615	-0.3895	0.2657
Nonfamily households								
Age 15-24	0.8629	0.3250 **	0.9419	0.3305 **	0.2736	0.2001	0.3016	0.2049
Age 25-64	-0.7276	0.2738 **	-0.5411	0.2922	-0.3915	0.2185	-0.3218	0.2260
Travel time to work								
0-9 min	0.1071	0.2369	0.1674	0.2403	0.0104	0.1327	0.0149	0.1355
10-30min	0.1684	0.2359	0.2123	0.2356	0.0380	0.1343	0.0440	0.1347
30-60min	0.2024	0.2338	0.2334	0.2344	0.0539	0.1363	0.0537	0.1371
60-min	-0.2352	0.2582	-0.1847	0.2588	-0.3194	0.1585 *	-0.3061	0.1595
Labor force participation								
Male	0.0979	0.0489 *	0.0867	0.0476	0.0276	0.0410	0.0221	0.0415
Female	0.2308	0.0546 **	0.2220	0.0543	0.0766	0.0418	0.0749	0.0422
Unemployment								
Male	-0.0143	0.0528	0.0099	0.0545	-0.0229	0.0391	-0.0127	0.0406
Female	-0.0327	0.0582	-0.0353	0.0582	-0.0363	0.0461	-0.0395	0.0458

Industry												
Agimin	-0.3178	0.1088	**	-0.3627	0.1155	**	-0.2368	0.0772	**	-0.2534	0.0788	**
Conmanu	-0.4667	0.0654	**	-0.4884	0.0637	**	-0.2430	0.0632	**	-0.2537	0.0623	**
retail	-0.0704	0.1334		-0.0734	0.1346		0.0061	0.0945		0.0004	0.0942	
Per capita income (x1000)												
ALL	0.0063	0.0020	**	0.0068	0.0021	**	0.0037	0.0015	*	0.0040	0.0016	*
NA	0.0096	0.0022	**	0.0090	0.0023	**	0.0013	0.0018		0.0010	0.0018	
Housing Tenure												
% owner	0.1114	0.0608		0.1254	0.0618	*	0.1348	0.0596	*	0.1490	0.0605	*
Lagged variables												
anycollege90							0.5936	0.0403	**	0.5950	0.0408	**
betteduc90							-0.0950	0.0738		-0.1100	0.0752	
Distance to the nearest college (x100)												
Private 2				-0.0028	0.0020					-0.0020	0.0014	
Private 4				-0.0114	0.0090					0.0005	0.0063	
Public 2	0.0026	0.0068		0.0054	0.0061		-0.0011	0.0045		0.0010	0.0046	
Public 4	-0.0128	0.0102		-0.0023	0.0118		-0.0087	0.0074		-0.0068	0.0084	
TCU	-0.0066	0.0014	**	-0.0057	0.0017	**	-0.0031	0.0010	**	-0.0025	0.0011	*
_cons	0.4109	0.3087		0.2532	0.3212		0.3427	0.2143		0.2994	0.2211	
R-squared	0.6330			0.6372			0.7686			0.7695		
F-value	28.37			28.41			54.13			52.24		
Obs	627			627			627			627		

* significant at 5%; ** significant at 1%

SE indicates the standard error

4.b Results for Native American with Bachelor and Beyond Degree

Table 7 shows Regression results from linear regression models for the percentage of Native American adults 25 years of age or older with bachelor, graduate or professional degree in NACs. Model 5 regresses the percentage of Native American adults with a bachelor degree or beyond in NACs on distance to the nearest two year public college, distance to the nearest four year public college and the distance to the nearest TCU, and other socio-economic variables. In model 5, distances to the nearest TCUs, distance to the nearest two year public colleges, and distance to the nearest four year public colleges all do not show significance which imply proximities to public colleges and TCUs do not affect Native Americans' bachelor, graduate or professional degree. This indicates that the positive impact found on any postsecondary education may be isolated in associate degree attainment and does not appear to lead to more BS degrees.

Model 6 uses same dependent variable with same set of independent variables from model 5, but with distance to the nearest two year and four year private colleges included. As before, the table then presents specifications that account for lagged education (Model 7) and finally both distance to private colleges and lagged educational attainment are controlled for in Model 8. Although it is weak significance ($p=0.01$), distance to the nearest TCU now shows a small positive relationship ($p=0.01$) with Native Americans' bachelor, graduate or professional degree attainment. This implies that being closer to TCU reduces number of Native Americans with bachelor or beyond degree, and this points out non zero diversion effect of TCUs. So TCUs are likely

attracting some Native Americans that may have opted for four year degrees in their absence.

In model 4, we find that distance to the nearest TCUs has significant negative relationship with the percentage of Native Americans with any post-secondary degree with same set of independent variables. This relationship shows democratization effects and diversion effects combined and negative relationship implies that democratization effects outweigh diversion effects. So, from findings from model 4 and 8, we conclude that some diversion effects of TCUs exists, however, democratization effects of TCUs outweigh these diversion effects.

Table 7. Regression Models Use the Percentage of Native American Adults 25 Years of Age or Older with Bachelor and Beyond Degree

Variables	Model 5			Model 6			Model 7			Model 8		
	Coefficient	SE		Coefficient	SE		Coefficient	SE		Coefficient	SE	
Percent of persons in area												
UrbanInside	-0.0278	0.0119	*	-0.0267	0.0116	*	-0.0223	0.0098	*	-0.0219	0.0099	*
UrbanOutside	-0.0348	0.0127	**	-0.0317	0.0127	*	-0.0275	0.0106	**	-0.0267	0.0106	*
RuralFarm	0.3169	0.0778	**	0.3559	0.0784	**	0.1509	0.0634	*	0.1672	0.0654	*
Family Households												
Age 15-24	-0.4189	0.2196		-0.2450	0.2102		-0.1834	0.1715		-0.1197	0.1687	
Age 25-64	-0.3395	0.0885	**	-0.2805	0.0866	**	-0.1915	0.0709	**	-0.1736	0.0699	*
Age 65 and up	-0.6223	0.1596	**	-0.5744	0.1517	**	-0.3786	0.1273	**	-0.3720	0.1250	**
Nonfamily households												
Age 15-24	0.4212	0.1612	**	0.4608	0.1597	**	0.2351	0.1185	*	0.2503	0.1174	*
Age 25-64	-0.5133	0.1375	**	-0.3960	0.1346	**	-0.2585	0.1091	*	-0.2150	0.1090	*
Travel time to work												
0-9 min	0.1838	0.0878	*	0.1908	0.0870	*	0.1160	0.0672		0.1133	0.0685	
10-30min	0.2280	0.0887	*	0.2344	0.0880	**	0.1147	0.0666		0.1147	0.0672	
30-60min	0.3528	0.0902	**	0.3490	0.0894	**	0.2155	0.0712	**	0.2110	0.0712	**
60-min	0.0413	0.0965		0.0589	0.0959		-0.0516	0.0734		-0.0455	0.0741	
Labor force participation												
Male	0.0140	0.0261		0.0064	0.0262		0.0135	0.0238		0.0097	0.0238	
Female	0.1013	0.0255	**	0.0964	0.0255	**	0.0308	0.0235		0.0298	0.0237	
Unemployment												
Male	-0.0799	0.0286		-0.0630	0.0292	*	-0.0567	0.0239	*	-0.0500	0.0246	*
Female	0.0139	0.0289		0.0096	0.0286		0.0180	0.0251		0.0155	0.0250	

Industry												
Agimin	-0.2102	0.0470	**	-0.2325	0.0474	**	-0.1270	0.0379	**	-0.1371	0.0381	**
Conmanu	-0.2581	0.0361		-0.2703	0.0353	**	-0.1360	0.0316	**	-0.1426	0.0322	**
retail	-0.1656	0.0662	*	-0.1702	0.0642	**	-0.0807	0.0530		-0.0851	0.0526	
Per capita income (x1000)												
ALL	0.0030	0.0011	**	0.0035	0.0011	**	0.0021	0.0009	*	0.0023	0.0010	*
NA	0.0033	0.0012	**	0.0026	0.0011	*	-0.0001	0.0010		-0.0004	0.0010	
Housing Tenure												
% owner	0.0317	0.0300		0.0532	0.0308		0.0536	0.0277		0.0650	0.0285	*
Lagged variables												
anycollege90							0.0703	0.0206	**	0.0726	0.0211	**
betteduc90							0.4060	0.0469	**	0.3939	0.0479	**
Distance to the nearest college (x100)												
Private 2				-0.0029	0.0010	**				-0.0015	0.0008	
Private 4				0.0001	0.0050					0.0017	0.0035	
Public 2	-0.0038	0.0040		-0.0005	0.0037		-0.0030	0.0025		-0.0014	0.0025	
Public 4	-0.0024	0.0057		0.0007	0.0059		-0.0042	0.0037		-0.0036	0.0043	
TCU	-0.0002	0.0006		0.0007	0.0007		0.0006	0.0005		0.0010	0.0006	
_cons	0.2338	0.1310		0.1594	0.1275		0.3427	0.2143		0.0938	0.1057	
R-squared	0.6274			0.6340			0.7191			0.7208		
F-value	28.37			28.41			54.13			52.24		
Obs	627			627			627			627		

* significant at 5%; ** significant at 1%

SE indicates the standard error

4.c Results for Whites

In order to see whether TCUs affects post-secondary education of Whites, we also analyze the effect of the distance to the nearest TCUs on Whites post-secondary educational attainment. If our result that proximity to TCUs leads to more education in NACs is because of unobserved time-varying effects associated with the location of TCUs and county attributes we might expect these unobservable variables to cause similar biases in the estimated relationship between TCU distance and the education of whites. So finding similar parameter estimates relating distance to TCUs and the education of whites may shed doubt on the validity of our estimated TCU effect on Native American education. Results of regressions on educational attainment for Whites are presented in table 8. Model 9 and 10 regress the percentage of White adults 25 years of age or older with an any college degree including some college, associate, bachelor, and graduate or professional degree in NACs on same set of variables used in other models for estimating Native Americans' case: both with and without private colleges and lagged variables.

Before controlling for distance to private colleges and lagged dependent variables, distances to the nearest TCU show some significance, however, after controlling for these variables, parameter estimates on distance to the nearest TCUs do not show significance.

Model 11 and 12 regress the percentage of Whites adults 25 years of age or older with bachelor, graduate or professional degree in NACs on same set of variables used in model 9 and 10: also both with and without private colleges and lagged variables. Results show no significant effect of distance to nearest TCUs on the percentage of Whites with

bachelor, graduate or professional degree, regardless of with or without lagged variables and private colleges. This is very reasonable result since TCUs are mostly two year non bachelor degree granting colleges that are supposed to affect Native Americans mostly (even though many may have many white students). Since distance to the nearest TCUs does not have any impact on post-secondary educational attainment of Whites, in NACs, access to TCUs has a unique impact upon Native Americans' educational attainment.

Table 8. Regression Models Use the Percentage of White Adults 25 Years of Age or Older with Post-Secondary Degrees and Bachelor and Beyond Degree

Variables	Model 9			Model 10			Model 11			Model 12		
	Coefficient	SE		Coefficient	SE		Coefficient	SE		Coefficient	SE	
Percent of persons in area												
UrbanInside	0.0070	0.0233		-0.0290	0.0083	**	-0.0579	0.0190	**	-0.0125	0.0077	
UrbanOutside	0.0456	0.0309		-0.0197	0.0120		-0.0680	0.0229	**	-0.0051	0.0108	
RuralFarm	-1.2664	0.3983	**	-0.1446	0.0896		-0.6684	0.2576	**	-0.0518	0.0769	
Family Households												
Age 15-24	0.7664	0.5698		-0.9609	0.2379	**	-1.8182	0.5631	**	-0.7169	0.2300	**
Age 25-64	0.7182	0.2856	*	-0.4312	0.1204	**	-0.1485	0.2728		-0.2670	0.1095	*
Age 65 and up	0.4186	0.4903		-0.5338	0.1850	**	-0.4428	0.4665		-0.2650	0.1712	
Nonfamily households												
Age 15-24	1.6843	0.2487	**	-0.4608	0.1310	**	1.4626	0.2320	**	-0.3320	0.1208	**
Age 25-64	0.9482	0.3972	*	-0.4665	0.1655	**	-0.3720	0.3856		-0.2300	0.1581	
Travel time to work												
0-9 min	-1.9372	0.7126	**	-0.1545	0.0955		-0.7151	0.4164		-0.1255	0.0942	
10-30min	-1.9382	0.6698	**	-0.1816	0.0892	*	-0.7782	0.4108		-0.1041	0.0877	
30-60min	-1.9331	0.6703		-0.1650	0.0906		-0.6666	0.3931		-0.0828	0.0895	
60-min	-2.1306	0.6734	**	-0.2166	0.1015	*	-1.0422	0.4079	*	-0.1080	0.0973	
Labor force participation												
Male	-0.2631	0.1818		0.0039	0.0643		0.1950	0.1442		0.0184	0.0623	
Female	0.1897	0.1335		0.0677	0.0598		0.0399	0.1088		0.0406	0.0539	
Unemployment												
Male	-0.9180	0.2500	**	-0.4496	0.1270	**	-0.8220	0.2343	**	-0.3137	0.1100	**
Female	-0.1757	0.3846		0.1680	0.1411		0.0094	0.3592		0.1314	0.1228	

Industry												
Agimin	-0.1130	0.1158		-0.2429	0.0605	**	-0.4990	0.0915	**	-0.1193	0.0547	*
Conmanu	-0.2465	0.0735	**	-0.0347	0.0248		-0.3960	0.0815	**	0.0109	0.0259	
retail	0.1209	0.1539		-0.0099	0.0599		-0.2682	0.1531		0.0263	0.0609	
Per capita income (x1000)												
ALL	0.0049	0.0037		-0.0001	0.0016		-0.0020	0.0034		0.0000	0.0016	
White	0.0060	0.0034		-0.0012	0.0017		0.0146	0.0036	**	-0.0012	0.0016	
Housing Tenure												
% owner	0.0754	0.0619		0.009729	0.03051		-0.07156	0.05628		-0.0068	0.0279	
Lagged variables												
anycollege90				0.9244	0.0243	**				0.0039	0.0219	
betteduc90				0.0420	0.0501					1.1567	0.0461	**
Distance to the nearest college (x100)												
Private 2				0.0002	0.0010					0.0004	0.0008	
Private 4				-0.0043	0.0027					0.0011	0.0025	
Public 2	-0.0022	0.0071		0.0012	0.0031		-0.0020	0.0074		-0.0023	0.0028	
Public 4	-0.0063	0.0104		-0.0026	0.0036		0.0263	0.0117	*	-0.0024	0.0036	
TCU	-0.0025	0.0011	*	-0.0004	0.0003		-0.0016	0.0009		-0.0004	0.0003	
_cons	1.7743	0.8155	*	0.7259	0.1780	**	1.1833	0.5694	*	0.3627	0.1768	*
R-squared	0.7973			0.9673			0.8663			0.9751		
F-value	28.37			28.41			54.13			52.24		
Obs	627			627			627			627		

* significant at 5%; ** significant at 1%

SE indicates the standard error

Section 5. Conclusions

This thesis concludes that TCUs play an important role in increasing Native Americans higher education. The results of the multivariate regression specifications shows increased access to TCUs significantly helps the post-secondary education of Native Americans even after controlling for the presence of other institutions, county well-being, demographics industrial structure, etc. The importance of TCUs is found to be rather unique as since proximity to other private and public colleges has no significant effect to higher education of Native Americans compared to proximity to TCUs. These results indicate that TCUs plays the role as the primary source of higher education for Native American students.

The best estimate of the overall impact of proximity to the nearest TCUs on Native Americans post-secondary education is based on model 4, which regresses the share of Native American any post-secondary degree holder on all variables including private colleges and lagged variables. The parameter estimate of the distance of the nearest TCUs is - 0.0025 which implies a 0.25 percentage point reduction in the share of college educated Native adults associated with 100mile increase in distance to the nearest TCU. This is a rather small effect, however, numerically. The average Native American population of a NAC is 3178, so living 100 miles closer to TCU will lead about 8 more Native Americans in each NAC to get post-secondary degree in any given year. I caution

however, that distance to the nearest TCU should be viewed as an imperfect measure of access, and that the magnitude associated with straight line distances be interpreted with caution.

TCUs have both democratization and diversion effects among Native Americans. Positive significant relationship between distance to the nearest TCUs and share of Native Americans' bachelor or better degree (in model 8) shows that TCUs have some diversion effects. They likely attract some individuals who may have opted to attend four year colleges in the absence of a TCU. Relationship between distance to the nearest TCUs and share of Native Americans with any post-secondary degree (in model 4) accounts for both democratization and diversion effects, and negative sign of the parameter estimate points out that democratization effects of TCUs is higher so that it outweighs diversion effects of TCUs. If estimates are interpreted literally, democratization is 0.35 percentage points (so it nets a 0.25 percentage point combined effect after a 0.10 percentage point diversion).

The findings are, as noted, robust to the inclusion of lagged education to account for time-fixed unobservable factors and it is unique to Native Americans. Estimating the same models for whites in NACs does not show any significant TCU effect. This increases confidence that the estimated effects are causal and not due to unobservable factors related to the location of TCUs.

Overall, we conclude that TCUs play their role in improving Native Americans post-secondary education, but the effect might be relatively small in magnitude and it is concentrated, as expected in associate degrees. Continued investments in supporting TCUs are likely to assist in increasing the well-being of Native Americans.

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APPENDIX 1: Description of variables.

Variable	Description
Percent of persons in area	
UrbanInside	Percent of persons in inside urbanized area 1990
UrbanOutside	Percent of persons in outside urbanized area 1990
RuralFarm	Percent of persons in rural farm area 1990
RuralNonfarm	Percent of persons in rural nonfarm area 1990
Family Households	
Age 15-24	Percent of family households 15 to 24 years 1990
Age 25-64	Percent of family households 25 to 64 years 1990
Age 65 and up	Percent of family households 65 years and over 1990
Nonfamily households	
Age 15-24	Percent of nonfamily households 15 to 24 years 1990
Age 25-64	Percent of nonfamily households 25 to 64 years 1990
Age 65 and up	Percent of nonfamily households 65 years and over 1990
Travel time to work	
0-9 min	Percent of workers 16 years and over whose travel time to work is less than 10 minutes 1990
10-30min	Percent of workers 16 years and over whose travel time to work is 10 to 30 minutes 1990
30-60min	Percent of workers 16 years and over whose travel time to work is 30 to 60 minutes 1990
60-min	Percent of workers 16 years and over whose travel time to work is 60 or more minutes 1990
0 min	Percent of workers 16 years and over who worked at home 1990
Labor force participation	
Male	Male labor force participation for Native Americans or Whites
Female	Female labor force participation for Native Americans or Whites
Unemployment	
Male	Male unemployment for Native Americans or Whites
Female	Female unemployment for Native Americans or Whites

Industry	
Agimin	Percent of employed persons 16 years and over work in agriculture, forestry, fisheries, and mining 1990
Conmanu	Percent of employed persons 16 years and over work in construction, manufacturing, and transportation 1990
Retail	Percent of employed persons 16 years and over work in communication and other public utilities, wholesale trade, and retail trade 1990
SVC	Percent of employed persons 16 years and over work in finance, insurance, real estate, business and repair services, personal services, entertainment and recreational services, health services, educational services, other professional and related services, and public administration 1990
Per capita income (x1000)	
ALL	Per capita income in 1989 for all
NA	Per capita income in 1989 for Native American
Whites	Per capita income in 1989 for Whites
Poverty status	
Child	Percent of Native American persons for whom poverty status is determined from under 5years to 17 years 1990
Age18-64	Percent of Native American persons for whom poverty status is determined from 18years to 64 years 1990
Age 65 and up	Percent of Native American persons for whom poverty status is determined from 65 years and over 1990
Housing Tenure	
% owner	Percent of owner occupied housing units 1990
% rent	Percent of renter occupied housing units 1990
Lagged variables	
anycollege90	Percent of Native Americans or Whites 25 years and over with Some college or Associate degree or Bachelor's degree or Graduate or Professional degree 1990 (lagged variable for anycollege00)
betteduc90	Percent of Native Americans or Whites 25 years and over with Bachelor's degree or Graduate or Professional degree 1990 (lagged variable for bettereduc00)

Distance to the nearest college (x100)

Private 2	Distance to the nearest two year private college in miles
Private 4	Distance to the nearest four year private college in miles
Public 2	Distance to the nearest two year public college in miles
Public 4	Distance to the nearest four year public college in miles
TCU	Distance to the nearest TCU in miles

APPENDIX 2: Descriptive Statistics for the Control Variables

Variables	Mean	SE
Percent of persons in area		
UrbanInside	0.172	0.006
UrbanOutside	0.239	0.005
RuralFarm	0.054	0.001
RuralNonfarm	0.535	0.006
Family Households		
Age 15-24	0.030	0.000
Age 25-64	0.569	0.001
Age 65 and up	0.135	0.001
Nonfamily households		
Age 15-24	0.019	0.000
Age 25-64	0.131	0.001
Age 65 and up	0.116	0.001
Travel time to work		
0-9 min	0.260	0.002
10-30min	0.455	0.002
30-60min	0.186	0.002
60-min	0.051	0.001
0 min	0.048	0.001
Labor force participation for Native Americans		
Male	0.724	0.004
Female	0.593	0.004
Unemployment for Native Americans		

Male	0.132	0.004
Female	0.131	0.004
Labor force participation for Whites		
Male	0.722	0.001
Female	0.530	0.001
Unemployment for Whites		
Male	0.057	0.001
Female	0.057	0.000
Industry		
Agimin	0.090	0.002
Conmanu	0.292	0.002
Retail	0.227	0.001
SVC	0.391	0.002
Per capita income		
ALL	11565.0	57.1
NA	9117.8	111.6
Whites	12340.6	64.7
Housing Tenure		
% owner	0.719	0.002
% rent	0.281	0.002
Distance to the nearest college		
Private 2	135.36	3.59

Private 4	47.10	1.11
Public 2	32.92	1.02
Public 4	41.49	0.74
TCU	476.13	6.28

SE indicates the standard error of the variable means

APPENDIX 3: Roster of TCUs

Name	Location
Bay Mills Community College	Brimley, MI
Blackfeet Community College	Browning, MT
Cankdeska Cikana Community College	Fort Totten, ND
Chief Dull Knife College	Lame Deer, MT
College of Menominee Nation	Keshena, WI
College of the Muscogee Nation	Okmulgee, OK
Comanche Nation College	Lawton, OK
Diné College	Tsaile, AZ
Fond du Lac Tribal and Community College	St., Cloquet, MN
Fort Belknap College	Harlem, MT
Fort Berthold Community College	New Town, ND
Fort Peck Community College	Poplar, MT
Haskell Indian Nations University	Lawrence, KS
Ilisagvik College	Barrow, AK
Institute of American Indian Arts	Santa Fe, NM
Keweenaw Bay Ojibwa Community College	Baraga, MI 49908
Lac Courte Oreilles Ojibwa Community College	Hayward, WI 54843
Leech Lake Tribal College	Cass Lake, MN
Little Big Horn College	Crow Agency, MT
Little Priest Tribal College	Winnebago, NE
Navajo Technical College	Crownpoint, NM
Nebraska Indian Community College	Macy, NE
Northwest Indian College	Bellingham, WA
Oglala Lakota College	Kyle, SD
Saginaw Chippewa Tribal College	Mount Pleasant, MI
Salish Kootenai College	Pablo, MT
Sinte Gleska University	Mission, SD
Sisseton Wahpeton College	Sisseton, SD
Sitting Bull College	Fort Yates, ND
Southwestern Indian Polytechnic Institute	Albuquerque, NM
Stone Child College	Box Elder, MT
Tohono O’odham Community College	Sells, AZ

Turtle Mountain Community College
United Tribes Technical College
Wind River Tribal College
White Earth Tribal and Community College

Belcourt, ND
Bismarck, ND
Fort Washakie, WY
Mahnomen, MN