HUMAN CAPITAL ACCUMULATION AMONG NATIVE AMERICANS

AN EMPIRICAL ANALYSIS OF THE NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

by

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Stefanie Jane Fischer

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ABSTRACT

Native Americans have low levels of human capital accumulation. In 2005, only 21% scored at the proficient level on the NAEP math test compared with 37% of all other test takers. One cause of their low human capital accumulation may be factors that commonly explain low academic performance among other minority groups within the United States, such as school quality and family background. Alternatively, Native American students may perform low academically due to factors that are unique to this population such as living on Native land or the political institutions that govern them. This paper will empirically examine Native American students' human capital accumulation decisions. Using data from the National Assessment of Educational Progress (NAEP), I find Native American students residing on Native land score ¼ of a standard deviation lower on the math assessment than Native American students living off Native land, with no other controls added. After controlling for other area characteristics, family background, peer effects and school resources, the effect of living on Native land is not statistically significant in explaining test scores. Family background and peer effects explain most of the variation in Native American students' human capital accumulation decision. Students who identify with the white peer group score 1/5 of a standard deviation higher than students who identify with the Native American peer group. Although legal institutions do not explain student test scores, they do appear to affect students' attendance. Students living in areas under tribal jurisdiction are 13% more likely to miss a week or more of school in a month, ceteris paribus.

CHAPTER 1

INTRODUCTION

Native American students academically underperform whites and most other minority groups. In 2005 Native Americans had a high school drop out rate of 20%, higher than any other ethnic group with the exception of Hispanics (Snyder, 2008).[1] As of 2007, only 14% of Native Americans 25 and older held a bachelor's degree or graduate degree while 19% of blacks, 32% of whites and 53% of Asians held a bachelors degree or graduate degree. Only 12% of Hispanics held a bachelor's degree or graduate degree. The 2005 report from the National Indian Education Survey (NIES) found fourth and eighth grade Native American students scored below the national average on both the standardized reading assessment and the standardized math assessment. Only 18% of Native American students scored at the proficient level on the NAEP reading assessment compared with 31% of all other students scoring at the proficient level.[2] Similarly, only 21% of Native American students sampled scored at the proficient level on the NAEP math assessment while 37% of all other students scored at this level.[3]

There are many individual benefits associated with human capital accumulation such as increased levels of expected future earnings and better health outcomes. The pertinent question is what incentivizes Native Americans to acquire human capital. It

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[1] The ethnic groups in the study include whites, blacks, Hispanics, Native Hawaiian/Pacific Islanders and American Indian /Alaska Natives.

[2] "All other students" include all students in the 2005 NAEP sample that are not classified as Native American or Alaska Native by school records.

[3] Students scoring at the proficient level have demonstrated competency over the tested subject matter.

may be Native Americans' human capital accumulation is determined by factors that also explain other minority groups' human capital accumulation such as family background, peer effects and school resources. It is also possible Native Americans' human capital accumulation is determined by factors unique to this population such as living on Native land or the legal institutions that apply.

Despite the fact that Native Americans' academic performance is low relative to the national average, there has been no systematic econometric analysis examining human capital accumulation decisions among Native Americans or the level of their academic performance. Extensive literature explores the academic achievement gap between blacks and other minority groups compared with whites. These studies empirically test several hypotheses as possible explanations for the achievement gap; including neighborhood effects, peer effects, school quality, family environment, genetics and early childhood education. The findings vary among the studies depending on the samples employed. Additional studies have attempted to explain the level of economic growth on Native American Reservations such as why low per capita income growth and low levels of employment persist in these areas. The limited research that exists attributes much of the low economic growth on reservations to certain legal and political institutions (Anderson and Parker, 2006). This paper's analysis will empirically estimate determinants of human capital accumulation among Native Americans, considering explanations common in the black-white test score gap literature and the growth literature.

This study employs a nationally representative sample of 2,993 eighth grade Native American students living on and off Native land. Three different education outcome variables proxy for students' human capital accumulation: standardized math and reading assessment scores from the 2005 National Indian Education Study (NIES) restricted-use data files and the number of days a student is absent in the past month. Four main factors are examined as possible explanations for Native Americans' low human capital accumulation: area characteristics, family background, peer effects and school resources. The vector of area characteristics includes measures of the economic opportunity of the area and the legal institutions that may influence human capital accumulation. First, a fixed effects specification is used to estimate students' NAEP math test score.[4] Second, a probit model is used to estimate students' attendance. Family background and peer effects are the main factors that predict students' math scores when all control vectors are included. Factors unique to Native Americans are not statistically significant in explaining varied levels of math test scores. Tribal legal jurisdiction as opposed to state jurisdiction, however, explains a student's attendance. Students residing in areas under tribal jurisdiction are 13% more likely to miss a week or more of school. Family background and peer effects also explain a student's attendance. The reading test score analysis yields similar results as the math analysis.

Chapter 2 reviews the previous applicable literature including studies on the black-white academic achievement gap and studies examining factors that influence Native American economic growth. Chapter 3 provides information on tribal legal

[4]In this study I also include an analysis employing standardized reading test scores as the dependent variable for 2,924 Native American students. Results for this analysis are very similar to the results for the math test score analysis. Results for the reading analysis can be found in Table 7 in the Data Appendix.

jurisdiction, and why it may explain variation in human capital. Chapter 4 employs the Human Capital Accumulation theoretical framework to model what may explain the level of Native American students' human capital accumulation. Chapter 5 details the empirical specifications employed and all measures and proxy variables used in the analysis. Predicted signs for variables of interest are also outlined in this section. Chapter 6 describes the data and their corresponding sources. Chapter 7 discusses the findings. Chapter 8 concludes.

CHAPTER 2

PREVIOUS LITERATURE

White-Black Achievement Gap Literature

Extensive research exists on education outcomes for blacks in the United States. Many studies have looked at the achievement gap between blacks compared with their white counterparts, where test scores are used as an achievement marker. Research acknowledges an achievement gap exists between black and white students. The findings vary across studies.

Many studies find socio-economic status and family background to explain the black-white test score gap. Phillips et al. (1998) using data from the National Education Longitudinal Study find the raw test score gap to shrink when controlling for family background and environment. They include mother's family background such as her parent's education level and occupations. Adding this second generation of background variables explains more of the gap, although not all. Armor (1992), Brooks-Gunn and Duncan (1997), and Mayer (1997) also attribute the achievement gap to differences in socio-economic class including family structure and poverty.

Coley (2002) uses Early Child Longitudinal Study Kindergarten cohort (ECLS-K) data and finds the socio-economic composite (SES) variable explains a majority of the raw black-white test score gap. Fryer and Levitt (2004) use ECLS-K data and are able to

eliminate the gap in the Fall of Kindergarten when a parsimonious set of covariates[5] are included. They find parent's education, occupation and household income explain 40% of the raw reading test score gap and 66% of the math gap at the beginning of Kindergarten. Although Fryer and Levitt (2004) can explain the gap in Fall of Kindergarten they find an achievement gap between blacks and whites emerges by the end of Kindergarten and persists through the spring of first grade. They test the following hypotheses as possible explanations for this emerging gap in achievement: skill attainment over the summer, quality of schools, parent and environment contributions, neighborhood effects, teacher discrimination and the possibility of measurement error in the standardized tests. School quality is their main explanation for this gap. Fryer and Levitt (2006) extend their initial analysis to look at the achievement gap through the first four years of school. In this study they no longer find school quality as the main cause for the gap. Their results imply the skills tested in kindergarten are different from the skills tested in third grade which may cause the test score gap. Similarly to the findings in Fryer and Levitt's first analysis, Cook and Evans (2000) use data from National Assessment of Educational Progress and find school quality as the main contributor to the black-white test score gap.

Several other studies come to the conclusion that peer effects are the main cause of the black-white achievement gap. A peer effect is when a student's academic performance is influenced by a particular peer group he identifies with, for example an ethnic group. Fryer and Torelli (2005) employ data from National Longitudinal Study of Adolescent Health, which includes an index for popularity, to estimate if peer effects

[5] Covariates included parental occupation, household income, education, mother's age at time of first birth, number of books in the home, child's age, child's birth weight and WIC participation.

cause the black-white achievement gap. Their findings show students who identify with the peer group, white, experience a positive correlation between grade point average and popularity among other students who identify with the white peer group. On the other hand, above the threshold of a 3.5 grade point average, black students experience a negative relationship between academic performance and popularity among other students who identify with the black peer group. Other studies that find peer effects explain the test score gap are Cook and Ludwig (1998), Obgu and Fordham (1986), Fryer (2002) and Steele and Aronson (1998).

Various results emerge among the studies depending on the samples and measures used. Socio-economic status, school quality and peer effects are commly found to explain the black-white test score gap. The previous literature sheds light on possible variables and specifications to employ in my analaysis of the causes of varied levels of test scores between Native American students.

Native American Economic Growth Literature

There is no previous economic literature on Native American education outcomes. Some studies have investigated other Native American outcomes addressing the causes of low economic growth on Native American reservations. These studies imply that factors unique to Native Americans may be relevant in explaining their human capital accumulation. Understanding the Native American growth literature will help inform the analysis for this paper.

Gitter and Reagan (2002) examine employment rates on reservations and find a negative relationship between employment and being a Native American male living on or near a reservation. Since this study, several other scholars have attempted to explain the cause of the low employment and income levels on reservations. Anderson and Parker (2006) examine how institutions affect a tribe's per capita income level and per-capita income growth. This study specifically estimates how different political, legal and land ownership regimes affect these outcomes. They conclude payments from the federal government and a significant percent of the reservation being employed by the tribe hinder long run economic growth. Additionally, reservations that have state court jurisdiction as opposed to tribal court jurisdiction, as well as resource rich land that is operated under fee simple contracts rather than as trust land, experience improved per-capita income levels and higher per-capita income growth rates. Similarly, Anderson and Parker (2008) find higher income growth on reservations is associated with state legal jurisdiction. Anderson and Lueck (1992) analyze the effect of land tenure on a reservation's agricultural production. They find the per-acre value of land decreases when the land type is classified as trust and when it is located in a region under tribal governance as opposed to state government.

Anderson and Parker (2006) and Anderson and Lueck (1992) focus on the relationship between land tenure, government power and economic growth. Cornell and Kalt (2000) also focus more heavily on institutions, both formal and informal, as the cause for reservations experiencing varied levels of income growth and employment levels. They specifically examine three main forms of formal tribal government: chief

executive, general council or a strong legislature and also informal government which they call “cultural norms.” Their findings report tribes experience increased income growth when formal and informal governments are closely aligned. Additionally, they find governments that have clear separation of powers, willingness to trade, access to markets, and human capital and natural resource endowments, experience higher levels of income growth.

CHAPTER 3

TRIBAL LEGAL JURISDICTION BACKGROUND

The characteristics of an area where an individual resides may predict one's human capital accumulation. As indicated in previous literature, one component that is likely to influence the economic environment of an area is its legal institutions. Native Americans are unique compared with other minority groups within the United States because they may live in areas that are not governed by United States law, therefore legal institutions very across the population. This chapter will give a brief history of Public Law 83-280 (PL-280) and outline how legal systems, particularly PL-280, affect economic growth on reservations. This informs the following section on the theory of how PL-280 might influence human capital investment decisions for Native Americans' residing on and off federally designated Native land.[6]

History of Legal Jurisdiction on Native American Land

The 1832 Supreme Court decision, Cherokee Nation v. Georgia, ruled that Georgia could not impose its laws on Cherokee tribal lands. This decision set the nationwide precedence of tribal sovereignty, the authority of tribes to govern themselves including the management of their own legal systems. From 1832-1953 legal matters on Native American land were the joint responsibility of the tribe and the Federal

[6] In this analysis I use "Native land" to refer to a student living on a reservation or on any type of Native land because PL-280, in the appropriate states, applies to all federally designated Native land and is not limited to reservations. For a complete definition of federally designated Native land see the Data Appendix.

government. All criminal and civil offenses committed on Native land by or against a Native American or non-Native American were litigated in tribal courts or the Federal court.[7] The only role of the state courts was to deal with offenses committed by non-Native Americans on Native land.

Tribal jurisdiction over criminal and civil matters caused several problems. As a result, many reservations experienced high levels of criminal activity, particularly against whites who resided in nearby towns. The federal government deemed a lack of Federal law enforcement in conjunction with ineffective tribal courts as the root cause for the inadequately regulated crime (Melton and Gardner, 1989).

In 1953, the Federal government imposed Public PL-280 on several states as an attempt to reduce the heightened criminal activity on Native land.[8] These states were labeled "mandatory" states because they were considered as having law and order codes functioning in an "unsatisfactory" manner with the exception of a few omitted regions within these states (Goldberg, 1975). PL-280 transferred tribal and Federal jurisdiction in the affected areas to the state courts. It became the responsibility of the state courts to litigate all criminal and civil offenses committed by or against Native Americans and

[7] The Federal government handled major criminal offenses, offenses between a Native American and a non-Native American and gaming disputes. Tribal courts handled most criminal and civil offenses, specifically crimes committed by or against Native Americans on Native American land.

[8] This law also was put into place during a time of Native American assimilation. The Federal Government specifically, the Bureau of Indian Affairs (BIA), was advocating that Native Americans adopt the cultural norms of the European settlers. The BIA implemented a "relocation" program that encouraged Native Americans to leave the reservation and seek employment in a metropolitan area.

non-Native Americans on Native land.[9] The jurisdiction over civil causes of action is considered by many scholars to be more of an afterthought (Goldberg, 1975).

Congress immediately imposed PL-280 on the following six states: California, Minnesota (except the Red Lake Nation), Nebraska, Oregon (except the Warm Springs Reservation), Wisconsin and Alaska (upon its statehood). In addition to the mandatory states, the Federal government gave all other states the option of undertaking PL-280 without the consent of the tribes. States choosing state jurisdiction over criminal and civil matters on Native land included Nevada (1961), Idaho (1963),[10] Iowa (1967), Washington (1957), South Dakota (1957),[11] Montana (1963), North Dakota (1963),[12] Arizona (1967)[13] and Utah (1971).

The law was controversial. Mandatory states opposed the ruling because of the added financial burden; Congress had no intention of funding this newly appointed state responsibility. Additionally, states were given little power in determining land use rights and taxation on reservations. Furthermore, tribes were in opposition because they wanted the opportunity to determine if state jurisdiction was appropriate and desirable for their reservation. (Goldberg-Ambrose, 1997).

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[9] PL-280 did not affect the trust status of Indian lands. It did not terminate the trust relationship, or exclude Indians from receiving benefits under federal Indian programs. PL-280 did not give states any power over environmental control, land use such as fishing and hunting rights, licenses, or gambling. In general states can not tax on Native lands.

[10] The Idaho state government added the disclaimer that in order to have state jurisdiction they must have the consent of the tribes.

[11] South Dakota only assumed state jurisdiction over civil and criminal actions on highways.

[12] North Dakota only assumed state jurisdiction when they had the tribe's consent.

[13] Arizona only assumed state jurisdiction over air and water pollution matters.

The law was amended, after much criticism, as part of the 1968 Civil Rights Act. The amendment added a clause declaring that any state electing into state jurisdiction after 1968 must have tribal consent. The amendment also allowed states, mandatory and optional, to return jurisdiction to the Federal government by submitting requests through the Department of Interior. Ultimately, the Secretary of the Interior made the final decision on which states would retrocede. Native Americans, however, could not initiate this request. Additionally, the act only applied to those states, mandatory and optional, transferring jurisdiction prior to 1968. Wisconsin retroceded jurisdiction over the Menominee Reservation (1973), Nebraska retroceded jurisdiction over the Winnebago and Omaha Reservations (1968) and Oregon retroceded jurisdiction over the Umatilla Reservation (1981). These were the only states to return some jurisdiction back to the Federal government.

Table 1. States with PL-280 (State Jurisdiction).

State	Year Law was Passed	Exempt Tribes	Mandatory
California	1953		Yes
Minnesota	1953	Red Lake	Yes
Nebraska	1953	Winnebago, Omaha	Yes
Oregon	1953	Warm Springs, Umatilla	Yes
Wisconsin	1953	Menominee	Yes
Alaska	1953		Yes
Nevada	1961		
Idaho	1963		
Iowa	1967		
Washington	1957		
South Dakota	1957		
Montana	1963		
North Dakota	1963		
Arizona	1967		
Utah	1971		

Source: Tribal Court Clearinghouse

Effect of Public Law 280 on Economic Growth

Several papers have found that tribal jurisdiction may lead to less private investment. Parker (2009) argues tribal court decisions are uncertain because few civil cases have been litigated under tribal law. The lack of dependable tribal precedents therefore may create a disincentive for private investors. Another reason investment may be lower on these reservations is because tribal courts may act in an opportunistic way. It is possible that sovereign governments face a time inconsistency problem resulting in lower private investment on reservations. Specifically, a tribal government may initially commit to an unbiased court, which will enforce contracts regarding specific investments, but after an investment occurs they may renege on the contract (Kydland and Prescott, 1977).

A number of papers have investigated the effect of PL-280 on Native American outcomes. Anderson and Parker (2006) find reservations under state jurisdiction have higher per-capita income and per-capita income growth. Cookson (2006) obtains similar results.[14] Anderson and Parker (2006) and Cookson (2006) both employ an ordinarily least squares specification with aggregate observations at the reservation level. The sample for both studies includes Native American reservations in several states. Both studies include the per-capita income earned by non reservation residents in counties in or adjacent to the reservation to control for the difference in economic growth off and on a reservation. In conclusion, the expectation that tribal courts may operate in an

[14] The main focus of this paper examines how the presence of casinos on reservations affects Native American income levels and income growth. The results are ambiguous; it is unclear whether having a casino on a reservation increases or decreases income levels and income growth.

opportunistic manner, or renege on private investment contracts, creates a disincentive for outside investors. For these reasons reservations under state court jurisdiction may achieve higher economic growth. It is also possible that tribal jurisdiction affects Native Americans' decision to invest in human capital in a similar way.

CHAPTER 4

ECONOMIC THEORY

The General Human Capital Accumulation Model[15] will provide a framework for theoretically investigating factors that may explain Native American students' human capital accumulation decisions. An individual's objective is to maximize the present value of his future earnings stream. A future earnings stream is composed of expected future non-labor income and expected future wages. Income, in the form of future wages, depends in part on an individual's human capital accumulation level.

There are several measures of human capital accumulation. The empirical analysis in this paper uses standardized test scores and number of days a student is absent in a month as proxies for human capital accumulation. Both proxies are education outcomes and vary with an individual's ability and the level of other education inputs. By controlling for the other inputs, test scores become a strong measure of his level of human capital investment.

The following sections in this chapter will introduce the general Human Capital Accumulation Model, examine factors that influence the cost and benefit of acquiring human capital and investigate how factors unique to Native Americans such as legal institutions and living on Native land may alter the general predictions set forth by the Human Capital Accumulation theory. Later, Chapter 4 will outline variables used to measure these inputs.

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[15] The General Human Capital Accumulation framework employed in this analysis comes from Becker (2003).

General Human Capital Accumulation Model

Consider a simple two period model where an individual can either choose to invest in a high level of human capital in the first period or he can choose to invest in a low level of human capital in the first period (one or the other).[16] If he chooses the low human capital investment option, it is assumed he works in the first period. Let W_1 be the low human capital wage or the wage earned if an individual chooses to work in the first period. Let W_2 be the high human capital wage earned in the second period if an individual chooses to invest in human capital in the first period. Let D be the direct cost of investing in human capital and r be the discount rate. Assume $W_2 > W_1$ and all individuals complete their human capital investment in the first period and work in the second period. If an individual invests in human capital in the first period, the present value of his future earnings stream is:

$$\left(\frac{W_2}{1+r}\right) - (W_1 + D) \tag{1}$$

Therefore an individual will invest in human capital in the first period if:

$$\underbrace{\left(\frac{(W_2 - W_1)}{1+r}\right)}_{Benefit} > \underbrace{(W_1 + D)}_{Cost} \tag{2}$$

[16] In this analysis investing in human capital or receiving the high human capital wage is associated with high NAEP test scores. Low human capital investment or receiving the low human capital wage is associated with low NAEP test scores.

That is, he will invest in human capital if the benefit of human capital, or the wage premium, is greater than the cost of investing in human capital. I will now investigate factors that influence the costs and benefits of acquiring human capital.

Factors that Influence the Costs and Benefits of Human Capital Accumulation

Human capital is an investment decision based on payoffs. Given the general human capital accumulation model, it becomes easier to understand what may change an individual's willingness to acquire human capital. Theoretical predictions for an individual's human capital accumulation decision can be made when the factors that change an individual's costs and benefits of acquiring human capital are considered.

One factor to consider is the cost of human capital accumulation. The greater the cost, direct and indirect, the less likely one will acquire human capital. The indirect cost is the time an individual spends acquiring human capital which could be spent on his next best alternative, his opportunity cost. The market wage, W_1, is a proxy for an individual's opportunity cost. In general, when an individual faces a high market wage, he is less likely to invest in human capital because his opportunity cost is higher. Unemployment levels in an area also determine an individual's opportunity cost. Lower unemployment in an area increases an individual's opportunity cost. Direct costs of human capital accumulation may include private tutoring, study materials and disutility incurred from human capital investment.

Another channel that may influence a student's benefit of acquiring human capital is the size of the wage premium received, $(W_2 - W_1)$. The larger the wage premium the

more likely he is to invest in human capital. One way to achieve a large wage premium is when the low human capital wage, W_1, is small. Another way an individual receives a large wage premium is when the high human capital wage, W_2, is large. Given a two period model, W_2 is likely to differ depending on where the individual chooses to work in the second period. The high human capital wage may be lower in areas under tribal court jurisdiction because less lucrative employment opportunities exist (Anderson and Parker, 2006).[17] Therefore, it is expected an individual living and working in an area under state court jurisdiction is likely to acquire a higher level of human capital than individuals living and working in areas under tribal jurisdiction. This prediction, however, is incomplete without considering an individual's migration decision.

Effects of Migration on Human Capital Accumulation

In order to fully understand the magnitude of the wage premium received for acquiring human capital, it is necessary to factor in the cost of migrating off Native land to predict where an individual is likely to work in the second period. For simplicity, I assume all individuals spend the first period on Native land and may migrate off Native land in the second period for employment. Considering migration, an individual has four possible options. First, he can work in period one and work in period two with no migration. Second, he can invest in human capital in period one and remain on Native land to work in period two. Third, he can work in period one and migrate off Native land

[17] Specifically, Anderson and Parker (2008) find that tribal court jurisdiction weakens property rights and provides a disincentive for investors looking to pursue specific physical investment on said reservations. Specific physical investment is investment that is highly immobile such as non-mobile infrastructure like casinos, farm land and mines to name a few.

to work in period two. Fourth, he can invest in human capital in period one and migrate off Native land to work in period two.

Let $OnNL$ indicate that an individual lives on Native land, $OffNL$ indicate that an individual lives off Native land and let M be the direct cost of migration. Assuming $W_2 > W_1$ and an individual is maximizing the present value of his future earnings stream, he will chose the option with the largest return.

$$\max\left\{\underbrace{W_{1,OnNL}+\frac{W_{1,OnNL}}{1+r}}_{LowInvest,NoMigration},\ \underbrace{\frac{W_{2,OnNL}}{1+r}-D}_{HighInvest,NoMigration},\underbrace{W_{1,OnNL}+\frac{W_{1,OffNL}}{1+r}-M}_{LowInvest,Migrate},\underbrace{\frac{W_{2,OffNL}}{1+r}-D-M}_{HighInvest,Migrate}\right\} \quad (3)$$

The first term in Equation 3 is the return to working in period one and working in period two (no investment in human capital), with no migration. The second term in Equation 3 is the return to investing in human capital in period one and working on Native land in period two, with no migration. The third term in Equation 3 is the return to investing in human capital in period one and migrating off Native land to work in period two. The fourth term in Equation 3 is the return to working in the period one and migrating off Native land to work in period two. Therefore, an individual will chose to invest in human capital in period one and migrate off Native land to work in period two, if the wage premium for acquiring human capital and migrating is greater than the cost of investing in human capital including the direct cost of migration.

Effects of School Quality on Human Capital Accumulation

School quality may also influence individuals' decision to acquire human capital. The higher the quality of the school, the more likely individuals will invest in human capital. It could be that the direct cost of acquiring human capital, D, is lower for individuals attending higher quality schools. Higher quality schools may be more effective and efficient in teaching their students. First, higher teacher quality and lectures may allow a student to acquire understanding of the subject matter in a shorter time. Second, it is possible more advanced technology is available to students, aiding in their human capital accumulation. The quality of schools Native American students attend may vary by residential location, if the school is on Native land, or by the type of legal regime that applies.

Theoretical Predictions

The implications of the Human Capital Accumulation theoretical framework are that individuals' incentives to invest in human capital vary based on the wage premium and institutions. Specifically, individuals who face smaller education wage premiums, higher migration costs or lower quality schools invest in lower levels of human capital, ceteris peribus. It is unclear how differences in legal regimes alter the general Human Capital Accumulation model predictions. The general Human Capital Accumulation Theory treats the decision to invest in isolation. It is possible that individuals consider physical capital and human capital decisions jointly. For example, tribal jurisdiction may weaken property rights providing a disincentive for investors looking to pursue specific

physical investment on these reservations.[18] Alternatively, these individuals may chose to invest in mobile physical capital (Parker, 2009) or in human capital, since both types of assets are less likely to be seized in a tribal court ruling. Thus, Native Americans residing on reservations under tribal jurisdiction may invest more heavily in human capital. It is also possible that factors unique to Native Americans, such as legal and political institutions, have no effect on students' human capital accumulation. A more general predictor of human capital accumulation, such as school quality or family background, may explain most of their decision. Therefore, since theoretical predictions are ambiguous when variations in legal regimes are introduced to the study, an empirical analysis is necessary to explain Native American students' human capital accumulation decisions.

[18] Specific physical investment is investment that is highly immobile such as non-mobile infrastructure like casinos, farm land and mines to name a few.

CHAPTER 5

EMPIRICAL METHODOLOGY

Two econometric models are used to empirically estimate human capital accumulation among Native American students employing two dependent variables: standardized math test scores and number of days a student is absent in a month. I examine four main factors as possible explanations: area characteristics, family background, peer effects and school resources.[19]

The first model uses NAEP math scores as the outcome variable. This model is a fixed effects specification. The second model uses the number of days a student is absent in the past month as the dependent variable. This model consists of a set of probit regressions because the outcome is a binary variable equal to one for all students missing five or more days of school in a month. Both models include three sets of baseline specifications.

The base specifications are as follows:

$$Y_{it} = \beta_o + \delta_0 (nativeland)_{ij} + \delta_1 (tribejuris)_{ij} + \varepsilon_{ij} \qquad (R.1)$$

$$Y_{it} = \beta_o + \delta_0 (nativeland)_{ij} + \delta_1 (tribejuris)_{ij} + \beta_1 (State)_j + \alpha A_{ij} + \omega F_{ij} + \rho P_{ij} + \varepsilon_{ij} \qquad (R.2)$$

$$Y_{it} = \beta_o + \delta_0 (nativeland)_{ij} + \delta_1 (tribejuris)_{ij} + \beta_1 (State)_j + \alpha A_{ij} + \omega F_{ij} + \rho P_{ij} + \gamma S_{ij} + \varepsilon_{ij} \qquad (R.3)$$

[19] The hypotheses tested in this analysis come from the theoretical framework and from commonly tested hypotheses in the previous literature such as Fryer and Torelli (2005), Fryer and Levitt (2004 and 2006) and Anderson and Parker (2008).

Regression $(R.1)$ will estimate the mean test score gap between students living on federally designated Native land compared with living off Native land as well as students living under tribal jurisdiction compared with students living off Native land, ceteris paribus. A difference-in-difference estimation is used to exploit the variation in legal institutions and variation in living on and off Native land. The control groups are students living off Native land and students living on Native land under state jurisdiction. The treatment group is students living on land under tribal jurisdiction.

$$(\underbrace{OnNL_{StateJurisdiction} - OffNL}_{OnNLEffect}) - (\underbrace{OnNL_{TribalJurisdiction} - OffNL}_{(OnNLEffect+TribalJurisdictionEffect)}) \tag{4}$$

$$(OnNL) - (OnNL + TribalJurisdiction) = TribalJurisdiction \tag{5}$$

Two effects are occurring, the effect of living on Native land and the effect of tribal jurisdiction. The first term in Equation 4 estimates the average effect that living on Native land has on test scores compared to living off Native land; there is no variation in legal regime. This effect is estimated by δ_0 in the baseline specifications $(R.1)$ - $(R.3)$. The second term in Equation 4 estimates the average effect that living on Native land under tribal jurisdiction has on test scores compared to living off Native land. The difference between the two average effects, Equation 5, estimates the average treatment effect, the effect of only tribal jurisdiction. In the baseline regressions the coefficient, δ_1, estimates the effect of tribal jurisdiction. The sum of the coefficients δ_0 and δ_1 estimates the effect of living on Native land that is under tribal jurisdiction.

All baseline specifications for both models contain state fixed effects and the same explanatory variables including the average treatment effect. State fixed effects are included to control for any systematic differences between states that might cause variation in Native American students' test scores.

Regression $(R.2)$ estimates students' test scores by including the following controls; vector, A_{ij}, proxies for the characteristics of the area in which student i resides in state j, vector F_{ij}, proxies for the family background of student i in state j and vector P_{ij}, proxies for peer effects of student i in state j. Regression $(R.3)$ is identical to $(R.2)$ but includes vector S_{ij}, which proxies for the school resources that apply to student i in state j.

Variables and Predicted Signs

Measures of Human Capital Accumulation

Two dependent variables are used in this analysis to proxy for students' human capital accumulation including NAEP math assessment scores and the number of days a student is absent in the past month.[20] For this analysis it is assumed the higher the test score the more human capital a student acquires, ceteris paribus. Similarly, I assume the fewer days a student is absent the higher the level of human capital the student acquires.

Measures of Area Characteristics

[20] Specifications are also run with NAEP reading scores as the dependent variable.

Vector, A_{ij} , includes proxies for area characteristics and factors that are unique to Native Americans.[21] This includes the legal institution that applies to each student, whether the student lives on Native land, the relevant minimum wage, per-capita income for the county, the distance from each student's school to the nearest county with an employment level of 75,000 or greater and the size of the community. The sum of the coefficients on "tribal jurisdiction" variable and the "Native land" variable estimates the marginal effect that living on a reservation and under tribal jurisdiction has on a student's assessment score, all else equal.[22] The expected sign off this effect is ambiguous.

The variable, distance to migrate, is included in the area characteristics vector and proxies for the cost of migration. Specifically, the variable is the number of miles to the nearest county that employs 75,000 or more people. This variable is expected to have a negative relationship with test scores; the farther the county employing this number of people, the higher the cost of migration. Higher migration costs are likely to yield lower test scores.

The wage premium received for acquiring human capital is likely to affect a student's test score or the level of his human capital accumulation. The wage premium will vary depending on the high human capital wage and the low human capital wage the individual is likely to earn. Measures of both wages are necessary to include in this analysis in order to proxy for the wage premium. The minimum wage that applies to a

[21] For this analysis, I assume an individual lives in the same county as the school he attends.

[22] Native Americans living off reservations and those living on a reservation with PL-280 are classified as being under state jurisdiction. Those living on a reservation with no PL-280 are considered to be under the jurisdiction of a tribe.

student is the proxy for an individual's low human capital wage.[23] State fixed effects would be sufficient to control for the variation in minimum wage across states but in some cases minimum wage varies within states because Federal minimum wage prevails on Native land. The expected coefficient on this variable is negative because the higher the minimum wage, the smaller the wage premium is for investing in human capital.

Theory predicts an individual's high human capital wage is affected by a particular area's economic opportunity. I use per-capita income in the county in which the individual resides as a proxy for the high human capital wage. This proxy may suffer from measurement error because per-capita income includes all individuals in the county, including those earning the low human capital wage and those earning non-labor income. The proxy for the high human capital wage is expected to have a positive relationship with test scores. An individual faced with a high wage premium will invest in human capital and may have higher test scores. An ideal measure of this wage would be the average wage premium earned for college graduates in a county. The wage premium data available only reports this measure by state. As a robustness check, I employ two alternative proxies for the wage premium instead of the minimum wage and per-capita income by county. First, I run specifications with the wage premium earned by state for gradating high school as opposed to the dropping out of high school. Second, I run specifications with the wage premium earned by state for graduating college as opposed to graduating high school. State fixed effects are excluded from these alternative

[23] As of 2005, fourteen states and the District of Columbia have a minimum wage higher than the Federal minimum wage; therefore the corresponding state minimum prevails. The other thirty-six states either have a minimum wage equal to the federal wage or less than the federal minimum in which case the federal wage prevails. The federal minimum wage, $5.15, applies to any individual residing on federally designated Native land regardless of legal regime.

specifications because the alternative wage premium proxies are measured at the state level.

Additionally, the size of the community that the student resides in is included in this vector. In general, the probability of being employed increases in a larger community and may increase the high human capital wage. Therefore, students in a larger community are likely to have higher test scores.

The high human capital wage may be affected by the legal system. In that case, if the proxy for the high human capital wage is excluded from the third specification, $(R.3)$, the coefficient on the variable tribal jurisdiction will estimate the total effect of legal institutions. For robustness, I will include the proxy for the high human capital wage in the baseline regressions but also include a specification excluding the proxy to determine if tribal jurisdiction influences an individual's high human capital wage.

Measures of Family Background

Vector, F_{ij}, includes proxies for family background including parents' education, number of books in the home, if a student is an English Language Learner and if the student attends a Title 1 school. The level of family inputs is likely to affect the direct cost of acquiring human capital which influences an individual's human capital investment decision. The coefficients on parents' education and number of books in the home are likely to be positive. These resources reduce the direct cost of acquiring human capital. Student test scores are likely higher the more the family contributes to their student's education.

Another variable included in the family background vector indicates if the student is an English Language Learner. Students that are English Language Learners may speak a tribal language in the home and as a result have poor English literacy skills. It is likely English Language Learner students face a higher cost of acquiring human capital. This variable is expected to have a negative relationship with test scores.

The variable indicating if a student attends a Title 1 funded school is used to proxy for family income. Schools are eligible to be Title 1 if they receive Title 1 funding from the government and if half of the students enrolled are classified as low income. The purpose of the Title 1 program is specifically to help low income students pass the state assessments at a proficient level (U.S. Department of Education). This variable indicates a school with the presence of a low socio-economic student body and therefore proxies for students with a low family income. In this sample, approximately half of the students that attend a Title 1 school also reside on Native land. Furthermore, of all the students in the sample residing on Native land, 67% also attend schools that designated Title 1. The sign on this coefficient is ambiguous.

An alternative used to proxy for family income is the percent of a school eligible for the National School Lunch Program (NSLP). NSLP is a federally funded meal program providing nutritionally balanced, low cost or free lunches to financially disadvantaged students attending public or non-profit private schools (United States Department of Agriculture). Similar to the Title 1 program, the NSLP program is a good indicator of a low family income. This program can be used to the check the sensitivity of the results from the baseline specification. It is only necessary to include one of these

variables in a specification because they are highly related and likely proxy for the same thing.

Measures of Peer Effects

It is important to include a proxy for peer effects, which may explain student test scores. This paper identifies peer groups by race. Some studies have found an explanation for blacks' low academic achievement is that they associate high academic performance with the rejection of their cultural identity (Cook and Ludwig, 1998). Students who identify with the black peer group are likely faced with a higher direct cost, the decreased popularity among the black peer group for doing well academically. A similar relationship may exist for students who identify with the Native American peer group. Therefore, to identify racial peer groups, I use a unique feature of the NIES dataset: a student response question on race. All the students in the sample by school records are identified as Native American. Students were presented the following question, "which of the following best describes you" and then had the option of selecting from the following racial groups: white, black, Hispanic, Asian, Native American, or more than one race. Table 2 outlines the results to this question. Only 60% of school identified Native Americans self report as Native American. There are several reasons for this. First, it is possible there is measurement error in the school reported race category. This is not likely because survey administrators checked school records to determine if any students had been miss-classified as Native American. In the case that there was a mistake, miss-classified students were dropped from the sample. Second, and more likely, students have selected the racial group that they most identify with. Thus, the student response race

question may provide a good proxy for estimating the effect that associating with different racial groups has on test scores.

Table 2. Student Reported Race Breakdown.

Race	Percent
White	10.54
Black	1.94
Hispanic	14.13
Asian	1.24
Native American	59.81
More than one	12.36

Source: 2005 NAEP restricted use data-files

It is unclear, without empirical investigation, whether the relationship between the Native American peer group and test scores is positive or negative. An alternative proxy for the Native American peer group is the percent of the school that is Native American by school records. Although this variable is likely not as good of a proxy as self reported race, it is useful to include in alternative specifications as a robustness check.

The binary variable gender is included in the analysis to reduce heterogeneity in the sample thus reducing the standard errors of the estimated coefficients. This variable is equal to one if the student is male. Previous studies imply males are likely to do better on math assessments and females are likely to do better on reading assessments, ceteris paribus.

Measures of School Resources

Theory predicts school quality is also expected to have an effect on a students' standardized test scores. The school resource vector, S_{ij}, is made up of the following measures: the size of the school's student body, expenditures per pupil in a school district

and the experience level of a student's teacher. The mean expenditure per pupil in a school district among schools on Native land is about $10,000 per year. The mean expenditure per pupil in a school district among all schools in the sample is about $9,500 per year. As a robustness check, I also include the pupil teacher ratio and the type of certification that a student's teacher holds. The school quality vector is expected to have a positive coefficient. The higher the school resources (i.e., the greater the number of inputs) the higher a student's expected test score.

CHAPTER 6

DATA

Data Source: National Center for Education Statistics (NCES)

2005 NIES Restricted-use Data Files

Several surveys administered by the National Center for Education Statistics (NCES) provide data for the dependent variables, family background vector, peer effects vector and the vector of school resources. The main data source for the analysis is the 2005 National Indian Education Study (NIES) restricted-use data files. The survey collects student level data for Native Americans on reading skills, math skills as well as general background information on the student, the student's teacher and the student's school. The NIES assessment is identical to the National Assessment of Educational Progress (NAEP) but only samples the Native American and Alaska Native population.[24] The data are a nationally representative sample for the year 2005 and include student level observations for eighth graders.

The three dependent variables, math test scores, reading tests scores and number of days absent in the past month, are from the NAEP. The math and reading scores are on a point system from 0-500 since NAEP scores are reported as plausible values rather than a single value. Plausible values are constructed by observing a pattern of responses to

[24] The purpose of the oversample is to collect more data so researchers can get a better understanding of the educational experiences of Native American Students. Native American students make up about 1% of all students in the United States or approximately 45,000 of all eighth graders (2005 NAEP Restricted-Use Data Files Data Companion).

items on the assessment because students are not tested on all content areas with in a subject area. Therefore, a student's score is the probability distribution over all possible scores and not actually observed. The sample for the math scores analysis includes 3,473 observations. After dropping 480 observations due to missing data, the actual sample used in the most basic regression is 2,993 student level observations. The mean math score across the 2,993 observations is 265.74 points with standard deviation 32.10. The reading sample drops 489 observations due to missing data so the actual sample employed in the most basic regression for estimating reading test scores is 2,924 Native American students. The mean score across the sample is 248.99 points with standard deviation 34.87. The third outcome variable used in this study is the number of days a student is absent in the past month. The variable is a binary variable equal to one if a student misses five or more days of school in a month. The mean likelihood a student is absent five or more days in a month is 0.1216 with a standard deviation of 0.3269.

Additionally, the 2005 NIES restricted-use data files provide some of the data for the independent variables. The background questionnaire on the NIES assessment provides data for variables relating to the quality of a student's teacher, self identified race and family background.

The NAEP survey has a few unique features. First, a complex sampling scheme is used where sampling rates vary across students based on the different subgroups they are a part of. To account for the differential probabilities of selection, student sample weights are included in the statistical analysis. Another unique characteristic of the NAEP survey is that it employs the Balanced Incomplete Block Spiraling (BIB) method. "Balanced

Incomplete Block" means that testing booklets contain different blocks of questions; the blocks included in each booklet vary by booklet. "Spiraling" refers to the assignment of booklets to students. Spiraling ensures an equal number of students in the sample receive each booklet since booklets are not identical. By using BIB Spiraling, fewer students have the same booklet within a school but more schools are included in the survey than if the survey design were a simple matrix. This increases the sampling efficiency by reducing the sampling variance. Additionally, as mentioned earlier the NAEP employs plausible values when reporting student math or reading scores rather than a single percentage score.[25]

Common Core of Data

The other main data source used in the analysis is the Common Core of Data (CCD). The CCD is another set of surveys administered by the NCES. The three CCD data files used in this paper include the 2005 Public Elementary and Secondary School Universe Survey, the 2005 Local Education Agency (School District) Universe Survey and the 2005 Local Education Agency (School District) Finance Survey. These three files provide a set of school and district level control variables including data on school district expenditures, percent of students in a school that qualify for the National School Lunch Program and pupil teacher ratio.

[25] For more information on the NIES design and scoring see the Data Appendix.

Data Source: Regional Economic Information System (REIS)

Data for the variable indicating whether a student resides on Native land are from the Regional Economic Information System (REIS). The variable was created by mapping the school each student attends with a comprehensive shape file of federally designated Native land. Mapping was done by using the longitude and latitude of the school each student attends. This binary variable is equal to one if a student resides on Native land. In this analysis I use "Native land" to refer to a student living on a reservation or on any type of Native land because PL-280, in the appropriate states, applies to all federally designated Native land and is not limited to reservations. For a complete definition of federally designated Native land see Table 8 in the Data Appendix.

Data for two other control variables were obtained from REIS as well. The variable per-capita income by county is a continuous variable measuring in dollars the per-capita income in the county where the student resides for the year 2005. The variable distance of migration is the distance from the student's school to the center of the nearest county employing 75,000 or more people.

Additional Data Sources

Data for the minimum wage variable comes from the Center for American Progress. The variable minimum wage is the state or federal minimum wage a student faces given the area he resides in. If the student lives on Native land, the federal minimum wage applies. Data for the variable measuring the wage premium for having a

college degree comes from the American Community Survey (ACS). Data measuring the wage premium for having graduate high school also is from the ACS. The variable, tribal jurisdiction, comes directly from Public Law 83-280 (18 U.S.C. § 1162, 28 U.S.C. § 1360) and is equal to one for a student if the region he resides in is under the criminal and civil jurisdiction of the tribe and equal to zero if the student lives in an area under the legal jurisdiction of the state. This variable measures variation in legal institutions across Native land.

A more detailed explanation of all the variables used in the study, their corresponding sources and how they are measured can be found in Data Appendix. A table of summary statistics for all variables can be found there as well.

CHAPTER 7

EMPIRICAL RESULTS AND DISCUSSION

The baseline results are reported in Tables 3 and 4 for the two dependent variables, NAEP math scores and the number of days a student is absent in the past month, respectively.[26] The first column in Table 3 reports the results for the specification that estimates the Native Land effect and the effect that tribal jurisdiction has on math test scores, with no other controls. In this most basic specification students living on Native land score lower than students living off Native land, ceteris paribus. Similarly, Students living under tribal jurisdiction are estimated to score lower than students living off Native land, ceteris paribus. The first column in Table 4 indicates living on Native land or living in an area under tribal jurisdiction has no effect on a student's attendance when no other controls are included.

The second column in Table 3 and Table 4 adds a full vector of area characteristics, a vector of family background variables and a vector that proxies for peer effects. After adding these variables, the effect of living on Native land remains statistically significant in explaining math test scores but is reduced in magnitude. In the first specification, the coefficient on Native land may also be estimating the effect of low family inputs among Native American students. Furthermore, living in an area under tribal jurisdiction, when the three vectors of controls are added, is not statistically significant in explaining test scores. The second column in Table 4 reports that after

[26] Results for the specifications using NIES reading scores as the outcome variable can be found in Table 7 located in the Data Appendix. Results for the reading analysis are similar to those of the math analysis.

controlling for area characteristics, family background and peer effects, there is still no Native land effect but living in an area under tribal jurisdiction negatively affects student attendance. The added area characteristics are not significant in explaining test scores or student attendance. Family background (parent's education, number of books in home, if a student is an English Language Learner and if the student attends a Title 1 school[27]) and peer effects (student reported race and gender), however, are statistically significant in explaining both test scores and attendance.

The results reported in the third column include a vector of school resources. In this specification math test scores are no longer explained by living on Native land. Family background and peer effects are still statistically and economically significant in estimating student math test scores and attendance. One result that stands out in the third specification in Table 4 is when all four vectors of control variables are included; living in an area under tribal jurisdiction has a negative affect on student attendance. Living on Native land also has a negative relationship with student attendance but is small in magnitude. The remainder of the results discussion will focus on how the four main factors; area characteristics, family background, peer effects and school resources, explain both outcome variables.

[27] Title 1 is only statistically significant in explaining math test scores, not in number of days a student is absent in a month.

Table 3. Fixed Effects Estimation of NAEP Math Scores.

Independent Variables	**(1)** **No FE**	**(2)** **FE**	**(3)** **FE**
Area Characteristics			
Native land	-9.739	-3.915	-1.892
	(4.664)***	(1.984)**	(0.778)
Tribal jurisdiction	5.519	2.931	1.07
	(2.841)***	(0.515)	(0.205)
PCI by county (in $1,000's)		0.273	0.277
		(1.493)	(1.469)
Distance to migrate		-0.002	0.013
		(0.111)	(0.54)
Minimum wage		-5.548	-4.106
		(1.694)*	(1.152)
Large town		-0.712	-0.404
		(0.251)	(0.132)
Small town		-2.488	-1.793
		(0.784)	(0.499)
Family Background			
Mother did not finish high school		-6.022	-5.995
		(2.017)**	(1.986)**
Mother has high school degree		-1.953	-1.211
		(0.826)	(0.492)
Mother has some post high school. ed.		-0.148	-0.163
		(0.059)	(0.06)
Mother ed. unknown		-9.297	-7.807
		(3.307)***	(2.66)***
Father did not finish high school		-10.054	-10.145
		(3.277)***	(3.086)***
Father has high school degree		-6.533	-6.975
		(2.571)**	(2.916)**
Father has some post high school ed.		1.919	0.806
		(0.664)	(0.312)
Father ed. unknown		-8.29	-10.309
		(3.453)***	(4.717)***
0-10 books in home		-15.362	-15.657
		(4.901)***	(4.715)***
11-25 books in home		-11.31	-10.862
		(4.86)***	(4.066)***
26-100 books in home		-4.102	-3.855
		(1.514)	(1.29)
English language learner		-9.874	-8.185
		(3.361)***	(2.589)***
Title1		-4.639	-4.622
		(2.099)**	(1.901)*

Table 3. Fixed Effects Estimation of NAEP Math Scores (continued).

Peer Effects			
Self I.D. white		5.09	5.627
		(1.707)*	(1.868)*
Self I.D. black		-9.08	-8.097
		(1.942)*	(1.525)
Self I.D. Hispanic		-3.294	-3.681
		(1.605)	(1.787)
Self I.D. Asian		-1.334	2.937
		(0.195)	(0.53)
Self I.D. more than one race		9.13	9.657
		(3.477)***	(3.807)***
Gender		3.341	3.575
		(2.017)**	(2.056)**
School Resources			
Expenditures/pupil (in $1,000's)			-0.001
			(1.016)
Years Taught			-4.207
			(1.983)**
School enrollment			0.002
			(0.582)
R-sq.	0.024	0.232	0.237
N	2993	2383	2083

t-statistics are indicated in parenthesis. *, **, ***, indicate statistical significance at the 10%, 5%, and 1% or better levels, respectively.

Table 4. Probit Estimation of Number of Days a Student is Absent in a Month.[28]

Independent Variables	**(1) No FE**	**(2) FE**	**(3) FE**
Area Characteristics			
Native land	-0.0229	0.01717	0.0488
	(1.33)	(0.83)	(1.95)*
Tribal jurisdiction	-0.013	0.08815	0.0878
	(0.72)	(1.70)*	(1.73)*
Minimum wage		-0.02192	0.0011
		(0.45)	(0.02)
PCI by county (in $1,000's)		0.00192	0.0024
		(1.34)	(1.60)
Distance to migrate		0.0000	0.0000
		(0.16)	(0.33)
Large town		-0.00461	-0.003
		(0.19)	(0.12)
Small town		0.01767	0.0362
		(0.79)	(1.5)

[28] The coefficients reported are the marginal affects dy/dx.

Table 4. Probit Estimation of Number of Days a Student is Absent in a Month (continued).

Family Background		
Mother did not finish high school	0.1218	0.1208
	(3.44)***	(3.19)***
Mother has high school degree	0.0864	0.0952
	(3.15)***	(3.21)***
Mother has some post high school. ed.	0.03254	0.0213
	(1.27)	(0.81)
Mother ed. unknown	0.0838	0.0799
	(2.84)***	(2.55)**
Father did not finish high school	0.0439	0.0432
	(1.45)	(1.33)
Father has high school degree	0.00032	0.0081
	(0.01)	(0.32)
Father has some post high school ed.	-0.00644	0.0093
	(0.25)	(0.33)
Father ed. unknown	0.03737	0.0473
	(1.56)	(1.83)*
0-10 books in home	0.04863	0.0326
	(1.76)	(1.18)
11-25 books in home	0.02226	.0142
	(1.0)	(0.63)
26-100 books in home	-0.00796	-0.0192
	(0.4)	(0.94)
English language learner	0.02803	0.0407
	(1.23)	(1.54)
Title1	-0.0036	0.0155
	(0.22)	(0.86)
Peer Effects		
Self I.D. white	-0.0599	-0.0593
	(3.25)***	(3.21)***
Self I.D. black	-0.00748	0.0109
	(0.16)	(0.20)
Self I.D. Hispanic	-0.0162	-0.0199
	(0.90)	(1.07)
Self I.D. Asian	-0.10316	-0.0995
	(4.82)***	(4.85)***
Self I.D. more than one race	-0.0084	-0.0066
	(0.41)	(0.31)
Gender	-0.0241	-0.0337
	(1.73)*	(2.31)

Table 4. Probit Estimation of Number of Days a Student is Absent in a Month (continued).

School Resources			
Expenditures/pupil (in $1,000)			-0.0068
			(1.68)*
Years taught			0.0033
			(0.18)
School enrollment (in 1,000)			0.0647
			(2.33)**
N	2427	2314	2023

z- statistics are indicated in parenthesis. *, **, ***, indicate statistical significance at the 10%, 5%, and 1% or better levels, respectively.

Family Background as a Predictor of Native American Test Scores

Consistent with other human capital accumulation literature, the results from the second and third specifications show family background is economically and statistically significant in explaining Native American students' math test scores. The results from the third specification indicate Native American students whose mother did not finish high school score approximately 1/5 of a standard deviation lower than students whose mother graduated from college. A similar effect exists regarding students' father's education level. The difference in test scores between students whose father graduated college and students whose father did not graduate high school is equivalent to moving from the 75^{th} percentile to the 80^{th} percentile among all NIES math test takers. Additionally, students with 0-10 books in their home score half of a standard deviation lower than students with over 100 books in their home. Students who are English language learners will also score about 1/4 of a standard deviation lower than students who are not.

The results from the third specifications also report the proxy for family income is statistically significant. Students who attend a school classified as Title 1 will have a

lower math score by about 1/7 of a standard deviation than students who attend a school with a more affluent student body. Adding school inputs to the specification has almost no effect on the magnitude or statistical significance of the Title 1 variable implying students who attend schools consisting of a mostly low socio-economic student body do not appear to score poorly because their schools lack resources. This result, however, may be misleading because the proxy for school resources does not include the private donations a school receives. Private donations are likely to vary significantly by the socio-economic status of a community and are also likely to influence the quality of a school. Therefore the variable Title 1 may be estimating family income as well as poor school quality.

I obtain similar results when the number of days a student is absent is employed as the outcome variable. The third specification indicates students whose mother did not graduate high school are approximately 12% more likely to miss a week or more of school than students whose mother graduated from college. Students' father's education level is less statically and economically significant in explaining student attendance than the mother's education level.

It is uncertain why a father's education level explains student test scores, or academic performance, but does not explain student attendance. It is possible a father who is more educated is better able to assist his child in his academic pursuits. The child will face a lower cost in acquiring human capital, as reflected in the math test score. On the other hand, attendance may be a student's decision and less affected by family inputs. Students may chose to attend school for reasons other than acquiring human capital. They

may attend for social benefits, athletics, or because they are required to by law. Compulsory schooling laws may incentivize a student to attend school but does not ensure human capital accumulation. Compulsory schooling laws are not included as a control in the analysis because there is no variation across the sample.

The variable that proxies for family income (Title 1) is not statistically significant in explaining student attendance but it is in explaining math test scores. One interpretation of this result, as earlier mentioned, is the variable is also estimating poor school quality. Since test scores appear to be more sensitive to school quality than attendance, it makes sense the variable would not estimate attendance. Similarly, to a certain extent gender explains test scores but it does not influence attendance.

The result that family background in general explains student test scores and attendance is consistent with the theoretical framework. Students with more family inputs experience lower direct costs of acquiring human capital and therefore have a higher academic performance. There is the possibility, however, that parent education is partially estimating school quality. Highly educated parents may self select into living in more affluent areas. Schools in these areas are likely to receive higher private contributions than schools in more disadvantaged areas, resulting in higher quality schools.

Peer Effects as a Predictor of Native American Test Scores

In the analysis estimating NAEP math test scores, the empirical results in the third specification report students who identify with the peer group, white, perform 1/5 of a

standard deviation higher on the math assessment than students who identify with the peer group Native American. Furthermore, students who identify as being more than one race score 1/3 of a standard deviation higher than students who identify with the peer group Native American. This variable has several interpretations. The negative relationship between race and test scores may indicate that there is a higher cost for human capital accumulation among students who identify with the Native American peer group. These students may associate high human capital with the rejection of their racial identity. It is possible they experience decreased popularity for doing well academically, similar to the findings in Fryer and Torelli (2005).[29]

Another possible explanation is that the coefficients on the racial peer groups are estimating family inputs. Duncan and Trejo (2005) report there is a strong negative relationship between the education level of Mexican-American parents and the likelihood their children will retain their Mexican ethnicity.[30] It is possible a similar relationship exists for Native Americans. It may be students with better educated parents are less likely to retain their Native American ethnicity. If this is the case, the Native American peer group may partially estimate low parental education which also leads to lower test scores.

Additionally, consistent with the broader human capital accumulation literature, male Native American students score slightly higher than female Native American

[29] Fryer and Torelli (2005) find an inverse relationship between popularity and academic performance among students that identify with the black peer group. A positive relationship exists for students that identify with the white peer group.

[30] They also find children of intermarried Mexican Americans are less likely to identify as Mexican than children of endogamous Mexican marriages.

students on the math assessment. The opposite result prevails when reading test scores are used as the outcome variable; females score higher on the reading assessment.

When student attendance is employed as the dependent variable the findings in the second and third specifications indicate a similar peer effect. Students who identify as being white are 6% less likely to miss a week or more of school in a month than students who identify with the Native American race. The results also report students who identify with the Asian race are 10% less likely to miss a week or more of school. In the sample, however, there are only 37 students that self identify with the Asian race, 35 of which miss less than a week of school in a month. The large magnitude on the Asian peer group may be driven by the sample.

Area Characteristics as a Predictor of Native American Test Scores

In the first specification, when only the variables Native land and tribal jurisdiction are included in estimating student NAEP math scores, both variables are statistically and economically significant. Students living on Native land will score 1/3 of a standard deviation lower than students living off Native land. Students living in areas under tribal jurisdiction will score 1/8 of a standard deviation lower than students living off Native land. In the second specification, when a full set of area characteristics, the family background vector and the peer effects vector are included, living on Native land is still statistically significant in estimating a student's test score; however the magnitude is greatly reduced. Living under tribal jurisdiction is no longer statistically significant in the second specification. It is likely in the first specification, the coefficient on the

variable, Native land, is estimating low family inputs or peer effects. Specifically, approximately 70% of the students in this sample who attend schools on Native land also are attending Title 1 schools. Therefore, it is possible Title 1 is estimating the Native land effect once it is included. Similarly, the variable, tribal jurisdiction may lose significance as controls are added for the same reason.

Furthermore, in the second specification, the minimum wage in the area a student resides predicts student test scores to a small degree. Consistent with the theoretical framework,[31] if the minimum wage that applies to a student increases by $1, his test score will decrease by 1/5 of a standard deviation. The increase in minimum wage is likely to reduce the wage premium for being educated or increases the direct cost of human capital accumulation. It is important to note, however, that minimum wage also may increase unemployment levels. Higher unemployment will reduce an individual's opportunity cost. Therefore, a higher minimum wage only increases opportunity cost for those that are able to obtain a minimum wage job. Including unemployment rates by county in the analysis will control for this bias. In the third specification when school resources are added, no area characteristics are statistically significant, including the variable "Native land".

In the first specification, where only measures for Native land and tribal jurisdiction are included in estimating the number of days a student is absent in a month, neither variable is statistically significant. In the second specification when the full area characteristics vector, family background vector and peer effects vector are included,

[31] Neumark and Wascher (1995) find a negative relationship between minimum wage and school enrollment. They also find a positive relationship between minimum wage and the proportion of teens both unemployed and not attending school.

living under tribal jurisdiction is statistically significant in explaining a student's attendance. Native American students living under tribal jurisdiction will be 9% more likely to miss five or more days of school than students who live off Native land. In the third specification, when the vector of school resource proxies are included, students living in an area under tribal jurisdiction are about 13% more likely to miss a week or more of school in a month than students living off Native land.

In the first specification, the variable measuring whether a student lives under tribal jurisdiction is likely to suffer from omitted variable bias. By controlling for area characteristics, family background, peer effects and school resources in third specification the coefficient on this variable is a more precise estimate of the effect that legal regime, or the law, has on student attendance.

School Resources as a Predictor of Native American Test Scores

School resources, which are added in the third specification, explain very little about student math test scores. One explanation, as mentioned above, is that vector that proxies for school resources is not adequate because it does not include the private revenue a school receives. The one school quality variable that appears to explain test scores is the number of years a teacher has been teaching. Students whose teachers have been teaching less than four years will score 1/8 of a standard deviation lower than students who have an experienced teacher. In the analysis estimating student attendance, the size of the student body is the only variable in the school resource vector that is

statistically significant. If a student body increases by 1,000 students, students are 6.5% more likely to miss a week or more of school in a month.[32]

Robustness Checks

I employ several variations of the baseline specifications to check the robustness of the results. First, I test the sensitivity of the school resource result by including pupil teacher ratio as a proxy for school resources in place of expenditures per pupil. The results are consistent across the two specifications and indicate school resources are not significant in explaining student test scores or likelihood of attendance. Furthermore, the magnitude and the statistical significance of the "Native land" variable was not affected in this alternative specification. Expenditures per pupil and pupil teacher ratio are considered alternative proxies for one another because they are highly correlated. Therefore, it is only necessary to include one of these variables in a specification.

Another variable used as a proxy for a school's resources is the type of a student's teacher's certification. This variable is not statistically significant in explaining math test scores or student attendance when added to the third baseline specification. This result is consistent with the previous result that school resources, other than teaching experience, have little effect on test scores.

I also check the sensitivity of the effect of the Native American peer group by using an alternative proxy, percent of the school Native American. Percent of the school Native American is not statistically significant in explaining test scores when it is

[32] NAEP reading test scores are also used as an outcome variable where a similar analysis to the NAEP math scores is employed. Results for this analysis can be found in Table 7. In general family background and peer effects explain NAEP reading scores.

included in the third baseline specification in place of the student reported race variable. This variable is also not statistically significant when it is included in a specification in addition to the race variable. Furthermore, percent of school Native American is not statistically significant in explaining student attendance when added to the third specification. Percent of school Native American may be a poor proxy for ethnic peer groups because it is school reported, where the race variable is student reported.

The percent of a school eligible for the National School Lunch Program (NSLP) is used as an alternative proxy for Title 1, as they both estimate low family income. The variable, percent of the school eligible for NSLP, is not statistically significant in explaining student attendance or NAEP math scores when it is included in the third specification in place of the variable Title 1. This result is consistent with the baseline regression estimating student attendance since Title 1 also does not explain a student's likelihood to miss five or more days of school in a month. On the other hand, the variable Title 1, explains NAEP math scores. It is uncertain why the alternative proxy, NSLP, does not estimate this same effect since the two variables are highly correlated.

I also employ an alternative specification to check if the high human capital wage is likely to be influenced by legal institutions. I use a restricted model which includes all control vectors but excludes the proxy for the high human capital wage. When the proxy for high human capital wage is excluded, the coefficient on the variable Native land has as stronger negative effect. This implies the high human capital wage is lower on Native land. Likewise, in the same restricted specification, the coefficient on the variable tribal

jurisdiction has a smaller positive effect on test scores. Therefore, it is likely the high human capital wage is even lower in areas under tribal jurisdiction.

Several other alternative specifications are used as robustness checks. The first includes the wage premium by state earned for graduating high school. I run the second and third baseline specifications estimating math scores, but include the high school wage premium variable in place of minimum wage and per-capita income by county with the expectation that it is a closer proxy for the wage premium. The high school wage premium is statistically insignificant in both specifications (note state fixed effects are excluded). I also run identical specifications to the first two but exclude minimum wage and include per-capita income by county. The high school wage premium is still statistically insignificant. Similarly, I employ the same four alternative specifications using the wage premium for graduating college. The college wage premium is also statistically insignificant in explaining math test scores. In all of the alternative specifications the coefficient on Native land is unaffected. One downside of these alternative specifications is that state fixed effects can not be included because the wage premiums are state level measurements. Excluding fixed effects is likely to cause omitted variable bias in the estimation. Furthermore, neither wage premium is statistically significant in estimating the probability of a student's attendance.

Last, NAEP reading test scores are employed as an outcome variable. A full report of these results can be found in Table 7. The reading analysis yields similar results as the NAEP math score analysis. Parent's education and books in the home are significant in explaining reading scores. Students that are English Language Learners

score 2/3 of a standard deviation lower than those that are not. Peer effects also explain a student's reading score.

CHAPTER 8

CONCLUSION

Native Americans have low human capital accumulation. In 2007 only 21% of Native Americans scored at the proficient level on the NAEP math assessment compared to 37% of all other students that took the assessment. No previous econometric analysis attempts to explain the cause of this low academic performance. In this paper I have empirically examined several factors that are likely to explain Native American students' human capital accumulation, specifically their NAEP test scores.

First, family background variables are statistically and economically significant in explaining all three of the measures of human capital that I employ. When family inputs are higher, students acquire a higher level of human capital. Specifically, more books in a home and having better educated parents yields higher test scores and reduces the likelihood of being absent. Students whose mothers did not finish high school are 12% more likely to miss a week or more of school in a month than students whose mothers graduated from college. Second, racial peer effects also appear to explain student test scores. Students who identify with the Native American peer group will have lower test scores by about 1/5 of a standard deviation than students who consider themselves white. It is not certain, however, whether the student reported race variable really is estimating racial peer effects. More analysis is needed to better support the peer effects finding.

Similarly, students with low family income also score lower than students that with a higher family income. Students who attend a Title 1 school score 1/7 of a standard

deviation lower on the NAEP math test than students attending a school with a more affluent student body. Last, legal jurisdiction and living on Native land does not explain a students test score but when a full set of control variables are included, tribal jurisdiction has a negative effect on the likelihood of a student's attendance. That is, students residing under tribal jurisdiction are 13% more likely to miss a week or more of school in a month than students living off Native land. All three of the statistically significant results, family background, peer effects and institutional factors unique to Native Americans, are consistent with the theoretical predictions outlined by the general Human Capital Accumulation Model.

In conclusion, this analysis provides a first step in understanding possible explanations of Native Americans' human capital investment decisions. The findings are pertinent to Native Americans but are also significant to a wider audience. Tribal governments, the United States Federal government as well as state governments may find the implications useful in developing educational policy aimed at increasing the level of Native Americans' human capital accumulation. Furthermore, the framework employed in this analysis can be used to examine similar education outcomes in developing countries or to look at other education outcomes among Native Americans. One possible next step in further developing this analysis may be to incorporate school reported non-Native Americans in the sample. Adding these students will allow for comparison across races while still exploiting the variation in Native land and legal institutions.

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APPENDICES

APPENDIX A

TABLES

Table 5. Summary Statistics for NAEP Math Score[33] Analysis.

Variable	Obs.	Mean	St. Dev.	Min	Max
NAEP Math Score	2993	265.738	32.103	143.26	381.06
Absent 5+ Days in Month	2427	0.1225	0.32686	0	1
Native Land	2993	0.35984	0.48003	0	1
Tribal Jurisdiction	2993	0.416973	0.49314	0	1
Minimum Wage ($)	2993	5.660625	0.86213	5.15	7.35
Distance to Migrate (mi.)	2993	151.2721	106.4279	0.490423	796.3056
PCI by County (in $1,000's)	2993	30.05955	8.31871	11.381	67.196
FIPST: state identifier	2993	30.05012	17.37102	1	56
Mother did not finish high school	2411	0.1225	0.32793	0	1
Mother has high school degree	2411	0.24209	0.42844	0	1
Mother has some post high school ed.	2411	0.2013	0.40105	0	1
Mother has college degree	2411	0.2512	0.43379	0	1
Mother ed. unknown	2411	0.18292	0.38668	0	1
Father did not finish high school	2421	0.12826	0.33445	0	1
Father has high school degree	2421	0.23254	0.42254	0	1
Father has some post high school ed.	2421	0.13849	0.34549	0	1
Father has college degree	2421	0.20857	0.40637	0	1
Father ed. unknown	2421	0.29214	0.45484	0	1
0-10 Books in Home	2428	0.15182	0.35892	0	1
11-25 Books in Home	2428	0.25591	0.43646	0	1
26-100 Books in Home	2428	0.36698	0.48208	0	1
> 100 Books in Home	2428	0.22528	0.41786	0	1
Gender	2993	0.47000	0.499958	0	1
Self I.D. w/ White	2993	0.1424	0.349514	0	1
Self I.D. w/ Black	2993	0.03286	0.178293	0	1
Self I.D. w/ Hispanic	2993	0.15949	0.36619	0	1
Self I.D. w/ Asian	2993	0.02286	0.14947	0	1
Self I.D. w/ N.A.	2993	0.49167	0.50001	0	1
Self I.D. w/ Multi-Race	2993	0.15074	0.35785	0	1
English Language Learner	2990	0.096841	0.333816	0	1
Expenditures/Pupil (in $1,000's)	2993	7.991121	3.264895	4.641043	60.4878
Pupil/Teacher Ratio	2993	16.02454	4.118314	0	57
% school NSLP	2873	45.49068	24.3088	0	99.47644
School Enrollment	2993	597.2104	361.1218	0	2578
City	2993	0.19347	0.39508	0	1
Large Town	2993	0.25265	0.43461	0	1
Small Town	2993	0.55388	0.49717	0	1
Title 1	2973	0.437283	0.496146	0	1
Years Taught	2637	0.245358	0.432212	0	1
Type of Teaching Certificate	2617	0.837401	0.36364	0	1
% school NA	2993	25.61884	34.64344	0	100
H.S. Wage Premium ($)	2993	6952.096	1285.013	4208	9979
College Wage Premium ($)	2993	16172.13	3124.116	8467	23171

[33] I use the same sample to estimate the number of days a student is absent in a month as I do to estimate a student's math test score. For the first analysis the variable, *absent*, is used as the left hand side variable.

Table 6. Summary Statistics for Reading Score Analysis.

Variable	Obs.	Mean	St. Dev.	Min	Max
NAEP Read Score	3288	248.997	34.869	123.66	342.76
Native Land	3288	0. 409976	0.491903	0	1
Tribal Jurisdiction	2924	0. 418605	0. 493415	0	1
Minimum Wage ($)	3202	5.650484	0. 855495	5.15	7.35
Distance to Migrate (mi.)	3288	123.6141	142.6727	0.345567	815.977
PCI by County	2921	30.28122	8.472529	11.381	86.062
FIPST: state identifier	2924	29.44602	17.58354	1	56
Mother did not finish high school	2365	0.14167	0.34878	0	1
Mother has high school degree	2365	0.21527	0.4111	0	1
Mother has some post high school ed.	2365	0.20453	0.40344	0	1
Mother has college degree	2365	0.24279	0.42886	0	1
Mother ed. unknown	2365	0.19574	0.39686	0	1
Father did not finish high school	2367	0.13228	0.33887	0	1
Father has high school degree	2367	0.23189	0.42213	0	1
Father has some post high school ed.	2367	0.16061	0.36725	0	1
Father has college degree	2367	0.19283	0.3946	0	1
Father ed. unknown	2367	0.28239	0.45026	0	1
0-10 Books in Home	2379	0.14155	0.34866	0	1
11-25 Books in Home	2379	0.27079	0.44446	0	1
26-100 Books in Home	2379	0.3583	0.4796	0	1
> 100 Books in Home	2379	0.22935	0.4205	0	1
Gender	3288	0.504573	0.500067	0	1
Self I.D. w/ White	2922	0.14288	0.35001	0	1
Self I.D. w/ Black	2922	0.02804	0.16512	0	1
Self I.D. w/ Hispanic	2922	0.16895	0.37477	0	1
Self I.D. w/ Asian	2922	0.02536	0.15726	0	1
Self I.D. w/ N.A.	2922	0.48697	0.49992	0	1
Self I.D. w/ Multi-Race	2922	0.1478	0.35497	0	1
English Language Learner	3274	0.093651	0.350868	0	1
Expenditures/Pupil (in $1,000)	2923	8.071699	3.183321	4.517241	60.4878
Pupil/Teacher Ratio	2925	15.90894	4.327067	0	72.8
% NSLP	2801	44.8452	24.11297	0	99.65237
School Enrollment	3288	582.7685	365.5655	0	2854
City	2924	0.20261	0.40201	0	1
Large Town	2924	0.25886	0.43808	0	1
Small Town	2924	0.53853	0.4986	0	1
Title 1	3270	0.437012	0.499436	0	1
Years Taught	3010	0.237619	0.427197	0	1
Teaching Certificate	2956	0.891501	.3371884	0	1
% school NA	3288	25.44408	38.26617	0	100
H.S. Wage Premium ($)	2925	6729.81	1255.82	4208	9979
College Wage Premium ($)	2925	14622.01	2986.47	8467	23600

Table 7. Fixed Effects Estimation of NAEP Reading Scores.

Independent Variables	**(1)**	**(2)**	**(3)**
Area Characteristics			
Native land	-6.433	-1.208	-1.679
	(2.285)**	(0.394)	(0.694)
Tribal jurisdiction	10.399	-8.037	-9.776
	(3.725)***	(1.085)	(1.251)
PCI by county (in $1,000's)		0.133	0.138
		(0.68)	(0.656)
Distance to migrate		0.009	-0.004
		(0.323)	(0.14)
Minimum wage		-5.318	-5.198
		(0.621)	(0.643)
Large town		3.349	2.65
		(1.084)	(0.799)
Small town		4.332	3.798
		(1.183)	(1.005)
Family Background			
Mother did not finish high school		-1.848	-3.065
		(0.616)	(1.0)
Mother has high school degree		-0.955	-2.16
		(0.406)	(0.992)
Mother has some post high school. ed.		5.817	5.504
		(2.087)**	(1.825)*
Mother ed. unknown		-7.285	-8.553
		(2.569)***	(3.116)***
Father did not finish high school		-5.286	-4.631
		(1.399)	(-1.137)
Father has high school degree		-4.977	-4.872
		(1.988)**	(1.76)*
Father has some post high school ed.		5.091	5.285
		(1.965)**	(1.875)*
Father ed. unknown		-4.961	-3.834
		(1.555)	(1.228)
0-10 books in home		-19.812	-18.226
		(6.835)***	(5.812)***
11-25 books in home		-15.676	-16.721
		(5.879)***	(5.856)***
26-100 books in home		-5.443	-6.232
		(2.527)***	(2.953)***
English Language Learner		-19.284	-18.068
		(7.767)***	(7.501)***
Title1		-0.091	0.377
		(0.039)	(0.155)

Table 7. Fixed Effects Estimation of NAEP Reading Scores (continued).

Peer Effects			
Self I.D. white		1.468	2.475
		(0.488)	(0.847)
Self I.D. black		-15.328	-11.84
		(2.165)**	(1.624)
Self I.D. Hispanic		-3.111	-1.974
		(0.979)	(0.618)
Self I.D. Asian		1.35	0.874
		(0.16)	(0.097)
Self I.D. more than one race		6.552	6.614
		(1.911)*	(1.942)*
Gender		-7.126	-6.31
		(3.409)***	(2.758)***
School Resources			
Expenditures/ pupil (in $1,000's)			0.342
			(0.649)
Years taught			0.053
			(0.025)
School enrollment			0.001
			(0.198)
R-sq	0.025	0.265	0.261
obs.	2924	2331	2149

t-values are indicated in parenthesis. *, **, ***, indicate statistical significance at the 10%, 5%, and 1% or better levels, respectively.

Table 8. Types of Federally Designated Native Land.

Land Type	Brief Description
Alaska Native Village Statistical Area (ANVSA)	"Alaska Native Village Statistical Areas are statistical entities that represent the densely settled portion of Alaska Native villages (ANVs), which constitute associations, bands, clans, communities, groups, tribes or villages, recognized by the Alaska Native Claims Settlement Act of 1972 (Public Law 92-203)."
American Indian Reservation	"Federal American Indian reservations are areas that have been set aside by the United States for the use of tribes, the exterior boundaries of which are more particularly defined in the final tribal treaties, agreements, executive orders, federal statutes, secretarial orders, or judicial determinations. The U.S. Census Bureau recognizes federal reservations as territory over which American Indian tribes have primary governmental authority. These entities are known as colonies, communities, pueblos, rancherias, ranches, reservations, reserves, villages, Indian communities, and Indian villages."
American Indian Off-Reservation Trust Land	"Trust lands are areas for which the United States holds title in trust for the benefit of a tribe (tribal trust land) or for an individual Indian (individual trust land). Trust lands can be alienated or encumbered only by the owner with the approval of the Secretary of the Interior."
Oklahoma Tribal Statistical Area (OTSA)	"Oklahoma tribal statistical areas (OTSAs) are statistical entities identified and delineated by the U.S. Census Bureau in consultation with federally recognized American Indian tribes in Oklahoma that do not currently have a reservation, but once had a reservation in that state. Boundaries of OTSAs will be those of the former reservations in Oklahoma, except where modified by agreements with neighboring tribes for data presentation purposes."
State Designated American Indian Statistical Area (SDAISA)	"State designated American Indian statistical areas (SDAISAs) are statistical entities for state recognized American Indian tribes that do not have a state recognized land base (reservation)."
Tribal Designated Statistical Area (TDSA)	"Tribal designated statistical areas (TDSAs) are statistical entities identified and delineated for the U.S. Census Bureau by federally recognized American Indian tribes that do not currently have a federally recognized land base (reservation or off-reservation trust land). A TDSA generally encompasses a compact and contiguous area that contains a concentration of people who identify with a federally recognized American Indian tribe and in which there is structured or organized tribal activity."

Source: United States Census Bureau http://www.census.gov/geo/www/cob/na_metadata.html

APPENDIX B

DATA

2005 NIES Sampling: Complex Sampling Scheme

Many surveys use a simple random sampling method where student A is just as likely to be selected for the sample as student B. The NAEP uses a complex sampling scheme where sampling rates vary across students. For example, certain subgroups (i.e. minority groups or students from a rural area) are oversampled to obtain more observations for those groups. The more data available on the particular subgroup the more precise the statistical analysis of that group will be. To account for the differential probabilities of selection, and to allow for the adjustments of non-response, each student is assigned a sampling weight. Sampling weights must be used to make valid inferences from samples and to obtain unbiased estimates of population characteristics. Two processes, Jackknifing or Taylor Series Expansion, can be used to obtain unbiased coefficients and valid standard errors. Without including sampling weights, standard errors will be underestimated and coefficients will appear more statistically significant than they really are.[34]

2005 NIES Design: Balanced Incomplete Block Spiraling (BIB)

Many surveys use a simple multiple matrix sampling scheme where all students within an assessment session are administered the same testing booklet. The NAEP uses the Balanced Incomplete Block Spiraling (BIB) method. In this method all test questions are divided into small blocks. Each block of exercises is paired with other blocks in other

[34] For more information on the complex sampling design, BIB spiraling or plausible values used in the NAEP see the American Institutes for Research help file or http://nces.ed.gov/nationsreportcard/pdf/main2005/2006453.pdf

booklets. Only a few students in any given session receive the same booklet. Students are assessed only in a single content area within the subject Math or Reading instead of all areas. BIB spiraling allows the estimation of correlations between items within a content area. It also allows the estimation of proficiency between content areas within a subject area. A benefit of the spiral design is that each block of items is presented to fewer students in any school, but more schools are included than in a simple matrix design.

2005 NIES Scoring: Plausible Values

In many standardized assessments students receive a percentage score between 0% and 100%. The NAEP uses plausible values where a student's proficiency, or score on the tests, is only partially observed. Instead of observing proficiency directly a pattern of responses to items on the assessment are observed. Therefore, an individual's score is represented by a probability distribution over all possible scores instead of a single value. In the NAEP each respondent is administered relatively few test questions in a subject area by nature of the BIB spiraling design, the uncertainty associated with his ability is too large to be ignored and thus estimates of proficiency can be seriously biased. To correct this problem, NAEP computes five plausible values for each content area and subject for each student. These plausible values are constructed from the results of a comprehensive marginal maximum likelihood regression equation including data from the background section of the NAEP and an appropriate random component. By using these plausible values, secondary analysts can obtain consistent estimates of population

characteristics even though individual point estimates for each individual might be biased.

Variable Definitions

Math

The dependent variable, math, is made up of five plausible values,[35] ranging from 0-500. This variable measures a Native American student's math proficiency as evaluated by the NAEP. Data for the variable come from the 2005 NIES Mathematics Assessment.

Read

The dependent variable, read, is made up of five plausible values, ranging from 0-500. This variable measures a Native American student's reading proficiency as evaluated by the NAEP. Data for the variable come from the 2005 NIES Mathematics Assessment.

Absent

The variable, absent, is a binary variable for the number of days a student is absent in the past month. This outcome variable proxies for a student's human capital accumulation. Data for this variable come from the 2005 NIES Mathematics Assessment. This variable has two categories and is coded as follows:

[35] For a more detailed definition of Plausible Values see the *2005 NIES Scoring: Plausible Values* section in the Data Appendix.

Absent = 0 if the student misses 0-4 days of school in a month

Absent = 1 if the student misses 5 or more days of school in a month

Native Land

The variable, Native land indicates if a student lives on a Federally designated Native Land. Federally designated Native Land includes the following: Alaska Native Regional Corporation (ANRC), Alaska Native Village Statistical Area (ANVSA), American Indian Reservations, American Indian Off-Reservation Trust Land, American Indian Tribal Subdivision, Hawaiian Homeland (HHL), Oklahoma Tribal Statistical Areas (OTSA), and Tribal Designated Statistical Area (TDSA) [36]. The variable was constructed in the statistical program, R, using a shape file containing all United States Native Land and mapping that to the longitude and latitude of the school student i attends. Data for the school's longitude and latitude come from the 2005 NIES Assessment. The variable is coded as follows:

Native land = 1 if the student lives on federally designated Native Land

Native land = 0 if the student does not live on Native Land

Tribe Jurisdiction

This binary variable indicates if a student lives on a Native land under tribal court jurisdiction. Information for this variable comes from Public Law 83-280. The variable is coded as follows:

Tribe jurisdiction = 0 if the student lives off a Native land or in a state under PL-280 (state criminal and civil jurisdiction prevails in these states)

[36] A more detailed description of each type of Native Land can be found in Table 8.

Tribe jurisdiction = 1 if the student lives on a Native land in a state with no PL-280 (or where tribal criminal and civil jurisdiction prevail).

Minimum Wage

The variable minimum wage is a measure of the minimum wage that applies to student i in 2005. Some states have set a minimum wage higher than the federal wage of $5.15 and some lower. In either case, the higher wage prevails. This variable is continuous and meant to proxy for the low human capital wage. Data for this variable come from the Center for American Progress, http://www.americanprogress.org/issues/2007/01/minwage/map.html.

Distance to Migrate

This variable is the distance in miles from the school student i attends to the center of the nearest county employing 75,000 people. The data were obtained from Regional Economic Information System (REIS). This variable is meant to proxy for the cost of moving for employment opportunities.

Per-Capita Income by County

This variable is the per-capita income in dollars for the county student i goes to school in. The variable is divided by 1,000 to scale it for easier interpretation. Data were obtained from Regional Economic Information System. This variable is a measure of the economic opportunity in the county student i resides.

Fipst

This variable is the Federal Information Processing Standard and uniquely identifies all fifty states within the United States as well as the District of Columbia, the Department of Defense Domestic, Department of Defense Oversees and the Bureau of Indian Education. The variable allows the specifications to include state fixed effects. Data for this variable come from the 2005 NIES Assessment.

Gender

This categorical variable indicates if student i is male or female. The data are obtained from the 2005 NIES Assessment. The variable is coded as follows:

Gender = 0 if the student is female

Gender = 1 of the student is male

Race

The variable, race, is a categorical variable and is obtained from the 2005 NIES Assessment. This particular measure of race is student reported and is coded as follows:

Race = 1 if student reports as being white

Race = 2 if student reports as being black

Race = 3 if student reports being Hispanic

Race = 4 if student reports being Asian

Race = 5 if student reports being American Indian or Alaska Native

Race = 6 if student reports being more than one race

The omitted category in this analysis is Race = 5.

Mother Education

This variable is a categorical variable indicating the level of education for the mother of student i. Data are obtained from the 2005 NIES Assessment. The variable is coded as follows:

Mother ed. = 1 if she did not finish high school

Mother ed. = 2 if she graduate from high school

Mother ed. = 3 if she obtained some education after high school

Mother ed. = 4 if she graduated college

Mother ed. = 5 if her education level is unknown

The omitted category in this analysis is Mother ed. = 4.

Father Education

This variable is a categorical variable indicating the level of education for the father of student i. Data are obtained from the 2005 NIES Assessment. The variable is coded as follows:

Father ed. = 1 if he did not finish high school

Father ed. = 2 if he graduate from high school

Father ed. = 3 if he obtained some education after high school

Father ed. = 4 if he graduated college

Father ed. = 5 if her education level is unknown

The omitted category in this analysis is Father ed. = 4.

Books

The variable, books, is a categorical variable for the number of books found in the home of student i. Data for this variable are from the 2005 NIES Assessment. The variable is coded as follows:

Books = 1 if student has 0-10 books in the home

Books = 2 if the student has 11-25 books in the home

Books = 3 if the student has 26-100 books in the home

Books = 4 if the student has over 100 books in the home

The omitted category in this analysis is Books = 4.

English Language Learner

English Language Learner is a dummy variable indicating if student i is an English Language Learner. The data for the variable come from the 2005 NIES Assessment. This variable is coded as follows:

English Language Learner = 0 if the student is not an English language learner or no longer is an English language learner

English Language Learner = 1 if the student is an English language learner

Expenditures per Pupil

This continuous variable is the expenditures per student by school district in dollars and was constructed by dividing the number of students in the district by the total expenditures in that district. The variable was then divided by 1,000 to scale it for easier

interpretation. The data for this variable come from the Common Core of Data, specifically the 2005 Local Education Agency (School District) Finance Survey.

Pupil Teacher Ratio

This is a continuous variable measuring the student to teacher ratio in the school student i attends. Data for this variable come from the Common Core of Data specifically, the 2005 Public Elementary and Secondary School Universe Survey.

Percent Free Lunch

This is the percent of students within the school student i attends that are eligible to participate in the National School Lunch Program under the National School Lunch Act. This is a continuous variable and was constructed by dividing the number of students eligible for the lunch program in the school by the total number of students in the school. Data for this variable come from the Common Core of Data specifically, the 2005 Public Elementary and Secondary School Universe Survey.

Enrollment

Enrollment is a continuous variable for the number of students enrolled in the school student i attends. Data for this variable come from the Common Core of Data specifically, the 2005 Public Elementary and Secondary School Universe Survey.

Location

Location is a categorical variable and indicates the size of the community in which student i lives. Data for this variable come from the 2005 NIES Assessment. The variable is coded as follows:

Location = 1 if the school is in a large to mid sized city

Location = 2 if the school is in an urban fringe or large town

Location = 3 if the school is in a small town

The omitted category for this analysis is Location = 1.

Title 1

This binary variable indicates whether the school student i attends qualifies as Title I. Title I provides funding to qualifying schools to improve the academic achievement of the disadvantaged. Data for this variable come from the 2005 NIES Assessment. The variable is coded as follows:

Title1 = 0 if the student is not in a Title 1 school

Title1 = 1 if the student is in a Title 1 school

Years Taught

This is a binary variable indicating the number of years a teacher has taught. Data for this variable come from the 2005 NIES Assessment. The variable is coded as follows:

Years taught = 0 if student i's teacher has been teaching for 5 or more years

Years taught =1 if student i's teacher has been teaching for 0-4 years

Teaching Certificate

Teaching certificate is a binary variable indicating the type of teaching certificate that student i's teacher holds. Data for this variable come from the 2005 NIES Assessment. The variable is coded as follows:

Teaching certificate = 0 if the teacher has another form of teaching license that is not the standard license including: probationary, temporary, emergency and no certificate.

Teaching certificate = 1 if the teacher has a standard teaching license.

Percent of School Native American

This variable is the percent of the school student i attends that is Native American. Data for this variable come from the 2005 NIES Assessment.

High School Wage Premium

This variable measures the difference in the average annual earnings in 2005 between individuals who graduated high school and those who did not. It is measured in dollars.

College Wage Premium

This variable measures the difference in the average annual earnings in 2005 between individuals who graduated from college and those graduated from high school. It is measured in dollars.