The Academic Achievement of American Indians

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May 13, 2013

Abstract

The academic achievement of American Indians has not been extensively studied. Using NAEP supplements, we find that the average achievement relative to white students resembles other disadvantaged groups. However, there are several differences. Family characteristics explain two times as much of the raw gap as for blacks. School factors also account for a larger portion of the gap than for blacks or Hispanics. The distribution is also strikingly different: low performing American Indian students have a substantially larger gap than high performing students. Finally, racial self-identification is more strongly related to achievement, especially as American Indian students age.

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1 Introduction

Disparities in educational achievement for various groups in the United States have been a concern of policy makers and economists for years. In a number of studies, significant portions of observed racial wage differentials can be explained by controlling for earlier academic achievement, raising concerns about long term effects of relative school performance.[1] While the black-white achievement gap has been extensively studied,[2] the relative achievement of American Indians has received far less attention, especially by economists.[3] Part of this is due to the small number of American Indian students in most datasets. American Indians make up only about 1 percent of the student population in the United States. However, American Indians are one of the most disadvantaged groups in the United States, with the lowest employment rates and highest poverty rates of any racial or ethnic group (U.S. Census Bureau, 2012). Although it is widely known that academic achievement is lower for American Indians than white students, there is little work quantifying the impact of demographic and school characteristics or comparing their performance to other disadvantaged groups. To our knowledge, Clotfelter, Ladd and Vigdor (2009) is the only other economics study that reports on the American Indian-white test score gap, based on data from North Carolina.

The first contribution of this paper is to document, in detail, the current test scores of American Indian students relative to other groups, describing mean gaps, the overall distribution of test scores, and the changes as students age. In recent years, the National Center for Education Statistics (NCES) has conducted the National Indian Education Survey (NIES) in connection with the National Assessment for Education Progress (NAEP), allowing for more robust analysis of this

[1] For example, see O'Gorman 2011; O'Neill 1990; Neal and Johnson 1996

[2] For literature on the effect of socioeconomic conditions and family background on the black-white achievement gap, see Phillips et al. (1998); Fryer and Levitt (2004); Armor (1992); Brooks-Gunn and Duncan (1997); Mayer (1997).

[3] We use the designation "American Indian" rather than "Native American" as it is the term used by NCES for racial and ethnic classification on the student and school records. "Native American" is also confusing as it can mean any student born in the United States, as opposed to an immigrant.

group than in the past. We use the restricted use data from this survey, together with data on school attributes and locations to document how observed individual, school, and geographic characteristics affect measures of the test score gap.

A second contribution of this paper is to explore how racial and cultural identification influences measures of achievement gaps. Most of the achievement gap research has taken a student's race to be a fixed category. This study is unique in estimating the gap using both the definition of the school and the definition of the student. The NAEP surveys used contain two measures of racial and ethnic groups: those reported by the school records and those reported by the student on the survey. As a result, gaps can be estimated for students who are only identified in a racial or ethnic minority group by themselves, only by their school, or by both.

This distinction is valuable because one proposed explanation for test score gaps relates to the interplay between academic achievement and social group identification. For example, the anthropologist John Ogbu developed the theory of "oppositional identity" among minority groups who found themselves involuntarily under the jurisdiction of the United States, as opposed to voluntary migrants. He argues that poor academic performance is related to cultural opposition to the structural barriers and discrimination experienced by these groups: students that perceive school culture to be aligned with "white" ideals are theorized to be more likely to exhibit negative attitudes towards academic success.[4]

In a similar vein, Akerlof and Kranton (2002) theorize that if a student's social category prescriptions differ from the school's ideals, then a student suffers identity loss for diverging from her social category's ideal school effort and as a result may underinvest in human capital. Austen-Smith and Fryer (2005) present a two audience signaling model that incorporates the ideas of peer dynamics with returns to schooling. The model predicts that middle ability types will pool on low investment: some individuals will under invest in education when the cost of forgone social acceptance is greater than the forgone high wage.

A number of researchers have empirically examined the relationship between identity and aca-

[4]See, for example, Ogbu and Fordham (1986).

demic and economic outcomes. Ogbu and Fordham (1986) find evidence in favor of the cultural opposition hypothesis, although Cook and Ludwig (1997) and Ainsworth-Darnell and Downey (1998) do not. Benjamin, Choi and Strickland (2010) use experimental data and find evidence that social identity affects fundamental economic preferences, specifically time and risk preference. Others have documented the relationship between student popularity and grades across racial and ethnic groups and find that some groups penalize individuals socially for "Acting White."[5] Recent evidence also suggests that identification with school may be the mechanism behind some academic gains associated with policies like class size reductions (Fletcher 2009).

The present study explicitly documents racial gaps in connection with a student's selection of race. American Indian students on average have more variation in this choice, making this population well suited for addressing questions related to identity. As described in detail below, the correspondence between a student's own classification and the school's classification of a student is lower for American Indians than for other groups. This is perhaps not surprising, as American Indian students may have more latitude for choosing from multiple groups with which to identify. American Indians have the highest rate of intermarriage of all race and ethnic groups in the United States (Lofquist et al. 2012): only one half of American Indians marry another American Indian, compared to 95 percent of whites and 85 percent of blacks who marry within their own race.[6] Hispanic students may also have ancestry in indigenous groups in Latin America, which also provides multiple options for classification. Furthermore, tribal policies allow an individual to be an enrolled tribal member based on ancestry which ranges from 1/32 (among the Kaw Nation) documented heritage to 5/8 (among the Ute), which may promote awareness of American Indian ancestry among individuals with many ancestral roots. This context provides more scope for examining the role of self-identification.

Furthermore, tension between group identification and investments in formal schooling may be particularly salient for American Indians given their historical experience. As the Bureau of

[5]For examples, see Fordham (1996); Fryer (2002); Steele & Aronson (1998); Austen-Smith and Fryer (2005); Fryer (2010); Fryer and Torelli (2010).

[6]Previous literature documents the effect of intermarriage on the ethnic identification of children (see Duncan and Trejo 2007).

Indian Education (2012) currently states, in the early twentieth century it was "federal policy to acculturate and assimilate Indian people by eradicating their tribal cultures through a boarding school system." This history is described in more detail in the next section, and it suggests that cultural identity and formal education were perceived to be in conflict over a long period.

Section 3 describes the data. Section 4 presents mean differences in achievement by school reported race for 4th and 8th graders in math and reading, and documents the impact of controlling for demographic and school characteristics. School reported race is used in this section to make the results most comparable with previous studies of test score gaps. Section 5 reports the quantile regression results, finding that the distribution of scores for American Indian students is quite different than for other groups. Section 6 examines gaps related to reservation location, and based on self and school reported race. Section 7 concludes.

2 Historical Background

In 1819, the Indian Civilization Act initiated federal support for educating native students. Initially, federal funds were provided mainly to missionary groups. Funding was also connected to other Indian-specific policies: after the 1830 Indian Removal Act forced the relocation of Cherokee and other tribes to what is now Oklahoma, federal funds for missionary schools east of the Mississippi (where the Cherokee had previously lived) were eliminated and generous subsidies were provided for western schools. In the 1870s, the government began to directly provide public schools through the Office of Indian Affairs, although missionary schools continued to receive funding through government contracts.[7]

Most of the early federal schools were boarding schools. The first boarding school for American Indian students, located in Carlisle, Pennsylvania, housed students from throughout the United States. The dominant view was that boarding schools were necessary to impede cultural transmission. The 1879 Annual Report of the Commissioner of Indian Affairs stated "The progress of the

[7]Much of this section draws on the histories provided in Reyhner and Eder's (2004) *American Indian Education: A History* and Szasz (1999) *Education and the American Indian*.

pupils in industrial boarding schools is far greater than day schools. The children being removed from the idle and corrupting habits of savage homes are more easily led to adopt the customs of civilized life and inspired with a desire to learn" (Quoted in Reyhner and Eder 2004, pg. 73). At this point, federal funds were restricted to schools that only provided instruction in English (a number of religious schools that provided some instruction in native languages in early grades no longer received funding). There are many accounts of students being punished for speaking native languages in any context, even in private conversations with each other; students were often given Anglo names, had to cut their hair, and were forbidden to engage in religious or cultural practices. Tribal groups were also often intermingled to impede native language use. (For example, the Carlisle School had 53 tribes represented in 1894.) The conflict between formal school and native languages and cultures was particularly acute as attendance was frequently involuntary. In 1891, Congress authorized compulsory education for Indians, with the Commissioner given the right to reduce rations and annuities to families whose children were not enrolled. Some of the most egregious examples of compulsion were the use of federal troops to enforce attendance among the Hopi and Navajo. Dana Coolidge's testimony in 1932 at the Senate Subcommittee of the Committee on Indian Affairs summarizes many of these conditions:

"I am making a brief statement of my experience with what I consider the greatest shame of the Indian Service—the rounding up of Indian children to be sent away to government boarding schools. . . . The children are caught, often roped like cattle, and taken away from their parents, many times never to return. They are transferred from school to school, given white people's names, forbidden to speak their own tongue, and when sent to distant schools are not taken home for three years." (Quoted in DeJong 1993, pg. 117-18).

Boarding schools came under criticism in the 1920s and 1930s, and the use of day schools and traditional public schools subsequently increased. In 1934, the Johnson O'Malley Act authorized federal contracts with states and territories to provide education services. However, there were many reports that the new approach restricted educational opportunities: geographic isolation limited access to day schools for many students, and some public schools serving both American

Indian and other students provided fewer opportunities and resources to the American Indian students. Accordingly, the House Select Committee to Investigate Indian Affairs and Conditions in 1944 again advocated the use of boarding schools, particularly for rural communities like on the Navajo reservation. In 1969, the congressional report, "Indian Education: A National Tragedy, A National Challenge," commonly known as the Kennedy Report, documented the continuing disparities in education. The Indian Self-Determination and Education Assistance Act of 1975 (P.L. 93-638) began contract programs for tribes to administer schools, and provided funds for supplemental programs for American Indian children in public schools both on and off reservations.

The latest revision to this act was part of the 2001 No Child Left Behind Act (NCLB), which reauthorized the program as Title VII Part A of the Elementary and Secondary Education Act. Today, there are 183 Bureau of Indian Education (BIE) schools, 59 of which are federally run and the other 124 are tribally operated but funded through BIE contracts or grants. The historical experience of conflict between native cultures and formal schooling is something that continues to be widely discussed in American Indian communities. Given this experience, the issues of personal identity and investment in formal educational institutions are likely to be particularly salient for students with American Indian ancestry.

3 Data and Methods

The main data source for this analysis is the National Assessment for Educational Progress (NAEP), a math and reading exam administered by the National Center for Education Statistics (NCES) to a random sample of 4th, 8th, and 12th grade students throughout the United States. This is the largest nationally representative exam and is the best measure to compare students across areas in the United States. Samples are designed to be representative of public school students and schools in each state, with a probability sampling design that over-samples some student groups. There are approximately 3,000 students sampled from each participating state per subject and per grade, with close to 150,000 students total for each subject and grade. On average, there are 30 students in each sampled school.

Only about 1 percent of students in the U.S. are American Indians or Alaska Natives. As a result, accurate estimates of their performance are limited in most studies. To remedy this, Executive Order 13336 authorized a new component of the NAEP, the National Indian Education Study (NIES). This study provides a nationally representative sample of American Indians in 4th and 8th grade for 2005, 2007, and 2009. The surveys include the universe of Bureau of Indian Education funded schools in 2005, 2007 and 2009. These data also include state representative samples for states with large populations of American Indian students, with the number of states varying over time.

The outcomes used in this analysis are math and reading scores in 4th and 8th grade pooled over the years 2007 and 2009.[8] We drop observations from Hawaii and Alaska because populations and institutions for Native students in these states are significantly different than those in the mainland United States.[9] To be consistent with the achievement gap literature, we exclude Asians from our sample as well. Unfortunately, 12th grade students are not included in this analysis because they are not included in the NIES sample.

One unique feature of the NAEP is that it contains two measures of student race. The first is the race that is designated in the school records, school reported race. The second is the race category that the student selected on the NAEP exam, student reported race. Prior to 2002, the NAEP used self reported race as the primary race variable; since 2002, school reported race is the primary race variable used. The majority of this paper's initial analysis uses school reported race since it is currently designated the primary measure. This also makes the estimates comparable with other studies that estimate racial and ethnic achievement gaps. Subsequent sections of this analysis will investigate and discuss the relative importance of self and school identified race.

The NAEP uses a complex sampling design. First, to achieve a nationally representative sample, students have different probabilities of being selected based on demographic characteristics

[8]We drop 2005 because it was the first year of the oversample. The American Indians in 2005 differ on some observable characteristics from those in the 2007 and 2009 files. Results using the 2005 data are largely similar to those reported in this paper.

[9]Test scores for American Indian students in Alaska are lower on average than in most other states, particularly in reading. Native Hawaiian students are classified in the "Asian and Pacific Islander" category, making it more difficult to analyze the relative performance of this population.

and their state. In order to get accurate statistical inferences, each student is assigned a sampling weight based on their probability of selection; students with a higher probability of selection are assigned lower weights. The original sampling weights (ORIGWT) are used in all of the regression analysis in this study. Second, the sample design differs from a simple random sample because sampling involves the selection of clusters of students based on school and demographic variables. The consequence is that observations are not independent of one another and traditional standard errors will be under-estimated. The standard procedure to adjust for this is to use the NAEP provided replicate weights (REPWGT) to produce jackknifed standard errors. [10]

Finally, the NAEP uses itemized response theory to preserve efficiency. Each individual student is assigned a subset of the assessment questions for a given subject area, making raw scores not directly comparable across students. Instead, NAEP assigns to each student five score estimates, or "plausible values," ranging between 0 and 500 points. These plausible values are constructed by the NAEP using marginal estimation scaling model techniques for latent variables (Mislevy and Sheehan 1987). Essentially, these are random draws from a student's posterior distribution, conditional on answers to the items assigned and demographic and background variables. The recommended procedure to deal with this survey feature is to use a multiple imputation method. This involves running a separate regressions for each of the plausible values. Following Rubin (1996), the final point estimates are an average of the point estimates from these five regressions. The estimated variance of the final estimate combines the standard errors of the five estimates (calculated using the jackknifing procedures described above) and the variance across the estimates:

$V(\hat{\beta}) = \sum_{i=1}^{m} se_i^2 + (1+\frac{1}{m})^{m-1} \sum_{i=1}^{m} (\hat{\beta}_m - \bar{\hat{\beta}})$.[11]

Table 1 reports the mean characteristics of students by school identified racial group. The table indicates that demographic and family characteristics for American Indian students are similar to those for black and Hispanic students, with more than three quarters eligible for free and reduced

[10] See NAEP Data Companion for more details on these weights and the recommended jackknife procedure.

[11] For more detail, see Section 3 of the NAEP Data Companion. Practically, this was implemented using STATA's multiple imputation package. This procedure for using NAEP data is standard when individual student scores are used, but is not necessary in studies that draw on the NAEP reported state averages or in studies that examine specific item responses.

price lunches, about a quarter living in homes with less than 10 books, and with parental education levels that tend to be lower than those for black students but higher than those for Hispanic students. Relatively more American Indian students (about 1 out of every 8) are also classified as disabled compared to the other groups.

[Table 1 about here]

Table 1 also shows that the mismatch between school and self identified race is greatest for American Indian students. Students who are identified to be white by their school also report themselves to be white most of the time: 80 percent of school identified white fourth graders and 86 percent of school identified white eighth graders self report the same race. For black students, the mismatch is marginally higher, with 75 percent of school identified black fourth graders and 80 percent of school identified black eighth graders also reporting themselves to be black. Hispanic students have the lowest rate of mismatch: 90 percent of the school designated Hispanic 4th graders also self report as being Hispanic, and this match is 97 percent in 8th grade. However for American Indian students, only 55 percent of school identified American Indian fourth graders and only 60 percent of school identified American Indian eighth graders choose the same designation. The reverse mismatch (percentage of all self identified students who are assigned the same category by the school) is similar; this is reported in Appendix Table A.1. Nearly all self designated white and black students are assigned the same race by the school. About 60 percent of self identified Hispanic students are similarly identified by their schools. However, among student who designate themselves to be American Indian, only 44 percent of 4th graders and 65 percent of 8th graders are also reported to be American Indian by the school. (Means of all other characteristics by self reported race are also reported in Appendix Table A.1.)

Why is the mismatch so large for American Indian students? Mismatches in part stem from the fact that schools are much more likely to report students to be of the majority group. Nearly all students who call themselves white are also called white by their schools, but schools designate many students to be white who self report a different race. Because the white population is large, this mismatch looks small as a percentage of school identified white students, but large in compar-

ison to the self reported other race group. For example, in 4th grade math, there are about 4,460 students who self report as American Indian whose schools designate them as white. This is only 2 percent of the school designated white sample but is 40% of the self identifying American Indian sample. Because American Indian student populations are small in many states, mismatches are highest for this group. Furthermore, the rate of mismatch for self identifying American Indian students is twice as high outside Western states than within the West, American Indian populations are largest in the West.

Schools are also more likely to report the same race/ethnicity as the student when the student is limited Enligh proficient. This is one reason why school designated Hispanic students nearly universally self identify as Hispanic. However, there are about twice as many self identifying Hispanic students as school identified Hispanic students: many of these students speak English fluently and these students are more likely to be classified as white by their schools (or occasionally as American Indian). American Indian students have lower rates of limited English proficiency than Hispanic students, and therefore do not have as clear of a "marker" for the school. Hispanic populations are much larger than American Indian populations, students who self designate as American Indian are more likely to be classified by their schools as Hispanic than the reverse.

4 Mean Differences in Achievement by School Reported Racial Groups

The first part of this analysis documents the mean differences in achievement by school reported race. Table 2 reports the mean math test score gap relative to whites in standard deviation units for 4th and 8th graders; Table 3 contains the results for reading. The first column of each set of results reports the raw gap with no controls. On average, school identified American Indians score 60 percent of a standard deviation lower than school identified whites on the NAEP math exam in 4th grade, increasing to three quarters of a standard deviation by 8th grade. This gap is about 15 percent smaller than the gap for school identified black students. Gaps for black students

are consistent with other estimates in the literature. School identified Hispanic students' math gaps are nearly the same as those for American Indians.

[Table 2 about here] [Table 3 about here]

The raw gaps in reading for all three groups are more similar, between 60 and 70 percent of a standard deviation. In addition, the math gaps widen with age for all three groups. However, the reading gaps in 8th grade are smaller or remain the same as in 4th grade for all three racial and ethnic groups.

The remaining columns of Tables 2 and 3 report regression adjusted mean differences in test scores by school reported race. Following the literature, covariates are added first for personal and family characteristics. Family and individual level characteristics include age, gender, disability status, English proficiency, eligibility for free lunch and number of books in home. Eighth grade results also include parental education measures (unavailable for fourth grade students). Adjusting for these factors reduces the gap considerably. About 40 percent of the raw math test score gap and about half of the raw reading gap for American Indians is explained by these factors. This leaves a gap relative to whites of about a third of a standard deviation in both math and reading. In unreported regressions examining subsets of these variables and in regressions run separately for each racial sub-group, relatively more of the gap for Hispanics is explained by English Language Learner status than for other groups. Socioeconomic characteristics (free lunch status, number of books in the home, and parental education) explain relatively more of the gap for American Indians than for black students or for Hispanic students.

In the next column (column 3 for 4th grade and column 6 for 8th grade), school fixed effects are included in addition to the individual and family characteristics. Including these fixed effects means that the gaps are average comparisons of students of different races and ethnicity within the same schools. The inclusion of school fixed effects further reduces the math gap for American Indians by about 10 percent of a standard deviation. School fixed effects have an even larger impact on the reading gap, reducing this gap by 13 to 18 percent of a standard deviation. Similar results are obtained using specific school characteristics such as level of urbanization, school size, and

resource measures in place of fixed effects.[12] Surprisingly, these fixed effects have a negligible impact on the black and Hispanic gaps. This may suggest that school characteristics play a larger role for American Indians or that American Indians disproportionately select into different types of schools. We investigate the specific effect of school location on a reservation in Section 6. Taken together, family, individual and school characteristics explain roughly one half to two-thirds of the American Indian-white test score gap. These same factors account for two-thirds to three-fourths of the Hispanic-white gap and only about a third of the black-white gap.

The last columns of Table 2 and 3 include the same covariates as the previous columns as well as controls for parent education level. The NAEP data for 4th graders do not include parental education. The education level of a student's parent however, matters very little in explaining the gap for American Indians and blacks after conditioning on other covariates. The remainder of the analysis will exclude parental education to make 4th and 8th grade results comparable.

5 Racial Gaps at Different points in the Achievement Distribution

Examining test score behavior at the mean is useful. However, the conditional mean only captures shifts in the distribution of the outcome. If the overall shapes of the distribution of test scores are different by race/ethnicity, then assuming the adjusted mean difference in test scores is constant across the conditional distribution will be misleading. Quantile regression analysis allows for statistical inference at the median as well as non-central locations. In this context, it allows for the estimation of gaps across the test score distribution, relative to white students at the same point in the distribution of white students. For example, if the distribution of scores for one group had the same mean but was flatter than the distribution for another group, there would be a positive gap at the 90th percentile and a negative gap at the 10th percentile. Likewise, if one distribution had a

[12] Note that we are not claiming that schools matter less than socioeconomic factors in explaining achievement gaps: the order covariates are introduced matters. See Gelbach (2009). We choose the order to be comparable with other results in the achievement gap literature.

thicker left tail, gaps at the 90th percentile might be small, while those at the 10th percentile would be large. However, some care is needed in the interpretation of the coefficients when including covariates. A quantile coefficient is the effect of the variable of interest on the distribution of the outcome variable, holding all else constant. However, the coefficient does not measure the marginal effect on individuals. This is a critical distinction: there is no guarantee that an individual will remain in the pth quantile after a covariate is marginally altered.

Figure 1 shows that the unadjusted test score gap for all races relative to whites for math and reading is largest at the 10th percentile and gets smaller monotonically across the distribution. Each point on the graph represents a test score gap relative to whites that corresponds to a given location in the distribution. For example, the upper left graph in Figure 1 shows that American Indians in 4th grade at the 10 percentile have a raw math gap of nearly 0.9 of a standard deviation relative to whites at that decile. This falls to less than 0.6 for American Indian students in the highest decile.

[Figure 1 about here]

Figure 1 also shows that the difference in the unadjusted test score gap between the 10th percentile and the 90th percentile is the largest for American Indians. The gradient is steepest for American Indians in all grades and subjects, with a particularly sharp difference in the gradients in 8th grade. The gradient for black students is relatively flat. This implies that the overall shape of the distribution for black students is more similar to that for white students, although the overall distribution is shifted. For American Indian students, however, the distribution of raw scores has a much different shape.

This general pattern of larger gaps at lower deciles persists even after controlling for other characteristics. Table 4 reports quantile regression results with bootstrapped standard errors in parentheses, adjusting for individual, family, and school covariates. American Indians in the 90th percentile have a gap of 12 percent of a standard deviation in math in 4th grade and about a fourth of a standard deviation in 8th grade. However, at the 10th percentile these gaps are about twice as large. The reading results are even more stark: virtually no gap exists at the 90th percentile, while

the gap at the 10th percentile is about 30 percent of a standard deviation in both 4th and 8th grade.

[Table 4 about here]

As in the raw scores, this pattern of much larger gaps at lower deciles is strikingly different for American Indian students than for other racial and ethnic groups. School identified black and Hispanic students at the lowest end of the achievement distribution also do worse relative to their white counterparts than those at the highest end but the difference is much smaller. For black students, the gap at the 10th percentile is only about 6 percentage points larger than at the 90th percentile, and for Hispanic students it is usually less than 5 percentage points larger.

One concern might be that the quantile results are driven by students attending schools located on reservations. In unreported results, we have estimated these quantile regressions for only students attending schools located outside of reservation boundaries. We find nearly identical estimates, with similarly larger gaps at lower deciles than at higher deciles. (These results are available on request.) We also estimated the quantile regressions separately by race to examine the relative role of covariates on the quantiles. We find that the magnitude of impact of socioeconomic variables (like the number of books at home) has a relatively constant coefficient across the percentiles for black and hispanic students. However, the magnitude of the effect on American Indian students tends to be larger for the highest percentiles than for the lowest percentiles.

6 Geography, Identity and the Achievement Gap

The previous two sections have established that American Indians score lower than whites on the NAEP math and reading exams. In particular, the evidence suggests that the math gap increases as students progress in school and that the gradient with respect to the ability distribution is particularly steep for American Indians, with much larger gaps for the poorest performing students. Disadvantages in family background explain slightly less than half of the math gap and half of the reading gap. School characteristics further reduce these gaps in math and reading by another 5-18 percent of a standard deviation. This contribution of school effects is larger than for other racial and ethnic groups in the sample. The following two subsections investigate the unique geography

and identity for American Indians as possible additional contributors.

6.1 Effect of Reservations on the American Indian Achievement Gap

About a fourth of American Indians live on reservations, which in many cases are remote areas with thin labor markets and few amenities. The NAEP oversamples these areas, with about 40 percent of the American Indian sample coming from schools located on reservations. The larger estimated impact of schools on test scores for American Indians relative to other groups may be in part related to reservation related factors, but using school fixed effects in the earlier analysis obscures the specific role of reservation location on American Indian students.

We identify schools located on reservations using GIS maps of reservation boundaries and each school's longitude and latitude. Reservation boundaries in some areas are quite large and include schools that serve a substantial number of non-American Indian students as well. Roughly 4,000 students in each sample attend schools on a reservation, about 25 percent of which are identified by the school as non-American Indian. Most of these students are reported to be white or Hispanic; very few are black. [13]

We examine the effect of reservation location by estimating a separate effect of reservations on American Indian and other students, as in the following regression equation:

$$y = \beta_0 + \beta_1 Onres + \beta_2 AI + \beta_3 Onres * AI + \alpha Race + \sigma X + \gamma Z + \delta State + \varepsilon \qquad (1)$$

The variable *Race* includes controls for black, Hispanic and other. The vector X includes the standard set of individual and family characteristics as described in section 4. The vector Z is comprised of school characteristics such as level of urbanization and school enrollment.[14] State fixed effects are also included in this specification. Results are reported in Table 5.

Table 5 indicates that the estimated effect of attending a school located on a reservation, β_1, is

[13] Similar results are obtained when we used distance to the center of a reservation and tribal or BIE control of a school.

[14] We did not include expenditures as these were not available for BIE schools in 2009. However, results for 2007 that also include expenditures are similar to those reported here.

negative, but is also small and indistinguishable from zero. This coefficient captures the average effect of attending a school on a reservation for students of all races and ethnicities. The coefficient on the variable AI, β_2, measures the test score gap for American Indians relative to white students in schools located outside reservation boundaries. The estimates indicate that school identified American Indians attending schools off of a reservation score on average about a quarter of a standard deviation lower in math and reading in 4th grade than white students attending schools off of a reservation. The gap in 8th grade math scores is slightly larger, while the gap in 8th grade reading scores is slightly smaller.

[Table 5 about here]

Table 5 reports that the gaps are larger in schools located on reservations. The interaction term, β_3, measures the additional gap for American Indian students attending a school on a reservation. The gap for an American Indian student on a reservation relative to a white student on a reservation is the sum of coefficients β_2 and β_3, and these gaps are uniformly larger than the off reservations gaps. Gaps on reservations are about 16 to 20 percent of a standard deviation larger than off a reservation (with the exception of reading in 8th grade); stated otherwise, on-reservation gaps are about 40 percent larger than off-reservation gaps. Due to data restrictions, these results can only control for a limited set of school characteristics, and it may be that schools located on reservations differ in systematic ways from schools in other locations. One key difference is that these schools have student bodies that are much more racially segregated. The Bureau of Indian Education schools have student bodies that are nearly exclusively American Indian. Of the roughly 250 other schools located on reservations, about 40 percent have student bodies that are 95 percent or more American Indian. Another 20 percent of schools on reservations have student bodies that are less than 20 percent American Indian. As a result, estimated test gaps on reservations compare American Indian and white students who on average attend different schools. The high correlation between location and the makeup of the schools makes it difficult to disentangle the effects of school characteristics, school location, and student race: given the small size of many of these schools and the limited variation in student characteristics within them, using school fixed effects

with this sub-sample leads to imprecisely estimated coefficients.

6.2 Effect of Self Identification on the Racial Achievement Gap

As noted in the introduction, there are several reasons to believe that self identity may be particularly salient for American Indian students. Predictions from the "single ideal" school model, put forth in Akerlof and Kranton (2002), suggest that students may make lower investments in formal schooling if the behaviors and norms associated with their social group do not align with those promoted by public schools. Given the long history of explicit opposition to native languages and cultures by schools, this theory may be particularly relevant to native populations. Furthermore, the high levels of intermarriage provide more scope for individually deciding among groups with which to identify.

As noted, the NAEP data include a student's self reported race/ethnicity in addition to school reported race/ethnicity. This allows for investigation of how self identification and school identification separately relate to test scores. As Table 1 and Appendix Table A.1 indicated, the data reveal a significant discrepancy between school and self reported race for American Indian students, far more than for any other group.

The choice of race and ethnicity, both by students and by schools, is likely endogenous to student performance. Because of this self-selection, the coefficient estimates should not be interpreted as causal effect of racial identification, but the relationships nonetheless are revealing of the association between academic outcomes and self identification or school identification. Table 6 reports the test score gap for three mutually exclusive identification categories: school reported only, self reported only, and both school and self reported. In 4th and 8th grade, the unexplained math gap for students classified both by themselves and their schools as American Indian is substantially larger than the gap for students who are only self or only school identified. A similar pattern appears in the reading results. Furthermore, in 4th grade, both the math and the reading gap for students that are school-only identified are larger than the gaps for self-only identified American Indians. As students progress in school, however, this reverses. By 8th grade the gap for self-only

identified American Indians is much larger than the gap for school-only identified students. In fact, in 8th grade the reading test score gap among those that self identify as American Indian is more than 10 times as large as the gap for students who are only school identified as American Indian: school-only identified American Indians do not experience a reading gap relative to whites by 8th grade, while self-identified students have gaps of a quarter of a standard deviation. The 8th grade math test score gap among self-only identified students is also larger than the gap for school-only identified students, although the difference in math gaps is not as dramatic as it is in the reading results.

[Table 6 about here]

A few of these patterns are similar for black students. The math and reading test score gaps are also largest among those that are classified as both self and school identified. Similarly, in 4th grade school-only identified students have larger gaps than self-only identified students. Furthermore, the gaps for self-only identified students grow from 4th to 8th grade. However, unlike American Indians, by 8th grade the math gap is still larger for school-only identified blacks compared to self-only identified blacks. The reading gap by 8th grade is slightly larger for self-only identified blacks compared to school-only identified blacks, but only by 8 percent of a standard deviation. This difference pales in comparison to the 25 percent of a standard deviation difference in the gap between these two race classifications for American Indians.

In contrast, out of the three mutually exclusive race categories, in 4th grade Hispanics that are school-only identified experience the largest gap in math and reading, but by 8th grade, in both reading and math, the gap for self-only identified Hispanics is largest. Like with American Indians and black students, the gap for self-only identified students grows from 4th to 8th grade.

Appendix Table A.2, a companion table to Table 6, reports the effects for each type of race category at the 10th and 90th percentiles. These results are similar to the ones reported in Table 6. For all race classifications – self-only identified, school-only identified, and both self and school identified – American Indians, blacks and Hispanics at the 10th percentile experience a larger gap than those students at 90th percentile in the achievement distribution. As before, gradients

are steeper for American Indians than other groups, although the gradient for self-only identified American Indians is the flattest of the three categories.

Theoretical and empirical evidence from the identity literature suggests that there will be differences in individual's behavior depending on the salience of group membership. One hypothesis is that the concentration of a group in a school affects the salience of group membership. Another possibility is that in locations where American Indians are better known by the general population, there may be more defined stereotypes or students may have a different propensities for how they classify themselves. In these data, the mismatch between school and self identification is much larger in states outside the West and in states with smaller percentages of American Indian students. Accordingly, we disaggregate students in three different ways: by reservation location, by percent American Indian in the school, and by geographic location.

Table 7 reports regression results using the same specification used in Table 6. Panel A is a sub-sample of only those that attend a school on a reservation. As noted, about 25 percent of students on reservations are identified by their schools as a classification other than American Indian. Of these students, a little over a third self identify as American Indian. Panel B is the complement of the Panel A sub-sample. It includes all the students that attend a school off a reservation; American Indians comprise roughly 3% of this sample.

Table 7 shows that, as before, students on a reservation have larger gaps on average than those off reservations in math, although the reading point estimates are more similar across the two locations. Gaps are also generally largest for students jointly identified as American Indian both by their schools and by themselves. Similarly, the pattern of the relative impacts of school and self identification are parallel across the two sub-samples, with generally declining gaps for school-only identified students and rising gaps for self-identified students moving from 4th to 8th grade. However, the coefficient for self-only identified students is not statistically significant at conventional levels on reservations. (This is due to the fact that the standard errors are much larger in the small sample of reservation students).

[Table 7 about here]

The next two panels disaggregate instead on the basis of whether American Indian students are a majority (Panel C) or a minority (Panel D) in the school. The average gaps vary across these two sub-samples in a similar way as they do when comparing reservation and off-reservation schools (Panel A and Panel B). Again, the gaps for students that are school-only identified decline from 4th to 8th grade, while those for self-only identified students rise. Students who are both school and self identified have the largest gaps, with point estimates that are similar across the sub-samples. Standard errors are again larger in the sample of students in highly segregated schools, but the point estimates are similar. Appendix Table A.3 replicates these results by Census region, again with similar results.

The analysis presents compelling evidence that even in eighth grade school and self racial identification of a student is remarkably inconsistent for American Indians, more so than for any other racial or ethnic group in the sample. The gap for American Indians that are self-only identified is substantially larger than those that are school-only identified in 8th grade. It also appears that the gaps for self-only identified students become relatively larger as students progress in school while the gaps for school-only identified students declines, and this is true across schools of varying compositions and locations.

7 Conclusion

American Indian academic achievement has been little studied, in spite of unique socioeconomic, geographic, and historical factors than may influence student outcomes. This study establishes a number of facts about the current state of American Indian academic achievement in comparison with other racial and ethnic groups in the United States. We investigate three general classes of explanations for racial and ethnic gaps. First, American Indian students on average come from more disadvantaged family and socioeconomic backgrounds than many other students. Second, schools for American Indian students are more likely to be located in more geographically isolated communities and on reservations. These and other school characteristics may affect performance. Third, the unique history of formal education for American Indians makes it more

probable that conflicts related to group identification and academic achievement are salient for this population.

We find a raw achievement gap of about 60 to 70 percent of a standard deviation for both math and reading. These gaps are smaller than the gaps for blacks and similar to the gap for Hispanics. As with other groups, the gaps also appear to be larger in 8th grade than in 4th grade for math. For reading, gaps are somewhat smaller in 8th grade than in 4th grade for American Indian and Hispanic students, while remaining relatively unchanged for black students.

Although the raw gaps are similar to those of other racial and ethnic groups, there are a number of important differences. First, more of the gap can be explained with observable characteristics for American Indian and Hispanic students than for black students. School fixed effects explain more of the remaining gap for American Indians than for both other groups. Demographic and school characteristics explain about two thirds of the raw gap for American Indians: after controlling for individual, family, and school characteristics, unexplained gaps for reading in 4th and 8th grade and for math in 4th grade are about 20 percent of a standard deviation, while the unexplained gap for 8th grade math is about 40 percent of a standard deviation. (For black students, two-thirds of the raw gap remains unexplained after controlling for observed characteristics.) Location on a reservation also matters: a gap exists off reservations but the achievement gap for American Indians students is somewhat larger on reservations than in other areas.

Second, we find that the distribution of test scores for American Indians is much different than for other racial and ethnic groups. Black and Hispanic students have score gaps that are comparatively uniform across the distribution: while students in the top quintile obviously perform better than those in the lowest quintile, the gap relative to white students in the same quintile is fairly similar across the distribution. In contrast, for American Indians the gaps relative to whites are much larger for students at the bottom of the achievement distribution. In reading, gaps at the 90th percentile are negligible and insignificant after adjusting for student and school characteristics, while at the 10th percentile, gaps are about a third of a standard deviation. In math, the gaps at the 10th percentile are about twice as large as the gaps at the 90th percentile.

Finally, the different historical context of education for American Indians suggests that there may be perceived conflicts between formal schooling and group identity. Although we cannot test for this directly, we exploit an unusual feature of the NAEP data: it contains measures of both self and school identified race and ethnicity. These data provide a unique opportunity to examine how self identification and school identification may have different associations with achievement. The match between self and school identification is lower for American Indians than for any other ethnic group. Gaps for students only identified as American Indian by the school decline between 4th and 8th grade, while gaps for self identified students increase as students age. For example, there is no statistically significant gap in 8th grade reading for students who are only identified by their school as American Indian, while self identifying American Indians (both with or without school identification) have a gap of one fourth of a standard deviation. In contrast, for black and Hispanic students, the pattern across these three mutually exclusive identification categories is less clear, with gaps that are more similar in magnitude. We do not find evidence that American Indian self identity is more salient by region of the country, by the concentration of American Indians in a school, or in schools located on reservations. In all of these areas, the general pattern is a declining gap from 4th to 8th grade for school-only identified American Indians. In contrast, the gaps for self-only identified American Indians grow with age and are universally larger than those gaps for school-only identified students by 8th grade.

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Figure 1: Raw Racial and Ethnic Test Score Gaps Relative to White Students in Same Percentile, weighted by sampling weights

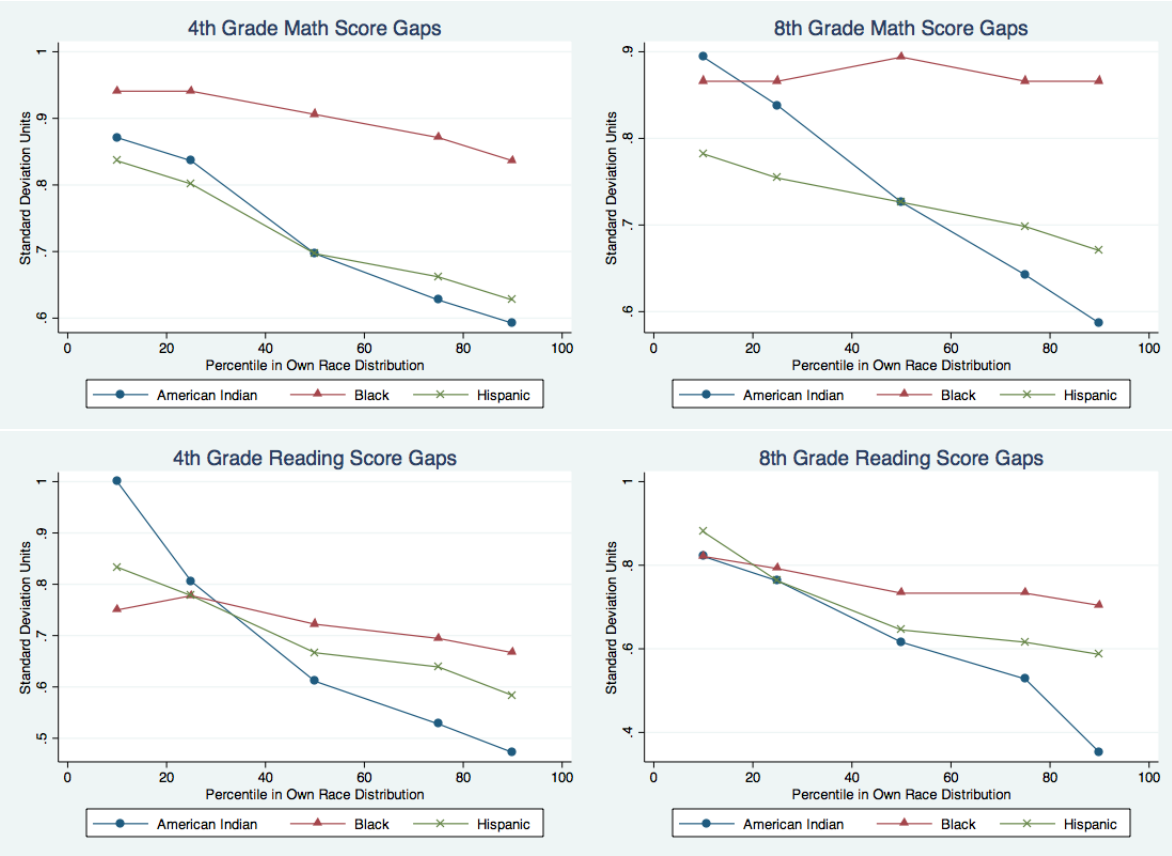

Table 1: Summary Statistics by Race: Means of Student Characteristics by School Reported Race

	Math									
	4th					8th				
	Full Sample	White	American Indian	Black	Hispanic	Full Sample	White	American Indian	Black	Hispanic
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Test Scores										
Math	0.000	0.247	-0.458	-0.490	-0.314	0.000	0.291	-0.577	-0.604	-0.409
	(1.000)	(0.704)	(0.818)	(0.742)	(0.766)	(1.000)	(0.899)	(1.016)	(0.897)	(0.928)
Race- School Identified										
White	0.599	1.000	0.000	0.000	0.000	0.620	1.000	0.000	0.000	0.000
	(0.490)					(0.485)				
American Indian	0.027	0.000	1.000	0.000	0.000	0.027	0.000	1.000	0.000	0.000
	(0.163)					(0.162)				
Black	0.182	0.000	0.000	1.000	0.000	0.186	0.000	0.000	1.000	0.000
	(0.386)					(0.389)				
Hispanic	0.183	0.000	0.000	0.000	1.000	0.162	0.000	0.000	0.000	1.000
	(0.387)					(0.368)				
Other	0.009	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000
	(0.093)					(0.076)				
Race- Student Identified										
White	0.495	0.796	0.109	0.013	0.061	0.539	0.859	0.082	0.007	0.013
	(0.500)	(0.403)	(0.312)	(0.115)	(0.239)	(0.499)	(0.348)	(0.274)	(0.081)	(0.115)
American Indian	0.034	0.023	0.553	0.018	0.010	0.025	0.011	0.606	0.008	0.003
	(0.182)	(0.150)	(0.497)	(0.131)	(0.100)	(0.156)	(0.103)	(0.489)	(0.091)	(0.053)
Black	0.146	0.007	0.037	0.743	0.020	0.156	0.009	0.020	0.799	0.008
	(0.353)	(0.084)	(0.188)	(0.437)	(0.139)	(0.363)	(0.921)	(0.140)	(0.401)	(0.091)
Hispanic	0.279	0.125	0.202	0.165	0.904	0.227	0.075	0.149	0.093	0.971
	(0.448)	(0.330)	(0.402)	(0.371)	(0.294)	(0.419)	(0.263)	(0.356)	(0.291)	(0.166)
Other	0.046	0.049	0.099	0.061	0.005	0.053	0.047	0.143	0.093	0.004
	(0.209)	(0.216)	(0.298)	(0.238)	(0.071)	(0.224)	(0.212)	(0.351)	(0.291)	(0.063)
Other Controls										
Free/reduced lunch	0.492	0.299	0.786	0.775	0.797	0.443	0.263	0.748	0.728	0.751
	(0.500)	(0.458)	(0.410)	(0.418)	(0.402)	(0.497)	(0.440)	(0.434)	(0.445)	(0.433)
Books 0-10	0.124	0.062	0.223	0.208	0.229	0.145	0.089	0.230	0.188	0.296
	(0.330)	(0.242)	(0.416)	(0.406)	(0.420)	(0.352)	(0.284)	(0.421)	(0.391)	(0.457)
Books 11-25	0.215	0.152	0.289	0.300	0.327	0.214	0.158	0.292	0.296	0.318
	(0.411)	(0.359)	(0.453)	(0.458)	(0.469)	(0.410)	(0.365)	(0.454)	(0.456)	(0.466)
Books 26-100	0.336	0.378	0.283	0.272	0.268	0.349	0.372	0.320	0.340	0.274
	(0.472)	(0.485)	(0.451)	(0.445)	(0.443)	(0.477)	(0.483)	(0.466)	(0.474)	(0.446)

Books 100 plus	0.325	0.408	0.205	0.220	0.176	0.293	0.381	0.159	0.176	0.112
	(0.468)	(0.491)	(0.403)	(0.414)	(0.381)	(0.455)	(0.486)	(0.365)	(0.380)	(0.315)
Male	0.508	0.512	0.502	0.500	0.503	0.502	0.507	0.497	0.485	0.506
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
Disabled	0.119	0.124	0.135	0.120	0.100	0.102	0.100	0.137	0.114	0.093
	(0.324)	(0.330)	(0.341)	(0.325)	(0.300)	(0.303)	(0.300)	(0.344)	(0.318)	(0.290)
English language learner	0.083	0.007	0.142	0.018	0.392	0.044	0.004	0.132	0.011	0.220
	(0.277)	(0.085)	(0.349)	(0.133)	(0.488)	(0.205)	(0.064)	(0.339)	(0.103)	(0.414)
Age	7.512	7.513	7.581	7.518	7.497	11.435	11.428	11.619	11.461	11.402
	(1.161)	(1.141)	(1.158)	(1.194)	(1.190)	(1.162)	(1.148)	(1.177)	(1.201)	(1.166)
Mother-H.S drop out	-	-	-	-	-	0.104	0.068	0.137	0.085	0.259
						(0.305)	(0.251)	(0.344)	(0.279)	(0.438)
Mother- H.S. grad	-	-	-	-	-	0.208	0.208	0.230	0.233	0.179
						(0.406)	(0.406)	(0.421)	(0.423)	(0.383)
Mother- some college	-	-	-	-	-	0.173	0.182	0.174	0.192	0.119
						(0.379)	(0.386)	(0.379)	(0.394)	(0.324)
Mother- college grad	-	-	-	-	-	0.364	0.433	0.249	0.334	0.152
						(0.481)	(0.495)	(0.432)	(0.472)	(0.359)
Mother- don't know	-	-	-	-	-	0.151	0.110	0.210	0.156	0.291
						(0.358)	(0.313)	(0.408)	(0.363)	(0.454)
Father- H.S. drop out	-	-	-	-	-	0.108	0.083	0.128	0.082	0.231
						(0.310)	(0.276)	(0.334)	(0.275)	(0.422)
Father- H.S. grad	-	-	-	-	-	0.207	0.215	0.240	0.219	0.160
						(0.405)	(0.411)	(0.427)	(0.414)	(0.366)
Father- some college	-	-	-	-	-	0.136	0.150	0.136	0.131	0.091
						(0.343)	(0.357)	(0.343)	(0.337)	(0.288)
Father- college grad	-	-	-	-	-	0.306	0.382	0.169	0.231	0.126
						(0.461)	(0.486)	(0.375)	(0.421)	(0.331)
Father- don't know	-	-	-	-	-	0.242	0.170	0.327	0.337	0.392
						(0.428)	(0.376)	(0.469)	(0.473)	(0.488)
Observations	322,992	193,506	8,871	58,727	59,066	278,096	172,324	7,492	51,583	45,064

Notes: Means of student characeristics are based on math sample. Means for reading sample are nearly identical, and are available on request.
Standard Deviations in parentheses. Parental education not available for 4th grade.

Table 2: Math Standardized Test Score Gaps in Standard Deviation Units (comparison group whites): Jackknifed standard errors in parentheses

	Math						
	4th	4th	4th	8th	8th	8th	8th
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
American Indian- School Identified	-0.598***	-0.340***	-0.203***	-0.740***	-0.418***	-0.366***	-0.344***
	(0.016)	(0.014)	(0.018)	(0.023)	(0.021)	(0.024)	(0.024)
Black- School Identified	-0.735***	-0.482***	-0.427***	-0.879***	-0.580***	-0.554***	-0.564***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)
Hispanic- School Identified	-0.599***	-0.182***	-0.157***	-0.724***	-0.237***	-0.237***	-0.188***
	(0.009)	(0.007)	(0.007)	(0.013)	(0.011)	(0.012)	(0.011)
Other- School Identified		-0.085***	-0.127***		-0.097***	-0.111***	-0.106***
		(0.018)	(0.018)		-0.031	(0.030)	(0.030)
Year 2009		-0.058***	-0.110***		-0.212***	-0.149**	-0.138**
		(0.010)	(0.011)		-0.015	(0.058)	(0.054)
Age		-0.033***	-0.049***		-0.134***	-0.137***	-0.125***
		(0.004)	(0.003)		-0.007	(0.007)	(0.007)
Male		0.109***	0.110***		0.155***	0.156***	0.147***
		(0.004)	(0.004)		-0.006	(0.006)	(0.006)
Disabled		-0.544***	-0.561***		-0.890***	-0.882***	-0.851***
		(0.007)	(0.007)		-0.012	(0.012)	(0.012)
Limited English Proficiency		-0.421***	-0.385***		-0.703***	-0.677***	-0.653***
		(0.012)	(0.010)		-0.019	(0.019)	(0.019)
Free Lunch		-0.293***	-0.188***		-0.298***	-0.261***	-0.194***
		(0.006)	(0.005)		-0.008	(0.008)	(0.008)
Books 0-10		-0.396***	-0.335***		-0.655***	-0.626***	-0.525***
		(0.008)	(0.008)		-0.010	(0.009)	(0.009)
Books 11-25		-0.308***	-0.258***		-0.509***	-0.483***	-0.409***
		-0.006	(0.006)		-0.009	(0.008)	(0.008)
Books 26-100		-0.062***	-0.043***		-0.263***	-0.247***	-0.207***
		(0.005)	(0.005)		(0.006)	(0.006)	(0.006)
Mother- H.S. grad		-	-		-	-	-0.0160
							(0.011)
Mother- some college		-	-		-	-	0.135***
							(0.010)
Mother- college grad		-	-		-	-	0.125***
							(0.012)
Mother- don't know		-	-		-	-	-0.085***
							(0.011)
Father- H.S. grad		-	-		-	-	0.013
							(0.009)
Father- some college		-	-		-	-	0.133***
							(0.010)
Father- college grad		-	-		-	-	0.198***
							(0.009)
Father- don't know		-	-		-	-	0.006
							(0.008)
School Fixed Effects	No	No	Yes	No	No	Yes	Yes
Observations	343,245	322,992	322,992	282,242	278,096	278,096	278,096

The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.

Table 3: Reading Standardized Test Score Gaps in Standard Deviation Units (comparison group whites): Jackknifed standard errors in parentheses

	Reading						
	4th	4th	4th	8th	8th	8th	8th
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
American Indian- School Identified	-0.642***	-0.364***	-0.186***	-0.575***	-0.280***	-0.155***	-0.138***
	(0.024)	(0.021)	(0.026)	(0.023)	(0.022)	(0.028)	(0.028)
Black- School Identified	-0.692***	-0.415***	-0.340***	-0.699***	-0.435***	-0.362***	-0.372***
	(0.010)	(0.010)	(0.010)	(0.008)	(0.007)	(0.008)	(0.008)
Hispanic- School Identified	-0.676***	-0.163***	-0.104***	-0.640***	-0.154***	-0.098***	-0.065***
	(0.012)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.011)
Other- School Identified		-0.035	-0.055**		-0.108***	-0.117***	-0.113***
		(0.021)	(0.019)		(0.031)	(0.031)	(0.030)
Year 2009		-0.203***	-0.264***		-0.299***	-0.321***	-0.301***
		(0.014)	(0.013)		(0.014)	(0.013)	(0.013)
Age		-0.067***	-0.0751***		-0.129***	-0.125***	-0.116***
		(0.006)	(0.006)		(0.006)	(0.006)	(0.005)
Male		-0.146***	-0.138***		-0.206***	-0.198***	-0.199***
		(0.005)	(0.004)		(0.006)	(0.006)	(0.006)
Disabled		-0.807***	-0.762***		-0.860***	-0.790***	-0.758***
		(0.014)	(0.012)		(0.015)	(0.014)	(0.014)
Limited English Proficiency		-0.672***	-0.587***		-0.851***	-0.767***	-0.734***
		(0.015)	(0.013)		(0.021)	(0.020)	(0.019)
Free Lunch		-0.387***	-0.263***		-0.283***	-0.195***	-0.154***
		(0.006)	(0.006)		(0.007)	(0.007)	(0.007)
Books 0-10		-0.455***	-0.374***		-0.674***	-0.592***	-0.523***
		(0.012)	(0.010)		(0.011)	(0.010)	(0.010)
Books 11-25		-0.331***	-0.273***		-0.476***	-0.417***	-0.372***
		(0.007)	(0.007)		(0.009)	(0.009)	(0.009)
Books 26-100		-0.084***	-0.061***		-0.227***	-0.194***	-0.171***
		(0.006)	(0.005)		(0.008)	(0.007)	(0.007)
Mother- H.S. grad		-	-		-	-	-0.027**
							(0.011)
Mother- some college		-	-		-	-	0.122***
							(0.011)
Mother- college grad		-	-		-	-	0.065***
							(0.010)
Mother- don't know		-	-		-	-	-0.141***
							(0.012)
Father- H.S. grad		-	-		-	-	0.037***
							(0.009)
Father- some college		-	-		-	-	0.120***
							(0.011)
Father- college grad		-	-		-	-	0.136***
							(0.009)
Father- don't know		-	-		-	-	0.012
							(0.010)
School Fixed Effects	No	No	Yes	No	No	Yes	Yes
Observations	329,873	325,780	325,780	288,246	284,175	284,175	284,175

The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.

Table 4: Standardized Test Score Gaps by Quantile (comparison group whites): Bootstrapped standard errors in parentheses

	Math		Reading	
	4th	8th	4th	8th
	(1)	(2)	(3)	(4)
American Indian- School Identified				
10th-Percentile	-0.281***	-0.485***	-0.327***	-0.318***
	(0.042)	(0.042)	(0.049)	(0.049)
25th-Percentile	-0.232***	-0.415***	-0.249***	-0.236***
	(0.032)	(0.040)	(0.033)	(0.031)
50th Percentile	-0.194***	-0.348***	-0.164***	-0.158***
	(0.024)	(0.028)	(0.029)	(0.028)
75th Percentile	-0.165***	-0.300***	-0.111***	-0.083**
	(0.028)	(0.027)	(0.034)	(0.035)
90th Percentile	-0.121***	-0.267***	-0.068	0.016
	(0.027)	(0.032)	(0.050)	(0.047)
Black- School Identified				
10th-Percentile	-0.460***	-0.590***	-0.365***	-0.393***
	(0.012)	(0.013)	(0.018)	(0.016)
25th-Percentile	-0.439***	-0.565***	-0.351***	-0.381***
	(0.009)	(0.012)	(0.016)	(0.012)
50th Percentile	-0.427***	-0.550***	-0.337***	-0.359***
	(0.009)	(0.008)	(0.011)	(0.011)
75th Percentile	-0.411***	-0.530***	-0.324***	-0.343***
	(0.009)	(0.010)	(0.011)	(0.009)
90th Percentile	-0.390***	-0.511***	-0.313***	-0.331***
	(0.010)	(0.014)	(0.014)	(0.017)
Hispanic- School Identified				
10th-Percentile	-0.157***	-0.276***	-0.107***	-0.102***
	(0.017)	(0.021)	(0.021)	(0.017)
25th-Percentile	-0.159***	-0.247***	-0.111***	-0.106***
	(0.013)	(0.012)	(0.014)	(0.015)
50th Percentile	-0.156***	-0.233***	-0.107***	-0.102***
	(0.010)	(0.010)	(0.016)	(0.015)
75th Percentile	-0.157***	-0.209***	-0.101***	-0.096***
	(0.010)	(0.015)	(0.013)	(0.012)
90th Percentile	-0.144***	-0.194***	-0.089***	-0.085***
	(0.011)	(0.018)	(0.021)	(0.019)
Observations	322,992	278,096	325,780	284,175

Notes: Racial subgroups also include a dummy variable for other. Additionally, the specification includes family/individual controls (see Table 2) and school fixed effects. The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.

Table 5: Standardized Test Score Gaps by Reservation Location (comparison group whites): Jackknifed standard errors in parentheses

	Math		Reading	
	4th	8th	4th	8th
	(1)	(2)	(3)	(4)
On Reservation	-0.057	-0.0103	-0.0585	-0.0207
	(0.051)	(0.044)	(0.066)	(0.039)
American Indian- School Identified	-0.244***	-0.327***	-0.242***	-0.208***
	(0.018)	(0.024)	(0.026)	(0.027)
On Reservation*American Indian-School Identified	-0.162**	-0.208***	-0.214**	-0.0542
	(0.066)	(0.064)	(0.089)	(0.061)
Observations	312,160	268,520	314,806	274,728

Notes: Racial subgroups also include a dummy variable for other. Additionally, the specification includes family/individual controls (see Table 2) as well as state fixed effects and school controls (enrollment and level of urbanization). The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.

Table 6: Standardized Test Score Gaps by Group Identification (comparison group whites): Jackknifed standard errors in parentheses

	Math		Reading	
	4th	8th	4th	8th
	(1)	(2)	(3)	(4)
American Indian				
School Identified Only	-0.169***	-0.193***	-0.147***	-0.022
	(0.022)	(0.031)	(0.031)	(0.031)
Self Identified Only	-0.154***	-0.288***	-0.113***	-0.251***
	(0.017)	(0.028)	(0.021)	(0.028)
School and Self Identified	-0.238***	-0.495***	-0.216***	-0.251***
	(0.025)	(0.032)	(0.029)	(0.036)
Black				
School Identified Only	-0.402***	-0.388***	-0.345***	-0.258***
	(0.010)	(0.016)	(0.013)	(0.017)
Self Identified Only	-0.249***	-0.365***	-0.262***	-0.344***
	(0.020)	(0.029)	(0.024)	(0.026)
School and Self Identified	-0.440***	-0.603***	-0.342***	-0.400***
	(0.007)	(0.010)	(0.011)	(0.008)
Hispanic				
School Identified Only	-0.270***	-0.253***	-0.284***	-0.270***
	(0.015)	(0.046)	(0.021)	(0.051)
Self Identified Only	-0.162***	-0.308***	-0.201***	-0.294***
	(0.006)	(0.011)	(0.009)	(0.010)
School and Self Identified	-0.171***	-0.281***	-0.122***	-0.145***
	(0.008)	(0.012)	(0.012)	(0.010)
Observations	322,992	278,096	325,780	284,175

Notes: Racial subgroups also include a dummy variable for other. Additionally, the specification includes family/individual controls (See Table 2) and school fixed effects. The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.

Table 7: Standardized Test Score Gaps by School Characteristics and Group Identification (comparison group whites): Jackknifed standard errors in parentheses

	Math		Reading	
	4th	8th	4th	8th
	(1)	(2)	(3)	(4)
Panel A: School Located On Reservation				
AI School Identified Only	-0.400***	-0.372***	-0.215	-0.187
	(0.101)	(0.099)	(0.185)	(0.122)
AI Self Identified Only	-0.208	-0.668*	-0.308	-0.222
	(0.204)	(0.329)	(0.303)	(0.232)
AI School and Self Identified	-0.480***	-0.659***	-0.201	-0.331*
	(0.119)	(0.070)	(0.120)	(0.092)
Observations	4,555	3,632	4,782	3,850
AI Observations*	3,855	3,075	4,233	3,390
Panel B:School Located Off Reservation				
AI School Identified Only	-0.158***	-0.180***	-0.135***	-0.015
	(0.024)	(0.034)	(0.034)	(0.034)
AI Self Identified Only	-0.155***	-0.292***	-0.111***	-0.243***
	(0.017)	(0.028)	(0.021)	(0.028)
AI School and Self Identified	-0.235***	-0.446***	-0.213***	-0.245***
	(0.029)	(0.035)	(0.032)	(0.040)
Observations	311,538	268,394	313,985	274,307
AI Observations*	11,568	7,185	11,523	7,371
Panel C: More than 50% AI in School				
AI School Identified Only	-0.272***	-0.0695	-0.244***	-0.134
	(0.077)	(0.083)	(0.068)	(0.093)
AI Self Identified Only	-0.109	-0.196	-0.202	-0.333
	(0.097)	(0.280)	(0.116)	(0.173)
AI School and Self Identified	-0.330***	-0.287***	-0.269***	-0.359
	(0.061)	(0.074)	(0.081)	(0.068)
Observations	8,301	6,842	8,124	6,934
AI Observations*	5,008	4,036	5,145	4,229
Panel D: Less than 50% AI in School				
AI School Identified Only	-0.198***	-0.179***	-0.138***	-0.017
	(0.031)	(0.034)	(0.035)	(0.038)
AI Self Identified Only	-0.192***	-0.289***	-0.117***	-0.274***
	(0.021)	(0.028)	(0.022)	(0.031)
AI School and Self Identified	-0.306***	-0.459***	-0.235***	-0.276***
	(0.038)	(0.040)	(0.034)	(0.046)
Observations	314,691	271,254	317,656	277,241
AI Observations*	10,693	6,457	10,892	6,792

*AI observations includes school identified American Indians, self identified American Indians and those that are school and self identified as American Indian.

Notes: Controls include all racial dummy variables, family/individual controls (see Table 2) and school fixed effects. The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.

Table A. 1: Summary Statistics by Race: Means of Student Characteristics by Student Reported Race

	Math									
	4th					8th				
Variable	Full Sample (1)	White (2)	American Indian (3)	Black (4)	Hispanic (5)	Full Sample (6)	White (7)	American Indian (8)	Black (9)	Hispanic (10)
Test Scores										
Math	0.000	0.264	-0.302	-0.464	-0.249	0.000	0.336	-0.576	-0.603	-0.375
	(1.000)	(0.708)	(0.784)	(0.721)	(0.793)	(1.000)	(0.890)	(0.986)	(0.890)	(0.948)
Race- School Identified										
White	0.599	0.964	0.401	0.029	0.268	0.620	0.988	0.263	0.034	0.204
	(0.490)	(0.187)	(0.490)	(0.168)	(0.443)	(0.485)	(0.107)	(0.440)	(0.181)	(0.403)
American Indian	0.027	0.006	0.441	0.007	0.020	0.027	0.004	0.651	0.003	0.018
	(0.163)	(0.078)	(0.497)	(0.083)	(0.140)	(0.162)	(0.064)	(0.477)	(0.059)	(0.132)
Black	0.182	0.005	0.093	0.925	0.108	0.186	0.002	0.061	0.947	0.076
	(0.386)	(0.070)	(0.290)	(0.263)	(0.310)	(0.389)	(0.048)	(0.240)	(0.223)	(0.265)
Hispanic	0.183	0.022	0.054	0.025	0.594	0.162	0.004	0.018	0.009	0.694
	(0.387)	(0.148)	(0.226)	(0.155)	(0.491)	(0.369)	(0.063)	(0.134)	(0.093)	(0.461)
Other	0.009	0.003	0.012	0.014	0.010	0.006	0.001	0.006	0.007	0.008
	(0.092)	(0.054)	(0.108)	(0.117)	(0.101)	(0.076)	(0.353)	(0.079)	(0.080)	(0.091)
Race- Student Identified										
White	0.495	1.000	0.000	0.000	0.000	0.539	1.000	0.000	0.000	0.000
	(0.500)					(0.499)				
American Indian	0.034	0.000	1.000	0.000	0.000	0.025	0.000	1.000	0.000	0.000
	(0.182)					(0.156)				
Black	0.146	0.000	0.000	1.000	0.000	0.156	0.000	0.000	1.000	0.000
	(0.353)					(0.363)				
Hispanic	0.279	0.000	0.000	0.000	1.000	0.227	0.000	0.000	0.000	1.000
	(0.448)					(0.419)				
Other	0.046	0.000	0.000	0.000	0.000	0.053	0.000	0.000	0.000	0.000
	(0.209)					(0.224)				
Other Controls										
Free/reduced lunch	0.492	0.291	0.667	0.768	0.686	0.443	0.249	0.713	0.726	0.670
	(0.500)	(0.454)	(0.471)	(0.422)	(0.464)	(0.497)	(0.433)	(0.452)	(0.446)	(0.470)
Books 0-10	0.124	0.064	0.175	0.213	0.185	0.145	0.081	0.217	0.196	0.258
	(0.330)	(0.245)	(0.380)	(0.409)	(0.388)	(0.352)	(0.273)	(0.412)	(0.397)	(0.437)
Books 11-25	0.215	0.155	0.259	0.308	0.276	0.214	0.156	0.286	0.302	0.287
	(0.411)	(0.362)	(0.438)	(0.462)	(0.447)	(0.410)	(0.363)	(0.452)	(0.459)	(0.452)
Books 26-100	0.336	0.379	0.305	0.271	0.293	0.349	0.376	0.318	0.335	0.292
	(0.472)	(0.485)	(0.460)	(0.444)	(0.455)	(0.477)	(0.484)	(0.466)	(0.472)	(0.455)

Books 100 plus	0.325	0.402	0.262	0.209	0.247	0.293	0.387	0.179	0.166	0.163
	(0.468)	(0.490)	(0.440)	(0.406)	(0.431)	(0.455)	(0.487)	(0.383)	(0.372)	(0.369)
Male	0.508	0.512	0.516	0.506	0.505	0.502	0.500	0.521	0.504	0.509
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	0.500
Disabled	0.119	0.123	0.139	0.116	0.111	0.102	0.095	0.157	0.112	0.106
	(0.324)	(0.329)	(0.346)	(0.321)	(0.315)	(0.303)	(0.294)	(0.364)	(0.315)	(0.307)
English language learner	0.083	0.014	0.098	0.027	0.246	0.044	0.004	0.127	0.012	0.159
	(0.277)	(0.117)	(0.297)	(0.162)	(0.431)	(0.205)	(0.063)	(0.333)	(0.111)	(0.365)
Age	7.512	7.505	7.562	7.509	7.518	11.435	11.420	11.582	11.472	11.432
	(1.161)	(1.141)	(1.159)	(1.192)	(1.184)	(1.162)	(1.148)	(1.174)	(1.201)	(1.167)
Mother-H.S drop out	-	-	-	-	-	0.104	0.061	0.134	0.085	0.217
						(0.305)	(0.239)	(0.340)	(0.279)	(0.412)
Mother- H.S. grad	-	-	-	-	-	0.208	0.207	0.233	0.237	0.189
						(0.406)	(0.405)	(0.423)	(0.425)	(0.391)
Mother- some college	-	-	-	-	-	0.173	0.182	0.171	0.189	0.136
						(0.379)	(0.386)	(0.377)	(0.391)	(0.343)
Mother- college grad	-	-	-	-	-	0.364	0.445	0.255	0.331	0.207
						(0.481)	(0.497)	(0.436)	(0.471)	(0.405)
Mother- don't know	-	-	-	-	-	0.151	0.105	0.207	0.158	0.251
						(0.358)	(0.307)	(0.405)	(0.365)	(0.433)
Father- H.S. drop out	-	-	-	-	-	0.108	0.077	0.132	0.084	0.198
						(0.310)	(0.267)	(0.339)	(0.277)	(0.399)
Father- H.S. grad	-	-	-	-	-	0.207	0.215	0.239	0.223	0.174
						(0.405)	(0.411)	(0.427)	(0.416)	(0.379)
Father- some college	-	-	-	-	-	0.136	0.151	0.133	0.127	0.104
						(0.343)	(0.358)	(0.339)	(0.333)	(0.305)
Father- college grad	-	-	-	-	-	0.306	0.394	0.182	0.230	0.171
						(0.461)	(0.489)	(0.386)	(0.421)	(0.376)
Father- don't know	-	-	-	-	-	0.242	0.162	0.314	0.337	0.354
						(0.428)	(0.368)	(0.464)	(0.473)	(0.478)
Observations	322,939	159,877	11,131	47,152	89,969	278,074	149,765	6,969	43,478	63,084

Notes: Means of student characeristics are based on math sample. Means for reading sample are nearly identical, and are available on request.

Standard Deviations in parentheses. Parental education not available for 4th grade.

Table A.2: Companion Table to Table 6, Standardized Test Score Gaps in Standard Deviation Units at 10-percentile and 90-percentile (comparison group whites): Bootstrapped standard errors in parentheses

	Math				Reading			
	4th		8th		4th		8th	
	10th	90th	10th	90th	10th	90th	10th	90th
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
American Indian								
School Identified Only	-0.231***	-0.0966**	-0.282***	-0.105*	-0.314***	-0.0053	-0.175**	0.122*
	(0.057)	(0.033)	(0.046)	(0.050)	(0.063)	(0.080)	(0.059)	(0.057)
Self Identified Only	-0.189***	-0.127***	-0.317***	-0.267***	-0.124**	-0.103***	-0.335***	-0.158***
	(0.030)	(0.020)	(0.046)	(0.040)	(0.041)	(0.028)	(0.048)	(0.040)
School and Self Identified	-0.346***	-0.158***	-0.591***	-0.392***	-0.309***	-0.139**	-0.401***	-0.106*
	(0.057)	(0.030)	(0.055)	(0.042)	(0.053)	(0.041)	(0.067)	(0.051)
Black								
School Identified Only	-0.448***	-0.353***	-0.411***	-0.369***	-0.382***	-0.307***	-0.285***	-0.231***
	(0.023)	(0.017)	(0.027)	(0.023)	(0.024)	(0.021)	(0.027)	(0.026)
Self Identified Only	-0.284***	-0.234***	-0.400***	-0.364***	-0.307***	-0.227***	-0.417***	-0.262***
	(0.040)	(0.030)	(0.056)	(0.045)	(0.051)	(0.046)	(0.049)	(0.034)
School and Self Identified	-0.466***	-0.410***	-0.645***	-0.556***	-0.358***	-0.323***	-0.433***	-0.365***
	(0.015)	(0.011)	(0.015)	(0.014)	(0.022)	(0.014)	(0.015)	(0.014)
Hispanic								
School Identified Only	-0.260***	-0.266***	-0.297***	-0.107	-0.287***	-0.288***	-0.427***	-0.203***
	(0.034)	(0.025)	(0.078)	(0.065)	(0.039)	(0.033)	(0.102)	(0.058)
Self Identified Only	-0.172***	-0.141***	-0.365***	-0.243***	-0.223***	-0.180***	-0.388***	-0.227***
	(0.011)	(0.011)	(0.021)	(0.021)	(0.018)	(0.012)	(0.016)	(0.020)
School and Self Identified	-0.178***	-0.155***	-0.331***	-0.229***	-0.130***	-0.102***	-0.168***	-0.118***
	(0.017)	(0.012)	(0.019)	(0.018)	(0.019)	(0.022)	(0.018)	(0.020)
Observations	322,992	322,992	278,096	278,096	325,780	325,780	284,175	284,175

Notes: Racial subgroups also include a dummy variable for other. Additionally, the specification includes family/individual controls (see Table 2) and school fixed effects. The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.

Table A.3: Companion Table to Table 7, Standardized Test Score Gaps in Standard Deviation Units by Census Region (comparison group whites): Jackknifed standard errors in parentheses

	Math		Reading	
	4th	8th	4th	8th
	(1)	(2)	(3)	(4)
Panel A: American Indian-Northeast				
School Identified Only	-0.113	-0.119	-0.155	0.057
	(0.082)	(0.144)	(0.088)	(0.114)
Self Identified Only	-0.103**	-0.251***	-0.125**	-0.192**
	(0.038)	(0.070)	(0.052)	(0.067)
School and Self Identified	-0.346	-0.730***	-0.152	-0.466
	(0.245)	(0.222)	(0.250)	(0.300)
Observations	54,296	47,990	54,989	49,149
AI Observations*	990	602	1,039	619
Panel C: American Indian-South				
School Identified Only	-0.099***	-0.232***	-0.124***	-0.039
	(0.031)	(0.041)	(0.041)	(0.051)
Self Identified Only	-0.118***	-0.262***	-0.119***	-0.168***
	(0.024)	(0.048)	(0.028)	(0.052)
School and Self Identified	-0.117***	-0.417***	-0.087*	-0.102*
	(0.034)	(0.046)	(0.045)	(0.048)
Observations	119,018	100,655	118,667	102,774
AI Observations*	4,539	2,628	4,604	2,769
Panel B: American Indian-Midwest				
School Identified Only	-0.147***	-0.121**	-0.239***	0.041
	(0.049)	(0.055)	(0.058)	(0.066)
Self Identified Only	-0.120***	-0.283***	-0.118***	-0.297***
	(0.026)	(0.043)	(0.036)	(0.047)
School and Self Identified	-0.239***	-0.402***	-0.320***	-0.202***
	(0.045)	(0.072)	(0.057)	(0.066)
Observations	74,336	66,699	75,954	67,974
AI Observations*	3,872	2,775	3,973	2,887
Panel D: American Indian-West				
School Identified Only	-0.276***	-0.189**	-0.125	-0.059
	(0.043)	(0.058)	(0.071)	(0.054)
Self Identified Only	-0.272***	-0.340***	-0.097**	-0.356***
	(0.036)	(0.070)	(0.033)	(0.071)
School and Self Identified	-0.344***	-0.580***	-0.283***	-0.380***
	(0.045)	(0.046)	(0.051)	(0.063)
Observations	75,342	62,752	76,170	64,278
AI Observations*	6,300	4,488	6,421	4,746

*AI observations includes school identified American Indians, self identified American Indians and those that are school and self identified as American Indian.

Notes: Controls include all racial dummy variables, family/individual controls (see Table 2) and school fixed effects. The level of significance is indicated as follows: * p< 0.10, ** p<0.05, *** p<0.01.