TEST SCORE GAPS AND TIME USE*

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Abstract

*This paper expands on the essay by Valerie A. Ramey, "Is there a "Tiger Mother" Effect? Time Use Across Ethnic Groups," published in the March 2011 *Economics in Action* newsletter of the Economics Department and on "Time Use and Educational Outcomes Across Ethnic Groups" by Valerie A. Ramety and Ling Shao. We wish to thank Julian Betts, Daniel Hamermesh, and Gordon Hanson for helpful comments

I. Introduction

Despite many decades of research and many experiments aimed at raising achievement in the public schools, the average U.S. K-12 student still performs poorly relative to students in many other countries. The National Assessment of Educational Progress in 2013 indicates that a majority of American students have skill levels that are rated below proficient. Beneath these U.S. averages lie significant gaps in academic performance across racial, ethnic, and socioeconomic groups. For example, there is a large test score gap between black and white students, and that gap has significant consequences for adult wage inequality (e.g. Neal and Johnson (1996)). Much less analyzed, particularly by economists, is the Asian test score gap. By some measures, this gap is as large in the opposite direction. For example, in the California public schools in 2016, within schools Asian-American students scored on average half a standard deviation higher than (nonhispanic) white students and a full standard deviation higher than black students on 11^{th} grade state-wide standardized math tests.[1] These estimated test score gaps control for school fixed effects, suggesting that non-school inputs into the educational production function play an important role.

This paper seeks to shed light on the role of non-school inputs in the test score gaps between Asian-American students and students of other ethnic and racial groups. The goal is not only to understand the gap itself, but also to gain insight into how students of other ethnic groups might raise their academic achievement.

We begin the analysis by documenting the test score gaps across racial and ethnic groups based on standardized tests given to millions of students in California public schools. We use these data because of the large sample sizes and because academic achievement is measured by statewide high-stakes tests. We then use an educational production function to link test score

[1] These statistics are from the California Assessment of Student Performance and Progress in 2016.

gaps to differences in inputs. Based on test score gaps that persist even within the same school and grade, we narrow in on inputs that are under the control of the student and his or her parents. We narrow in on a key input into the production function - hours of work, not of teachers, but of the students themselves as well as their parents. Using time diary data from the American Time Use Survey, we uncover a “time use gap” that we argue can potentially explain an important part of the test score gap. In particular, we show that Asian-American students spend significantly more time studying than students of other racial and ethnic groups. This gap persists even after controlling for many other socioeconomic variables. We also consider other ways that the students spend their time, as well as potential differences in parental inputs of time. We then use estimates from the literature that establishes a causal effect of studying on tests and grades to determine how much of the remaining test score gaps can be explained by differences in study time. (Conclusion to be completed later).

II. Related Literature

This paper is related to several strands of literature across a variety of disciplines. First, there is a large economics literature focusing on differential academic achievement across racial and ethnic groups. Most of these studies focus on the White-Black achievement gap and the links to later wage inequality, and merely note in passing that there is also a Asian-White achievement gap. In contrast, there is a large literature spanning psychology, sociology, education and child development that studies the higher educational attainment and greater test scores of Asian-American students. For example, Flynn’s 1991 book *Asian Americans: Achievement Beyond IQ* carefully documents that although the average IQ scores for Chinese Americans are comparable to those for Whites, they have much greater average academic and occupational achievements than Whites. Many studies focus on cultural differences and, in particular, different parenting styles. For example, the March 2013 issue of *Asian American Journal of Psychology* published seven papers analyzing "tiger mother" parenting in Asian families.

In an important recent study, Hsin and Xie (2014) use the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K) and the Education Longitudinal Study (ELS) to track achievement from Kindergarten through high school for Asian Americans versus Whites. They measure both achievement and work effort using teachers' subjective assessments of students. Two findings are particular relevant to what we shall report. First, the academic achievement gap between Asian Americans and Whites grows with each grade. Second, teacher assessments of work effort explain most of the gap in teacher assessments of achievement. Third, the authors are able to link the work effort gaps to student beliefs, such as whether they believe that one must be born with an ability or can work hard to gain that ability and whether their parents expect them to succeed. These results are quite informative, though, as Hisin and Xie concede, the teacher ratings are a combination of real achievement or effort and the teacher's perceptions and biases and there are not direct objective measures. In follow-up work, Liu and Xie (2016) find that the cultural orientation of Asian American families works to mediate the effects of family socioeconomic status on academic achievement.

A second strand of literature to which our study relates is the literature on time use. Juster and Stafford's (1991) review of the literature on time use compared time spent studying by middle and high school students in the U.S. versus Japan. They found that Japanese school children spend much more time studying than American school children. Hofferth and Sandberg (2001) used time diaries from the Child Development Supplement of the PSID to study how

American children under the age of 13 spend their time. One of their findings was that Asian American children spent two and one-half hours more time studying per week than White children.[2] Ramey (2011) used the American Time Use Survey to show that Asian-American high school and college students spend far more time studying than other groups of students. Our paper is an extension of that initial study. Stinebrickner and Stinebrickner (2004) use rich data from Berea College to estimate a causal negative effect of time spent in paid work during the semester on college students' grade point averages.

A third strand of related literature is the analysis of the returns to time spent doing homework. Betts (1997) was an important early contribution using sizeable data sets. He used the Longitudinal Study of American Youth to estimate a value added production function of math test scores. The key input he analyzed was the amount of homework assigned by the math teacher. His estimates implied that an extra half hour of math homework per night between grades 7 and 11 could advance a student almost two grade equivalents. Aksoy and Link (2000) found positive and significant effects of homework on tenth grade math scores. They used the National Educational Longitudinal Study of 1988 (NELS 88) and as the homework measure used the time spent doing homework reported by the students themselves. Eren and Henderson (2008) used parametric and nonparametric methods on the NELS 88 data to determine the relationship between the amount of math homework assigned by the teacher and math test scores. They found significant effects of homework time on math scores, greater than for standard inputs such as class size, but the effects are heterogeneous across populations. Eren and Henderson (2011) explored the relationship for other subjects and other grades and find that the effects are smaller outside of math.

[2] There were only 85 total Asian-American children in the sample, though.

McMullin (2011) also uses NELS 88 but extends their work in an important way. In particular, he recognizes that the previous estimates by Betts (1997) and Eren and Henderson (2008) using the amount of homework assigned do not account for an imperfect response of students in terms of homework completed. The earlier estimates are appropriate for answering the question: how much do student test scores rise when teachers assign an extra hour of homework? However, they cannot answer the question of the causal effect of an extra hour of homework *completed by the student* on test scores. To answer this question, McMullin (2011) uses the panel nature of NELS 88 to estimate student fixed effect regressions of test scores on students' reports of how much time they spend on homework, instrumented by the amount of homework assigned by the teacher and the student's locus of control. His estimates imply that an extra hour of mathematics homework per week raises test scores by 0.18 standard deviations at the mean.

Finally, the most definitive demonstration of a causal effect of homework on grades comes from Stinebrickner and Stinebrickner (2008) who gather rich data from an ideal natural experiment at Berea College. In particular, they exploit the fact that college roommates are assigned randomly at the college. They then show that if one's college roommate brings a video game to college, one's own homework time goes down. The "treatment" has no effect on other inputs such as sleep and going to class. They then estimate the causal effect of time spent doing homework on grades, using the presence of a roommate with a game box as a very relevant instrument. The IV estimates are much larger than the OLS estimates, implying that an extra hour of study per day raises a student's grade point average by 0.36 points. They also show that if they do not use their instrument, but instead try to address omitted variables bias using student fixed effects in an OLS regression the estimates are severely biased downward.

We will refer to some of these estimates when we link our findings on time spent studying to test score gaps.

III. Test Score Gaps by Group

We begin by documenting test score gaps in an unexploited data set – standardized test scores in the California public schools. These data have several advantages over other analyses of Asian American test score gaps. The first is the large sample size. The number of Asian Americans is often very low in smaller sample studies because they constitute less than five percent of the U.S. population. However, they are larger in samples representative of the California population because one-third of all Asian Americans live in California. In 2016, California public schools administered state-wide standardized tests to a total of 3.3 million students across grades 3 – 8 and grade 11. Of these, 300,000 were Asian American. A second advantage of the California data is the nature of the test administered. The California public schools standardized tests are highly publicized high stakes tests. Moreover, they are comprehensive, requiring more than three hours for *each* of the English Language Arts and Math tests. In contrast, the achievement tests given to students in studies such as NELS 88 are very short tests, with a duration of only 20 to 30 minutes per subject, and they have no import outside of the research study. The California data do, however, have a significant disadvantage and that is that individual student records are not released. Nevertheless, the test score data are reported by school, grade, and important subgroup. Thus, one can condition on some of the key determinants of test scores.

The state of California has administered standardized tests and published the results since 1998. From 1998 through 2013, the tests were known as Standardized Testing and Reporting

(STAR) tests. These were administered across a variety of subjects to children in grades 2 through 12. Beginning in 2014, the state of California changed the test to the California Assessment of Student Performance and Progress (CAASPP) in order to align the test to the new Common Core standards. These new tests are administered across a variety of subjects to children in grades 3 through 8 and grade 11. In the current version of the paper, we mostly use the 2016 CAASPP test results, although we will report some results using the 2013 STAR results since those reports contain some information not contained in the later reports. The research files for the data are publically available at caaspp.cde.ca.gov and star.cde.ca.gov.

We follow the California Department of Education definition of major ethnic/racial groups: white, black, Hispanic, Asian, Filipino, Pacific Islanders, American Indian, and Mixed Race. Note that Federal studies usually include Filipinos as Asians, but California reports them separately. The test scores are also reported separately for each ethnic group according to whether the student is disadvantaged or not. "Disadvantaged" is defined by California as "students eligible for the free and reduced priced meal program (FRPM), foster youth, homeless students, migrant students, and students for whom neither parent is a high school graduate." In order to be eligible to receive Federally-subsidized free or reduced price meals, a child's family income must fall below 130% of the federal poverty guidelines ($31,005 for a family of four in 2014-2015) to qualify for free meals, or below 185% of the federal poverty guidelines ($44,123 for a family of four in 2014-2015) to qualify for reduced price meals (California Dept. of Education, <u>Student Poverty FRPM Data</u> (Mar. 2016)). Just over half of the students tested were classified as disadvantaged.

In order to estimate test score gaps, we estimate the following simple econometric model:

(1) $M_{sgj} = \sum_{j=1}^{J} \beta_j D_{sgj} + \theta \vec{X}_{sgj} + \varepsilon_{sgjk}$

M denotes the mean scale score for a particular subject test (e.g. math or English language arts) in school s, for grade g, and for ethnic/racial group j. One could also add a time index since the estimation could be expanded to multiple years. The *D*s are indicator variables for ethnic/racial groups. Whites are the omitted group. The $\vec{X}_{sgj}$ denotes a vector of control variables and the ε is the error term. Each observation is for a school, grade level, and group category. We estimate a weighted regression using Stata analytical weights equal to the number of students tested in each school-grade-ethnic group-socioeconomic group cell. The total number of students represented is almost 2.9 million.[3] We adjust the standard errors for clustering at the school-grade level.

Table 1 shows the test score gap relative to whites, with math scores in Panel A and English Language Arts (ELA) in Panel B. As the note to Panel A of the table indicates, the standard deviations of individual scale scores of the math test range from 80 in grade 3 to 125 in grade 11, with an average around 100. The first column shows the estimates with only grade level dummy variables as controls. The estimates of β indicate that on average Asian American students in the California public schools score almost 59 points higher on the math test than white students, which is equal approximately equal to 59 percent of the average standard deviation (SD) across grades. Black students score almost an entire SD lower than white students, whereas Hispanic students score 70 percent of a SD lower. Filipino students have a positive gap, though lower than the Asian category, whereas Pacific Islanders and American Indians have a very negative gap. Mixed race has a positive gap similar to Filipinos.

[3] This number is less than the total number of students tested because scores were not reported for subgroups when there were too few students in the group in order to preserve confidentiality.

The second column shows the estimated test score gaps when interacted school and grade fixed effects are included. All gaps decrease by 20 to 50 percent, indicating that school-specific inputs are important, but the gaps remain quantitatively and statistically significant even within schools. The Asian test score gap is now 46 percent of an SD, the black one is negative 63 percent and the Hispanic one is negative 42 percent.

The last column exploits the only within-racial group information reported by expanding the specification in equation (1) so that the subscripts on the variables also include k, where k indicates whether the student is disadvantaged or not. Thus, the observations in this specification are cell averages by school s, for grade g, for ethnic/racial group j, and for income group k. We include an indicator variable for income group in the control variables. Not surprisingly, the coefficient on the disadvantaged indicator is significantly negative at 40 percent of a SD. With this additional control, the gaps for black and Hispanic students fall somewhat, but surprisingly the gap for Asian students increases to 50 percent of a SD. In sum, the math test score gap between Asians and Whites remains quantitatively significant even after controlling for school fixed effects and indicators of disadvantage. Moreover, the gap is as large as those between Whites and Blacks and Hispanics.

Panel B shows the results for English Language Arts (ELA). While the gaps tend to be smaller in each case, the story is similar. After controlling for school-grade fixed effects and an indicator for economic disadvantage, Asian American students still score 30 percent of a SD higher than Whites.

We also analyze whether the test gaps differ across grades and across socioeconomic level. Figure 1 shows estimates based on regressions run *separately* by income group and grade. All regressions include school fixed effects and allow for clustering at the school level. The mean scale scores are normalized by the test-specific standard deviation in third grade, so the coefficients reported are fractions of the third grade standard deviation (80 for Math and 88 for English Language Arts). The blue solid lines are the Asian-White test score gap, the green short dashed lines are the Hispanic-White test score gap, and the orange long dashed line are the Black-White test score gaps. For clarity, we do not show gaps for other ethnic/racial categories.

Consider first the Asian-White test score gap. Interestingly, the gap is similar across income categories. The graphs indicate that for both economically disadvantaged and not disadvantaged the Asian-White math test score gap is about 0.4 SD in third grade. It rises noticeably in 6th through 8th grade and stays higher through 11th grade, so that the gap for both groups is 0.85 SDs by grade 11. For English Language Arts, the gap starts out around 0.2 SDs in third grade for both groups and then rises only slightly toward 0.4 SDs. In all cases, the gaps are estimated very precisely.

The Hispanic-White math test score gaps are negative, starting around -0.2 SDs in third grade. They become somewhat more negative with higher grades. The Black-White test score gap begins large and negative in third grade, at -0.5 SDs for the not economically disadvantaged and -0.4 SDs for the economically disadvantaged. The gaps tend to become even more negative between third and fifth grade and then level out. The implied gaps between Asians and Blacks are very large. For example, the 11th grade gap is estimated to be 1.5 SDs for math for not economically disadvantaged students. Thus, the test scores of all three groups diverge from white test scores with each passing grade, with the Asian American test scores rising relative to white test scores and black and Hispanic test scores falling relative to white test scores.

Our results for the Asian-White test score gaps are qualitatively consistent with the findings of Hsin and Xie (2014), who also find higher gaps at higher grades, but our results are quantitatively much larger. Their gaps, which are based on combined teacher subjective assessments of proficiency on math, reading and general knowledge, are much smaller, with a peak of 0.3 SDs in high school. In contrast, we find gaps as high as 0.85 SDs by grade 11.

The "Asian American" group includes ethnic groups from all of Asia. Are the gaps different for different Asian subgroups? The CAASPP test scores are not reported for more detailed subgroups. However, some of the predecessor STAR tests do report those detailed subcategories. We use the 2012 STAR test results, which were the last one to report the detailed racial categories. We estimate Equation (1) including school by grade fixed effects. We are not able to control for household income class because the subcategory data are not reported. The non-Asian ethnic/racial groups are also included, but the coefficient estimates are not shown. For reference, the standard deviation of the scale score was around 62 for the English Language Arts and around 80 for Math in the 2012 STAR tests.

Table 2 shows the coefficient estimates, which are generally very precisely estimated. The groups are ordered by their Math scores. The estimates show that the Chinese Americans have the biggest test score gaps with Whites of any group, 60 in Math and 23 in English Language Arts. For the math gap, the Chinese are followed in order by the Koreans (51), Asian Indians (44), Vietnamese (40), Japanese (34), Other Asian (23), and Filipino (7). Laotians, Hmong, and Cambodians all have negative test score gaps relative to Whites. For English Language Arts, the gaps are smaller. Asian Indians are second to the Chinese, who are followed by the Koreans. The Laotian, Cambodian, and Hmong gaps are quite negative.

The California test score data do not allow us to distinguish by disadvantaged status or other socioeconomic variables, but we can use the American Community Survey (ACS) to assess the differences across groups. We calculate the following percentages for children ages 18 and under who live in California: the percent with both parents in the household, at least one foreign-born parent, at least one parent with a (four year) college degree, at least one parent with a graduate degree. As we will demonstrate later, these variables have important impacts on time use. The last four columns shows these percentages for the Asian subgroups and for non-Hispanic Whites. The first of these columns show that the Asian groups with higher test scores than Whites tend to have higher fractions of children living with both parents in the household, with the reverse for the groups with lower test scores. The second of these columns shows that the vast majority of Asian American children in California have at least one parent who was born abroad. For example, 90 percent of Chinese American children and 98 percent of Vietnamese American children have a foreign-born parent. This compares to 21 percent for non-Hispanic white children. The last two columns show the groups with higher test scores also tend to have more highly educated parents. The most educated are the Asian Indians, fo lowed by the Chinese and Koreans. The groups below the non-Hispanic white average are the South East Asian groups. For the most part, the ranking on test score gaps follows the ranking on educational attainment of the parents. It is notable, however, that the Vietnamese American test score gap is similar to the top Asian subgroups despite the fact that parental educational attainment is lower than non-Hispanic Whites. One possible explanation is the very high rate of foreign-born parents. As we shall see when we analyze time use, there is a positive effect of immigrant status on time spent studying by children.

Overall, the estimates show significant heterogeneity among Asian Americans in their test score gaps. Some of these differences may be linked to immigrant status and educational attainment of the parents.

IV. Understanding the Test Score Gaps Through Education Production Functions

In the last section we documented test score gaps across ethnic groups. We found that even controlling for school by grade fixed effects, there are large and significant differences across ethnic groups in test scores. Moreover, the Asian-White gap is almost as large when we control for whether the student comes from a disadvantaged household. Finally, the gap grows with each grade.

To understand these gaps, we consider an educational production function with a different focus than is typical. Much of the economics of education literature focuses on specific school inputs, such as class size, etc. because of the policy relevance for school reform. Since we are trying to understand differences in test scores *within* schools, we abstract from the particulars and include simply an index of school quality, S. This index encompasses curriculum, teacher quality, disruptive behavior by classmates, etc. Many other strands of literature focus on "culture" as an explanation for educational achievement gaps. We do not view culture itself as an input into the education production function, however. Rather, culture affects the quantity and quality of other key inputs. The key inputs that are affected by culture are mainly the time and effort devoted to academic endeavors. Student time spent in academic endeavors is the main input. However, the productivity of that input can be affected by parental inputs, such as helping with homework, hiring tutors, etc.

To capture the features, we specify the knowledge production function as follows:

$$K_{ig} = G\left(K_{i,g-1}, S_{ig}, A_{ig}, H_{ig}^{c}, H_{ig}^{hw}, F_{ig}, \varepsilon_{ig}\right)$$

where

K_{ig} = knowledge of student i at the end of grade g.

G(·) = production function for knowledge.

S_{ig}= an index of the quality-adjusted school inputs

A_i = student's innate cognitive ability (e.g. speed of learning)

H_{ig}^{c}= student's hours devoted to class attendance

H_{ig}^{hw}= student's hours devoted to homework and studying

F_{ig} = Family inputs, such as parental time spent reading

ε_{ig} = idiosyncratic student-grade shock

This production function embeds the oft-made assumption that the level of knowledge at grade g-1, K_{ig}, is a sufficient statistic for educational inputs up through grade g-1. As discussed above, *S* is an index of school quality, which encompasses curriculum, teacher quality, disruptive behavior by classmates, etc. *A* is the student's innate cognitive ability, or speed of learning. The *H*'s are the hours the student devotes to attending class and doing homework. *F* is family inputs, which can involve family time or paid tutor time. Finally, we allow for an idiosyncratic student-grade shock.

We assume that the production function is increasing in each of the inputs, i.e. $G_j(\ ) > 0$ for each input j. We also maintain the following assumptions. First, a higher cognitive ability should raise the productivity of student hours devoted to class attendance and homework. It also seems plausible that the productivity of student hours rises with the school quality. A higher quality curriculum should make class and study time more productive. Similarly, family inputs may make hours devoted to homework more productive. Some of these inputs might simply be monitoring the student so that he or she focuses on the homework rather than being distracted by social media, etc.

An earlier literature attributed Asian educational achievement gaps to higher innate cognitive ability (i.e. higher *A*). Flynn's (1990) careful analysis of the data found no difference in IQ scores, however. Thus, we do not focus on cognitive ability as the source of the test score gap. This leaves student study hours and parental inputs as the remaining student-specific inputs. In the next section, we will study those in detail.

V. Time Use Gaps by Group

In this section, we update and extend the analysis of Ramey (2011) and Ramey and Shao (2015) who used time use data to study differences in time spent studying across ethnic groups. In this section, we use the American Time Use Survey, which gives the most accurate measurements because the responses are based on detailed time diaries. This survey does not, however, link the study time to academic achievement. In letter sections, we will marshal additional data and estimates from the literature to make that link.

A. Data

We use the American Time Use Survey (ATUS) to estimate the amount of time students spend doing homework. The ATUS draws its sample from the eighth outgoing rotation group of the Current Population Survey (CPS). The US Bureau of Labor Statistics administers both the ATUS and the CPS. We combine the ATUS surveys from 2003 to 2015.

For each household, the ATUS selects one family member, 15 years or older, to describe his or her activities during the previous day in as much detail as possible. Our sample consists of individuals between 15 and 18 years old who were enrolled in high school. The fraction of that age group reporting to be enrolled in high school varies from highs of 87 percent in April and November to 29 percent in July. Thus, most students are not counted as enrolled in high school during the summer.[4] The ATUS interviewers then categorize the responses by activity code. Examples of homework activities include: studying, reading for class, writing paper for class, and attending study group. The ATUS Activity Lexicon describes the different activity categories in detail.

B. Time Use of High-School Students by Ethnicity and Socioeconomic Characteristics

We begin by estimating simple averages of time spent studying by high school students. We include time spent studying for classes for a degree as well as test prep studying (e.g. SAT). The first row of Table 3 shows averages for each major ethnic group and the second row shows the gap relative to white students. White high school students spend almost 6 hours per week doing homework and studying. Asian high school students spend an astounding13.4 hours on homework, 7.5 hours more per week than white students. Black students spend only 3.2 hours per week on homework and Hispanic students spend 5.25 hours per week. The averages are all statistically different from the white student averages. Figure 2 better illustrates the scale of the differences. The bar representing Asian American student study time dwarfs the bars for the other ethnic groups.

The remaining rows of Table 3 study the intensive versus extensive margin of homework time. Asian students spend two-thirds of their days doing some homework, in contrast to white

[4] We also explored an alternative measure which used information from the CPS, which was taken two to five months earlier. We classified someone as enrolled in high school if they answered affirmatively for the present or for the earlier CPS. This alternative, which averages study time over more vacation days result in half an hour week less time spent studying.

students who spend about 40 percent of their days doing homework. Conditional on doing homework that day, Asian students do more homework than other students. Moreover, Asians students do more homework on both weekdays and weekends than other students.

There are only 168 hours in a week so what activities are Asian students giving up to do homework? Table 4 shows the time spent on homework and various other activities by ethnicity. The data appendix describes the exact definition of each category. The first row repeats the first row of Table 3. Row (2) shows that there are no statistically significant differences by ethnicity in the time spent in class. Typically, students have no control over the length of the school day, but there could be differences in absenteeism. This factor does not seem important.

There are statistically significant differences between Asian students and white students for time spent working, doing household chores, and playing sports. White students lead all others in terms of time spent in paid work, averaging more than five hours per week. Asian students spend only 1.5 hours in paid work per week. Asians also do about an hour less per week in household chores. Asian and white students spend equal amounts of time sleeping, just over 64 hours per week (just over nine hours per day). In contrast, Black and Hispanic students spend more time sleeping, almost 68 hours per week for Black students and almost 67 hours per week for Hispanic students. These two groups also spend an hour more per week on other personal care.

Moving to leisure activities, we see that white students enjoy two hours more per week in leisure activities (excluding sports) than Asian students, but the difference is not statistically significant. Socializing accounts for one hour of that difference. Asian students spend a little more time watching TV and playing on the computer, but the difference is not significant. On the other hand, black students spend four hours more per week on TV and computer compared to white students. One leisure activity, reading and writing for personal interest, likely has positive spillovers on test scores. White students lead, spending over an hour a week on this activity. Asian American students spend just under an hour but the estimate is not statistically different from Whites. On the other hand, black and Hispanic students spend significantly less time in reading and writing, spending on average under half an hour per week.

Considering time spent in sports, Asian students spend significantly less time playing sports than the other ethnic groups. They spend 1.7 hours less per week playing sports relative to white students and the difference is statistically significant.

The last three categories are extracurricular activities (excluding sports), volunteering and religious activities. There are a few differences across groups but both the averages and the differences are small.

Combining activities, white students spend 6.8 more hours on paid work, chores, and sports than Asian students. This gap accounts for most of the 7.5 hour homework gap between white and Asian students.

Working for pay mechanically reduces the amount of time available to do homework since there are only 24 hours in a day. However, students may learn valuable skills from working during high school. In fact, other research finds that the skills obtained by working during school may offset the negative academic consequences of working. Ruhm (1997, abstract) finds that "There is no indication that light to moderate job commitments ever have a detrimental effect; instead, hours worked during the senior grade are positively correlated with future earnings… These gains occur even though employed seniors attain slightly less education than their counterparts." On the other hand, Stinebrickner and Stinebrickner (2003) find a negative causal effect of working during the school year on college grade point averages.

Likewise, doing chores around the house is also a productive activity. We cannot find any academic research on the effect of doing chores and academic performance. However, it is probably safe to say that a moderate amount of chores would not have a detrimental effect on academic performance. Finally, playing sports and exercising may improve health and wellness, and other research finds that physical exercise is positively correlated with better academic performance (Tomporowski et. al 2007).

We next consider how much of the differences in time use across ethnic groups can be explained by differences in student and family characteristics. As noted before, the ATUS sample is drawn from CPS respondents. The CPS is primarily used to calculate national labor-force statistics, so it only contains basic demographic data about the respondent and his family. The variables we characteristics we consider include family income, age, gender, whether the student lives in a two parent household, whether either parent is foreign-born, and highest level of education attained by either parent. We should note that the characteristics that are ascribed to the mother or father are actually to the "likely" mother or father. For example, we use the maximum education level of adult males (over age 27) in the household as the father's education level. We chose age 27 as the cutoff since the youngest children whose studying we observe are age 15.

Table 5 presents the least-squares regression of time use on student and family characteristics. The dependent variable is given in the column header. Our main focus is on homework time, which is shown in the first column, though we also show results for several other time use categories.

Consider first how much of the Asian-White study gap can be accounted for by student-family characteristics. Recall that the unadjusted Asian-White homework gap was 7.5 hours per week. Column (1) indicates that the Asian-White homework gap, conditional on additional student and family variables, is still a large and statistically significant 5.3 hours per week. Thus, seventy percent of the gap remains. The black-white homework gap shrinks in magnitude from -2.7 to -1.9 and the small Hispanic-white homework gap becomes statistically insignificant after controlling for other characteristics. Thus, a few student observables go a long way in accounting for the black-white and Hispanic-white homework gaps. However, demographic differences cannot explain the Asian-white homework gap. This finding is consistent with Liu and Xie's (2016) finding that the effects of socioeconomic characteristics on test scores are mitigated for Asian American students.

Which student and family characteristics matter the most for time spent studying? We outline the most important ones. One should keep in mind that the estimates only imply correlations, not causality.

- The presence of a father in the household is associated with almost 3 more hours of time spent studying per week by the high school student and the presence of a mother in the household is associated with an additional 2 hours more of studying. When these two variables were included, additionally controlling for whether the parents were married had no significant effect on study time, so we did not include that additional variable.
- The education of each of the parents matters significantly for study time. Having a mother with a college degree (as the highest degree) is associated with 2 more hours of study time whereas a father with a college degree contributes an additional 1.6 hours. The numbers for graduate degree are even larger, 2.7 for mothers and 2.3 for fathers.

- Having at least one parent who is foreign-born is associated with two more hours of studying per week. We also explored the nativity of the mother and father separately, as well as of the student, but none of these additional variables contributed significantly to the amount of study time.
- Income has a moderate effect. Relative to those students in households with income below $35K , those from households with income between $35K and $75K study slightly less. Students from households with incomes above $150K study 1.5 hours more per week.

We also explored the effects of the number of siblings and total number in the household, but none of these had a significant effect on study time.

The other columns of Table 5 show the results for paid work, chores, leisure (excluding sports), sports and sleep/personal care time. The Asian-White paid work and chore gaps remain significant quantitatively and statistically in the presence of the controls. The other gaps are modest and not very significant. The higher amount of time spent on sleep and personal care by black and Hispanic students remain large and significant. In terms of control variables, having more educated and higher income parents tends to result in significantly less leisure time (excluding sports) and less time spent on sleep and personal care. However, we did find that time spent in one key leisure category increased with parents' education: time spent reading and writing for pleasure. In results not shown in the table, we found that students from households in the $150K plus category with a mother with a graduate degree spend 1.5 hours more per week on reading and writing for pleasure than students from low income households with mothers who do not have a college degree.

C. Educational Time Inputs by Parents by Ethnicity and Socioeconomic Characteristics

The results of the previous section provide information an important link for the literature. Many analyses of test scores and educational attainment note the high positive correlation between parental education and children's test scores. The literature finds that some of this correlation is due to intergenerational transmission of innate cognitive ability, but that there is still a significant correlation after controlling for measures of cognitive ability. We have now identified a plausible direct mechanism for the positive relationship: educated parents make their children spent more time in academic pursuits, be it studying or reading and writing for pleasure. Using the production function we outlined above, these increased hours should result in higher education achievement.

A key question is whether making children spend more time studying requires more time on the part of parents. Amy Chua's book *Battle Hymn of the Tiger Mom* chronicled the huge amounts of time she spent making her children study and do music practice. Is this behavior common among Asian Americans? Or is it just a reflection of the education level of the parents, since it has long been noted that college-educated mothers devote more time to childrearing than less educated mothers (see, for example, U.S. Department of Agriculture (1944), Leibowitz (1974), Bianchi, Robinson, Milkie (2006), Guryan, Hurst, Kearney (2008), and Ramey and Ramey (2010)). To shed light on these questions, we study time use by parents, and in particular, time spent with children.

Table 6 shows several measures of averages of childrearing time by ethnicity. Units are again hours per week. The sample is limited to mothers or fathers with a child age 18 and under in the household and childcare refers to care of all children in the household, not only children ages 15 – 18. The sample covers the entire year (including summer vacation).

The various measures of childcare are as follows. The first is time spent caring for a household child under the age of 18 as a primary activity.[5] This broad category includes feeding babies, supervising children, playing with children, helping with homework, taking them to the doctor, etc. The second is a subcategory of the first and is limited to time spent on educational activities. These activities include reading to children as well as helping with homework, meetings with teachers, and home schooling. The third measure is time spent caring for one's own household child under the age of 13 as a secondary activity. This category sums across time spent on other activities as a primary activity, but with childcare as a secondary activity. For example, it would include times when a parent is cooking but is also supervising children doing homework. Finally, the fourth category shows time spent in the presence of one's own household child. This can involve time spent in childcare or in other activities. The key is that one's child is present.

Table 6 shows that time spent in these activities tend to differ across ethnic groups. First, Asian American mothers and fathers spend more time in primary childcare, educational childcare, and secondary childcare than white mothers and fathers; the only exception is time spent in secondary childcare by fathers. The differences are typically statistically significant and the differences range from 0.8 to 2.5 hours per week. There is not much difference in time spent in the presence of one's own children. Black and Hispanic mothers and fathers tend to spend significantly less time on primary childcare than Whites, with differences ranging from 1.5 to 3.5 hours per week. However, Hispanic parents spend significantly more time in childcare as a

[5] This could include caring for household children who are not one's own children. Most of this activity is likely care of own children since we have sampled only parents with an own child in the house.

secondary activity than white parents. The difference for mothers is 5.6 hours per week. Finally, Black parents spend significantly less time in the presence of their own children than white parents. Recall that the sample includes only mothers and fathers who live with their own children. On the other hand, Hispanic parents spend much more time with their own children than white parents.

In sum, even after selecting the sample for mothers and fathers who live with their children, there are significant gaps in time spent on childcare and with children. For primary childcare and educational childcare, the ethnic gaps are of the same sign as the test score gaps and student study time gaps. For secondary childcare, the results differ in some cases.

Since parents are not the only family members who can help care for children, we include at the bottom of the table time spent in the presence of grandchildren for women and men over 55 years old. Unfortunately, we cannot determine who is actually a grandparent. Nevertheless, the estimates are interesting and suggest the possible importance of other family inputs. The estimates show that older Whites spend very little time with grandchildren, less than an hour per week for women. In contrast, Asian and black older women spend over two hours per week and Hispanic older women spend almost four hours per week with grandchildren. The ranking is the same for older men, though the average hours are about half those for older women. Thus, grandparents may be contributing important time inputs, potentially into educational activities.

Table 7 shows the estimates after controlling for family structure and education. Time spent in childcare depends significantly on the ages of the children, with younger children requiring more time, and the number of children. Thus, we control for whether the youngest child is an infant, a toddler, a preschooler, early elementary, and later elementary, as well as a quadratic in the number of children. We also control for whether the parent has a college degree (and no more) or a graduate degree.

The coefficients on the controls all have the expected sign and virtually all tend to be significant. We focus on how the time use averages by ethnic group change when we include these controls. Once the family structure and parental educational controls are included, there is no significant difference in primary childcare time, secondary time, or time in the presence of one's own children across Asian American and White parents. Thus, the differences is the unconditional averages shown in Table 6 are not due to cultural differences apart from family structure and education level. Time spent on child education activities, however, remains significantly different with Asian mothers spending 40 minutes more per week and Asian fathers spending parents spending 23 more minutes per week. The differences between Blacks and Hispanics and Whites shrink in a number of cases once the controls are included, but the gaps remain quantitatively and statistically significant.

Recall that the high school student study time gaps remained quite large even after including socioeconomic control variables. Thus, it appears that Asian American students spend significantly more time studying without their parents spending much more time than white parents. The next section uses several longitudinal surveys of education which contain measures of attitudes, along with some less precise measures of study time and achievement.

VI. Homework Time Gaps and Attitudes

To be completed. (We use the Education Longitudinal Survey of 2002 (ELS: 2002), which allows us to analyze data with student-parent-teacher information.)

VII. Linking Homework Gaps to Test Score Gaps

To be completed. (We will use estimates from the literature measuring the causal link between time spent doing homework and test scores to estimate the fraction of the Asian American test gap that might be explained by differential time spent on homework. We will argue that the fact that the gap increases with each year is easy to explain with the differential homework explanation.)

Table 1. Standardized Test Scores in California, 2016
A. Mean Scale Math Scores Relative to Whites

	(1)	(2)	(3)
Asian	58.68	45.87	51.59
	(1.091)	(0.863)	(0.838)
Black	-96.59	-62.84	-54.45
	(0.854)	(0.734)	(0.715)
Hispanic	-70.05	-41.90	-31.26
	(0.519)	(0.504)	(0.436)
Filipino	14.25	17.92	16.79
	(1.088)	(1.030)	(1.119)
Hawaii/Pacific Islander	-66.29	-34.91	-27.49
	(4.662)	(5.279)	(6.472)
American Indian	-95.65	-50.98	-41.74
	(4.862)	(4.270)	(4.827)
Mixed race	14.04	2.452	8.327
	(1.023)	(0.875)	(0.965)
Economically disadvantaged			-40.02
			(0.432)
Constant	2466.1	2525.3	2545.1
	(0.577)	(0.341)	(0.422)
Controls	Grade fixed effects	Grade x school Fixed effects	Grade x school Fixed effects
N	54224	54224	61366
R-sq	0.620	0.971	0.968

Standard errors in parentheses. Since most estimates are very precise, we do not indicate stars for significance. Each observation is for a school, grade level, and group category. The regressions were estimated using the number of students tested represented in each observation as weights. Standard errors correct for clustering by grade x school.

The standard deviations of the individual Math mean scale scores range from 80 in grade 3 increasing to 125 in grade 11.

Table 1 (continued)
B. Mean Scale English Language Arts (ELA) Scores Relative to Whites

	(1)	(2)	(3)
Asian	34.94	26.01	30.38
	(0.768)	(0.618)	(0.580)
Black	-85.73	-54.26	-45.23
	(0.797)	(0.685)	(0.679)
Hispanic	-64.12	-37.45	-26.10
	(0.464)	(0.439)	(0.379)
Filipino	11.47	15.73	14.34
	(0.992)	(0.898)	(0.967)
Hawaii/Pacific	-70.76	-35.49	-31.39
Islander	(4.811)	(5.700)	(6.184)
American	-95.16	-48.51	-36.14
Indian	(4.296)	(4.336)	(5.313)
Mixed race	11.60	1.745	5.635
	(0.877)	(0.761)	(0.834)
Economically			-39.81
disadvantaged			(0.375)
Constant	2453.0	2534.3	2553.7
	(0.572)	(0.302)	(0.358)
Controls	Grade fixed effects	Grade x school Fixed effects	Grade x school Fixed effects
N	54161	54161	61219
R-sq	0.689	0.979	0.975

The standard deviations of the individual ELA mean scale scores range from 88 in grade 3 increasing to 110 in grade 11.

Table 2. Standardized Test Scores in California, 2012
Mean Scale Scores Relative to Whites: Detailed Categories

			% of children with:			
	Math	English Language Arts	Both parents in household	At least one foreign-born parent	At least one parent with a college degree	At least one parent with a graduate degree
Chinese	60.64 (0.886)	22.57 (0.714)	83	90	72	43
Korean	50.70 (1.060)	14.33 (0.915)	85	96	80	39
Asian Indian	44.41 (1.702)	17.18 (0.915)	94	97	84	60
Vietnamese	40.19 (0.915)	12.42 (0.764)	80	98	41	12
Japanese	33.79 (2.106)	-2.098 (2.344)	81	70	78	28
Other Asian	26.72 (1.638)	7.101 (1.269)	85	84	69	33
Filipino	6.587 (0.578)	2.242 (0.444)	80	91	67	12
Laotian	-2.063 (2.295)	-10.17 (3.512)	59	79	27	4
Hmong	-6.509 (1.404)	-22.27 (1.427)	68	86	25	9
Cambodian	-12.50 (2.206)	-15.49 (2.139)	61	89	21	9
Non-Hispanic White	366.0 (0.180)	374.8 (0.167)	76	21	58	28
N	97216	70411				
R-sq	0.895	0.943				

Notes: Scores shown are for the STAR 2012 tests administered to California public school students from grades 2 through 11.

The information about parents' nativity and education are from the American Community Survey 2015 (Steven Ruggles, et al. 2015) and refer to all individuals ages 18 and under who live in California.

Table 3. Student Time Spent on Homework by Ethnicity

	White	Asian	Black	Hispanic
Homework hours per week	5.90	13.43	3.19	5.25
	(0.15)	(0.58)	(0.31)	(0.25)
		7.54***	-2.71***	-0.65**
Homework gap with Whites	-	(0.60)	(0.35)	(0.29)
Proportion of days with HW>0	0.43	0.67***	0.32***	0.42
HW hours per day/HW>0	1.96	2.86***	1.41***	1.80**
HW hours per day/Weekday	0.88	1.89***	0.46***	0.83
HW hours per day/Weekend	0.13	0.34***	0.15*	0.15*

Data from the ATUS: 2003 – 2015. The sample consists of 15-18 year olds enrolled in high school. Standard errors in parenthesis. Stars indicate that the estimate is significantly different from the estimate for Whites.

p<0.10 ** p<0.05 *** p<0.01.

Table 4. Student Time Use by Ethnicity

	White	**Asian**	**Black**	**Hispanic**
Homework	5.90	13.43***	3.19***	5.25**
Class attendance	23.41	23.54	22.46	24.34
Paid work	5.43	1.53***	3.98***	2.37***
Chores	5.63	4.49**	4.35***	6.10*
Sleep	64.20	64.73	67.84***	66.74***
Other personal care	5.63	5.22	6.90***	6.49***
Leisure (excl. sports)	33.15	31.27	35.47***	32.33
Socialize	6.66	5.42*	6.20	6.72
TV/Computer	19.56	21.32	23.65***	20.26
Reading and writing	1.13	0.90	0.47***	0.40***
Sports	5.04	3.30***	5.30	4.75
Extracurricular activities	0.60	0.47	0.34**	0.48
Volunteer	1.52	1.97	0.93***	1.00***
Religious activities	0.90	0.94	1.29**	0.90
N	4,389	267	785	1,256

Activities are measured in hours per week. Data from the ATUS: 2003 – 2015. The sample consists of 15-18 year old students enrolled in high school. Stars indicate the sample mean is significantly different from the sample mean for Whites.

p<0.10 ** p<0.05 *** p<0.01.

Table 5. Student Time Use Gaps by Ethnicity, Controlling for Family Background

	Homework	Paid work	Chores	Leisure (excl. sports)	Sports	Personal Care
Asian	5.325***	-2.805**	-1.725**	-1.674	-1.626*	-0.537
	(0.661)	(0.898)	(0.664)	(1.551)	(0.668)	(1.180)
Black	-1.877***	-1.514**	-1.575***	1.089	0.344	4.114***
	(0.361)	(0.490)	(0.363)	(0.847)	(0.365)	(0.644)
Hispanic	-0.659	-2.849***	-0.324	-1.852*	-0.263	2.212***
	(0.369)	(0.502)	(0.371)	(0.867)	(0.373)	(0.659)
Male	-1.429***	-0.640*	-2.144***	4.800***	4.104***	-1.577***
	(0.231)	(0.314)	(0.233)	(0.543)	(0.234)	(0.413)
Dad_in_home	2.832***	-1.573*	-0.855	-3.360**	0.491	-0.0115
	(0.480)	(0.653)	(0.483)	(1.127)	(0.485)	(0.858)
Mom_in_home	2.004**	-1.238	-0.572	-3.649*	1.059	-2.790*
	(0.737)	(1.002)	(0.741)	(1.730)	(0.745)	(1.316)
Mom college	2.069***	-0.697	-0.0430	-2.610***	-0.281	-0.898
(no grad)	(0.318)	(0.432)	(0.320)	(0.747)	(0.322)	(0.568)
Dad college	1.597***	-0.607	-1.187***	-0.373	0.416	-0.628
(no grad)	(0.344)	(0.467)	(0.346)	(0.807)	(0.347)	(0.614)
Mom grad	2.744***	-1.136*	-0.534	-1.758	-0.0391	-2.755***
degree	(0.424)	(0.576)	(0.426)	(0.995)	(0.428)	(0.757)
Dad grad	2.260***	-1.542**	-0.949*	-1.123	0.153	0.260
degree	(0.412)	(0.560)	(0.414)	(0.967)	(0.416)	(0.736)
Foreign parent	2.037***	-0.633	0.917**	0.139	-0.319	0.534
	(0.351)	(0.477)	(0.353)	(0.824)	(0.355)	(0.627)
$35K - $75K	-0.662*	1.058*	0.574	-0.562	0.297	-1.269*
	(0.321)	(0.437)	(0.323)	(0.754)	(0.325)	(0.574)
$75K - $150K	0.207	1.653***	-0.475	1.754*	-0.655	-2.195***
	(0.353)	(0.479)	(0.355)	(0.828)	(0.356)	(0.630)
$150K plus	1.457*	0.112	1.016	-1.179	0.807	-2.006
	(0.606)	(0.823)	(0.609)	(1.421)	(0.612)	(1.081)
_cons	0.0413	8.793***	8.519***	38.44***	1.509	74.84***
	(0.856)	(1.162)	(0.860)	(2.008)	(0.865)	(1.528)
N	6697	6697	6697	6697	6697	6697

Standard errors in parentheses
* p<0.05 ** p<0.01 *** p<0.001

Activities are measured in hours per week. Data from the ATUS: 2003 – 2015. The sample consists of 15-18 year old students enrolled in high school. The omitted group is White, native-born, native-parent, adult male present, both parents with less than college, low income.

Table 6. Parent Time Use by Ethnicity

	White	Asian	Black	Hispanic
			Mothers	
Primary childcare	14.48	15.26**	10.95***	12.95***
Educational childcare	1.560	2.297***	1.168***	1.344***
Secondary childcare	32.77	35.24***	30.45***	39.98***
Time with child	44.06	44.53	37.30***	49.65***
			Fathers	
Primary childcare	7.606	8.413**	5.955***	6.025***
Educational childcare	0.705	1.189***	0.812*	0.544***
Secondary childcare	23.37	24.56	24.90**	24.72***
Time with child	30.45	31.80*	26.85***	32.66***

Grandparents

			Women ages 55+	
Time with grandchild	0.77	2.69***	2.36***	3.82***
			Men ages 55+	
Time with grandchild	0.43	1.42***	0.90***	1.71***

Activities are measured in hours per week. Data from the ATUS: 2003 – 2015. Parental sample is limited to individuals with own child <=18 years old in house.

Table 7. Parent Time Use by Ethnicity, Controlling for Education and Family Structure

A. Mothers

	Primary childcare	Educational childcare	Secondary childcare	Time with child
Asian	-0.181	0.673***	1.267	-0.214
	(0.339)	(0.101)	(0.724)	(0.683)
Black	-3.361***	-0.354***	-3.087***	-7.393***
	(0.215)	(0.0641)	(0.460)	(0.434)
Hispanic	-2.598***	-0.244***	3.338***	1.964***
	(0.183)	(0.0545)	(0.391)	(0.369)
infant	18.50***	0.147*	43.11***	34.09***
	(0.247)	(0.0737)	(0.528)	(0.498)
toddler	12.63***	0.480***	44.02***	28.97***
	(0.311)	(0.0927)	(0.664)	(0.627)
preschool	9.962***	0.892***	40.29***	22.19***
	(0.255)	(0.0759)	(0.544)	(0.513)
elementary1	6.583***	1.305***	37.11***	14.94***
	(0.251)	(0.0747)	(0.535)	(0.505)
elementary2	3.116***	0.749***	26.48***	9.038***
	(0.254)	(0.0757)	(0.542)	(0.512)
num_child	2.736***	0.353***	4.257***	6.264***
	(0.213)	(0.0634)	(0.454)	(0.429)
num_child2	-0.262***	0.0203	-0.485***	-0.572***
	(0.0366)	(0.0109)	(0.0782)	(0.0738)
college	2.409***	0.386***	-0.0694	0.313
	(0.176)	(0.0525)	(0.376)	(0.355)
grad	2.922***	0.469***	-2.191***	-1.020*
	(0.231)	(0.0689)	(0.494)	(0.466)
constant	1.109***	0.0160	-4.275***	17.19***
	(0.282)	(0.0840)	(0.602)	(0.568)
N	36285	36285	36285	36285

Standard errors in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Activities are measured in hours per week. Data from the ATUS: 2003 – 2015. Sample is limited to individuals with own child <=18 years old in house.

B. Fathers

	Primary childcare	Educational childcare	Secondary childcare	Time with child
Asian	-0.212	0.389***	-0.546	0.191
	(0.327)	(0.0761)	(0.836)	(0.820)
Black	-1.398***	0.130*	0.827	-3.856***
	(0.247)	(0.0574)	(0.630)	(0.618)
Hispanic	-1.925***	-0.140***	-1.158*	0.425
	(0.178)	(0.0413)	(0.454)	(0.445)
infant	8.881***	0.0970	28.17***	17.93***
	(0.240)	(0.0558)	(0.612)	(0.601)
toddler	7.231***	0.303***	29.74***	17.52***
	(0.299)	(0.0696)	(0.764)	(0.750)
preschool	6.103***	0.468***	28.93***	14.82***
	(0.248)	(0.0577)	(0.634)	(0.622)
elementary1	3.941***	0.656***	28.44***	10.82***
	(0.244)	(0.0569)	(0.624)	(0.613)
elementary2	1.873***	0.311***	21.89***	7.717***
	(0.247)	(0.0574)	(0.630)	(0.619)
num_child	1.091***	0.291***	0.150	1.963***
	(0.214)	(0.0498)	(0.546)	(0.536)
num_child2	-0.119**	-0.0301***	0.206*	-0.0823
	(0.0371)	(0.00863)	(0.0948)	(0.0930)
college	1.493***	0.197***	0.127	-0.248
	(0.175)	(0.0407)	(0.447)	(0.439)
grad	1.635***	0.381***	-0.253	0.187
	(0.210)	(0.0489)	(0.537)	(0.527)
constant	0.904**	-0.131*	-0.429	16.02***
	(0.276)	(0.0642)	(0.705)	(0.692)
N	25006	25006	25006	25006

Standard errors in parentheses
="* p<0.05 ** p<0.01 *** p<0.001"

Figure 1. Test Score Gaps by Subject and Grade

Scaled as a fraction of the 3rd grade test specific standard deviation

(Shaded areas indicate 95 % confidence intervals.)

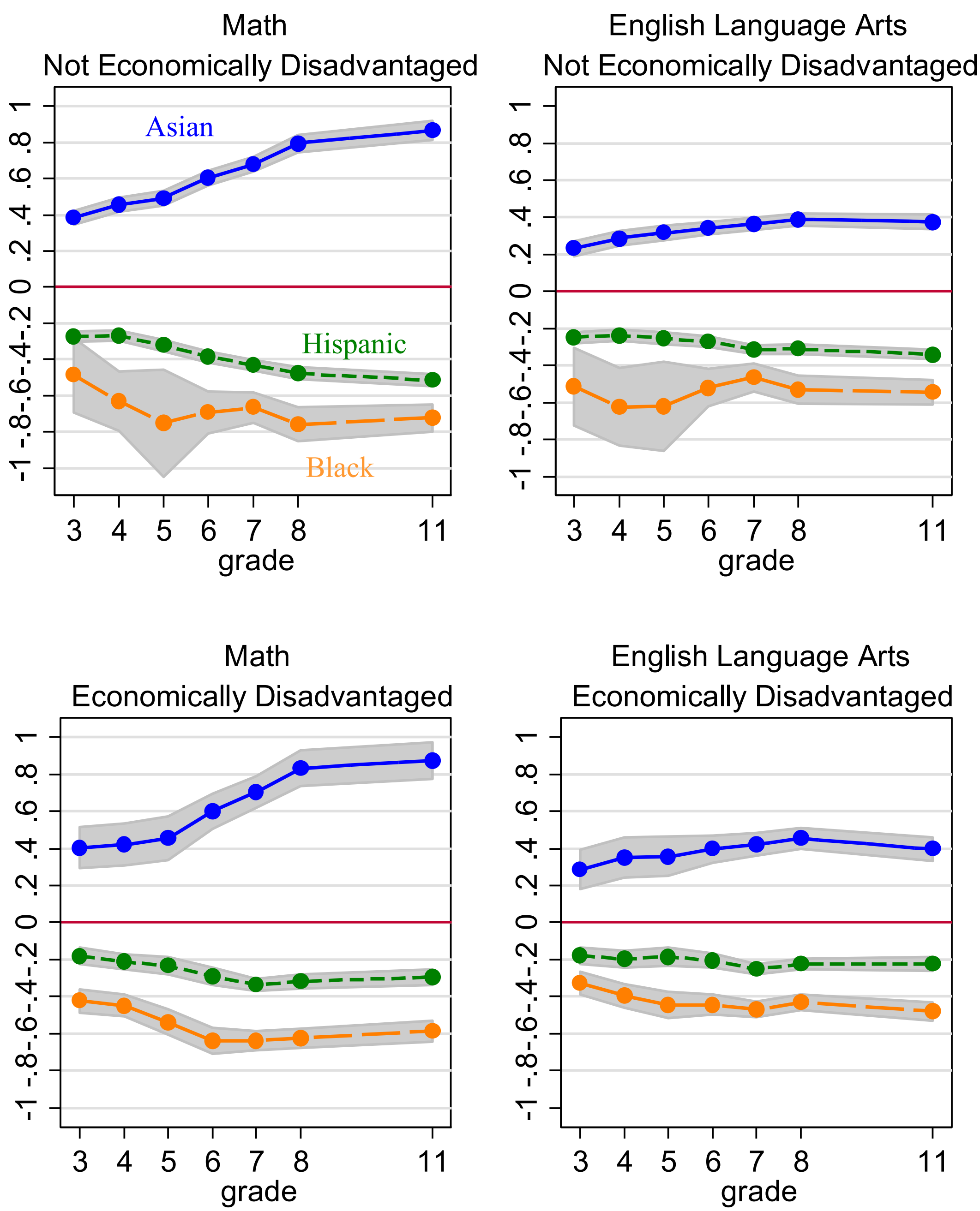
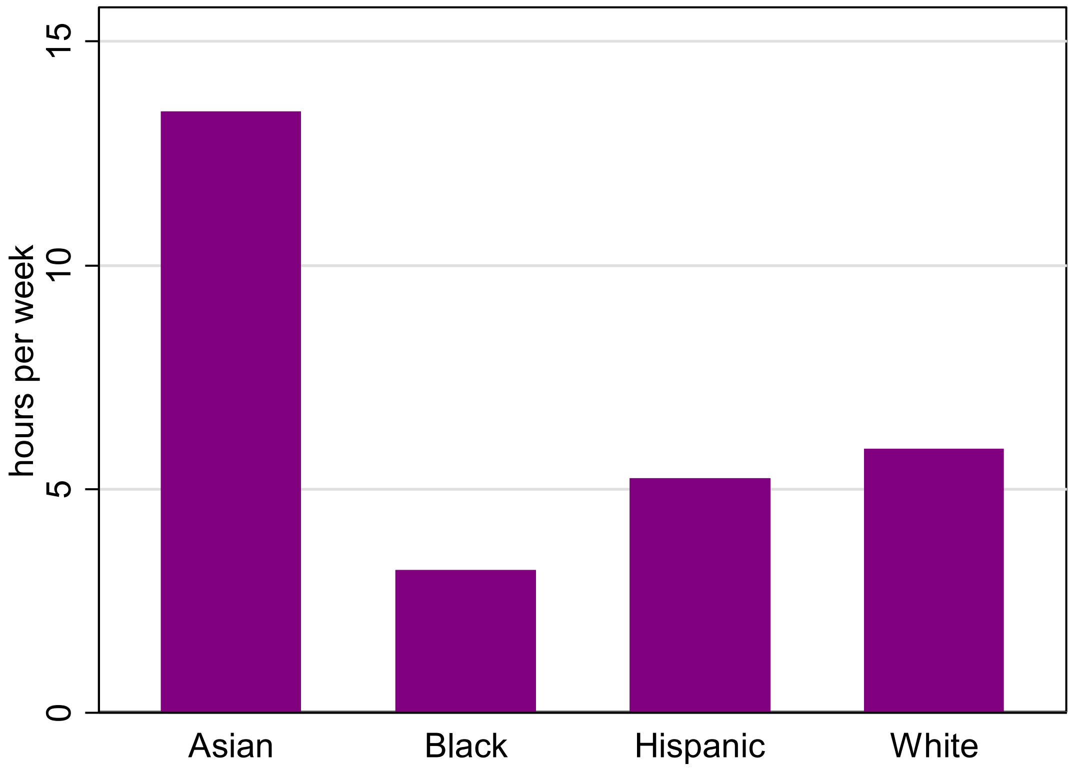


Figure 2. Time Spent on Homework by High School Students



Notes: Homework time is measured in hours per week. Data from the ATUS: 2003 – 2015. The sample consists of 15-18 year olds enrolled in high school.

Data Appendix

To be completed

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