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ABSTRACT

Gender and Racial Differences in Peer Effects of Limited English Students: A Story of Language or Ethnicity?

There is a perception among native born parents in the U.S. that the increasing number of immigrant students in schools creates negative peer effects on their children. In North Carolina there has been a significant increase in immigrants especially those with limited English language skills and recent data suggest that North Carolina has the 8th largest ELL student population with over 60 percent of immigrants coming from Latin America and the Caribbean. While past research suggests negative though negligible peer effects of Limited English (LE) students on achievement of other students, potential peer effects of student from Latin America in general has not been considered. In this paper we attempt to identify both LE student and Latin American (LA) student peer effects separately utilizing fixed effects methods that allow us to deal with the potential selectivity across time and schools. On average we find no evidence of negative peer effects of LE students on females and white students but note small negative effects on average on males and black students. We also find that, holding constant other factors, an increase in the share of LA students share does not create negative peer effects on native students' achievement. Rather, it is the limited English language skills of some of these students that leads to small, negative peer effects on natives.

JEL Classification: I20, I21, J15, J24

Keywords: immigrants, student achievement, peer effects, education, race, gender, Limited English students, Latino peer effects, Hispanic peer effects

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1. Introduction

The United States has experienced significant demographic changes over the past 35 years. According to Census Bureau reports, the share of the U.S. population that is foreign-born has increased from 6.2 percent in 1980 to 13.3 percent in 2014, and it is projected to increase to 18.2 percent by 2050 – populations of 14.1 million, 42.3 million, and 72.3 million foreign-born residents respectively. Over a similar period, the share of individuals over 4 years of age speaking a language other than English at home has increased from 11 percent in 1980 to 20.1 percent in 2010 with Spanish speaking persons representing 62.1 percent of this total. In the last 50 years, 40 percent of all immigration has come from five countries in Latin America: Mexico, Cuba, El Salvador, Guatemala, and the Dominican Republic.[1] The significant increase in the number of immigrants in combination with their racial and ethnic composition and limited English proficiency has sparked intense and ongoing debates on U.S immigration policy and the impact of immigrants in communities.

Anecdotal evidence suggests that native parents believe immigrant students create negative externalities that impact their children. A growing literature has formally explored the influence of foreign-born students on native students' academic outcomes (Diette and Uwaifo Oyelere 2014 and 2012, Jensen and Rasmussen 2011, Geay, McNally, and Telhaj 2013, and Ohinata and van Ours 2013). In addition, others have examined the effect of different races or ethnicities on student achievement (Hanushek, Kain, and Rivkin 2009, Hanushek and Rivkin 2009). Finally, other studies have looked at gender differences in peer effects (Angrist and Lang 2004, Legewie and DiPrete 2012). This research has suggested negative peer effects of Black peers on Black students but not on White students (Hanushek, Kain, and Rivkin 2009, Hanushek and Rivkin 2009). One potential channel through which native children could be affected by immigrant children is an externality from limited English proficiency of immigrant children in the same

[1] While data from the Census Bureau show immigrants from Latin America and the Caribbean are 54% of all immigrants, they form a higher proportion of recent immigrants driven by the significant increase in undocumented immigrants since 1980. In 1970 (among those 5 and older) 70 percent of immigrants spoke a language other than English this has risen to 85 percent by 2012. More than half of the immigrants from Mexico and El Salvador age 5 and over speak English less than "very well". This contrasts to just 30% for immigrants from Africa and 28% from Europe (US census bureau community survey 2012). On average 61% of immigrants from Latin America and Caribbean speak English less than well.

classroom as native children. Diette and Uwaifo Oyelere (2014) suggests negative peer effects of Limited English (LE) students on Blacks.[2]

In this paper, we use nine years of administrative data from North Carolina to jointly examine peer effects of Limited English (LE) students and Latin American (LA) students on native students.[3] We shed light on whether the increase in immigrants from Latin America creates externalities on native students independent from the effect that comes from students with Limited English and if these effects differ by gender or race of native students. Specifically, we investigate three important questions, in all cases looking separately at boys versus girls and Black students versus White students. First, do LE students in a school affect the academic performance of students? Second, would an increase in the share of LA students in a school affect the academic performance of students? Third, do these peer effects depend on the student's relative academic achievement within the school?

These questions are important given the possible differential effects that population and demographic changes may create. Policymakers and educators need to be better informed of such heterogeneity and whether the presence of immigrant children in schools may significantly harm the educational outcomes of particular groups of native children, even though overall negative effects on natives appear to be minimal. Finally, since LE students are more likely to be from Latin America, it is beneficial to attempt to address whether any effects associated with Limited English ability are misinterpreted as being due to the ethnicity of students.

We approach answering our questions using the value-added approach common in the literature. We address potential selectivity issues using a school fixed effects model, an individual fixed effects model, and a school-by-year fixed effects model. We estimate LE and LA student effects

[2] The U.S. Department of Education defines an English language learner (ELL) as follows. An individual who, due to any of the reasons listed below, has sufficient difficulty speaking, reading, writing, or understanding the English language to be denied the opportunity to learn successfully in classrooms where the language of instruction is English or to participate fully in the larger U.S. society. Such an individual (1) was not born in the United States or has a native language other than English; (2) comes from environments where a language other than English is dominant; or (3) is an American Indian or Alaska Native and comes from environments where a language other than English has had a significant impact on the individual's level of English language proficiency.

[3] This data is made available through the North Carolina Education Research Data Center (NCERDC).

first by gender and second by race – Black and White students. We also divide each of these four groups into three subgroups based on whether students fall into the top third, middle third, and bottom third of the prior achievement distribution within their grade within their school.

Our results demonstrate the importance of addressing selection bias over time and across schools. In addition, our results also provide evidence of heterogeneity in LE peer effects across gender, race and achievement level. Specifically, we find on average no LE or LA student peer effects on girls. In contrast for boys, we find negative LE student peer effects but no effect of LA students. The negative LE effects on boys is not uniform across the achievement distribution. Rather, we find these effects are concentrated in the top tercile. When we estimate our preferred model for Whites and Blacks separately, we find negative LE peer effects on Black students but no effects of LA students. The noted effects on Black students is also not distributed uniformly across the achievement distribution but concentrated in the bottom and top terciles. For White students we do not find any LA and LE peer effects on average. However, when we look within the achievement distribution, we note negative LE effects in reading in the top tercile.

The overarching inference from our results are that LA students do not create any negative peer effects on native students by gender or race. Finding no effect on Black students is especially noteworthy as prior research often suggests that Black students appear more vulnerable to increases in disadvantaged population shares. Second, the negative peer effects of Limited English students noted are small and are not effects policy makers should be concerned about. However noting heterogeneity in these effects across the achievement distribution, gender and race is interesting and draws attention to how demographic change can affect sub-groups of the population differently.

The remainder of this paper is organized as follows. Section 2 provides an overview of the literature. Section 3 details the data used in the analysis. Section 4 provides some summary statistics. Our methodological approach for answering the research questions is in section 5. Section 6 highlights our preliminary and primary results. Our robustness checks on the sensitivity of our results are in section 7. We conclude in section 8.

2. Literature Review

There is a large literature on student academic performance and how it is influenced by innate ability, family, socioeconomic status, peers, neighborhoods, teachers, and schools.[4] Among these factors, the influence of peers, especially black peers and peers from lower socio-economic backgrounds, has been evaluated extensively.[5] In general, these papers provide evidence of peer effects although effects are typically small.

Within this literature of peer effects, a subgroup of studies have focused on potential heterogeneity in peer effects based on ethnicity, socioeconomic status, and gender. For example, Hanushek, Kain, and Rivkin (2009) find that among black students, having a higher percentage of Black schoolmates reduces achievement for Black but not for White classmates. Hanushek and Rivkin (2009) suggest that disproportionate exposure of initially high achieving Black students in third grade to a high concentration of black peers explains a portion of the widening of the achievement gap between third and eighth grade. Angrist and Lang (2004) also find heterogeneous effects of Metco, a program that sends students from Boston schools to more upper-class suburban schools, on non-Metco students. Their findings suggest no effect on White students but modest negative effects on minority female students in the receiving schools. Bifulco, Fletcher, and Ross (2011) find that increases in the percent of classmates with a college-educated mother decreases the likelihood of dropping out and increases the likelihood of attending college.

Immigrants represent another subgroup that could negatively affect native students, possibly due to relatively low socioeconomic status or English language limitations. A growing literature considers the education effects of immigrants more generally while other studies focus specifically on immigrant peer effects on natives' achievement. For example, Hoxby (1998) and Borjas (2007) both look at whether immigrants crowd-out natives from slots in college and graduate programs. At the pre-college level, Betts and Fairlie (2003) provide some evidence of native flight to private schools in some metropolitan areas including Los Angeles. Santallino

[4] See Todd and Wolpin (2003) for an early review of the literature. For a recent review of this literature see Bifulco et al. (2011) and Diette and Uwaifo Oyelere (2012).

[5] Examples of papers documenting peer effects include Hoxby (2000), Evans et al. (1992), Hanushek et al. (2003), Ammermueller and Pischke (2006), Rumberger and Palardy (2005), Rivkin (2000), and Armor and Duck (2007).

(2009) provides evidence of crowding out in North Carolina public schools, but he does not find evidence of heterogeneity of this effect across race. Also more recently, low-skilled immigration to the United States has been linked to a reduction of native demand for public schools (Cascio and Lewis 2012), improvement in native academic performance (McHenry 2015), and an increase in the years of schooling completed (McHenry 2015).

Studies focused on the effect of immigrants on native students' achievement have found modest negative effects or no overall effect. For example, Jensen and Rasmussen (2011) consider the short term impact of immigrant concentration in Denmark on natives' performance in math and reading and they note significant negative effects in math using an IV strategy. Similarly, Ohinata and van Ours (2013) analyze how the share of immigrant children in the classroom affects the educational attainment of native Dutch children and find no significant effect in the short term. Both of these papers also test for heterogeneous effects of immigrant concentration by immigration status (natives versus immigrants), while we focus on possible heterogeneous effects among natives based on race and gender. Another paper finding no evidence of immigrant peer effects is Geay, McNally, and Telhaj (2013). They examine the influence of non-native English speakers in England on reading, writing and mathematics exams at the end of primary school for native students in England.

Most of the aforementioned papers consider short-term impacts of certain peers. However, longer term impacts have also been examined. For example, Gould, Lavy, and Paserman (2009) examine the long-term academic effect of immigrant concentration in elementary school in Israel on passing a high school matriculation exam. Their results suggest negative effects of higher immigrant concentration in elementary school. Betts (1998) also focuses on high school graduation by investigating whether immigrants affect the probability of high school graduation of American born minorities. His results suggest strong negative effects of immigrant concentration on African Americans and Hispanics, although the effects on Hispanics are not robust to the exclusion of California. His result provides further motivation to consider heterogonous racial effects of immigrant peers on natives. With respect to the U.S context, there are also a number of papers investigating immigrant peer effects within a state. For example, Conger (2015), using administrative data from Florida, suggests positive immigrant peer effects

on high school achievement of natives and other immigrant students, a finding that contrasts with the previously mentioned papers focused on immigrant peer effects.[6]

Another indirect way of estimating immigrant peer effects is by focusing on the subset of immigrant students with limited English proficiency. One reason to concentrate on this subset of immigrants is that the specific channel is clear through which immigrants can negatively affect native students. Using different econometric approaches and covering different grades, Santillano (2009) and Diette and Uwaifo Oyelere (2014, 2012) both search for peer effects in North Carolina focused on this subset of immigrants.[7] They both find significant heterogeneity in the effects of LE students on natives. Santillano (2009) explores whether effects differ by prior achievement in Math and Reading. He reports negative effects among low achievers in math and positive effects among previously high achieving math students. Diette and Uwaifo Oyelere (2012) find no effect on average but negative effects on native students in schools with lower median share of LE students and schools in cities. In an extension, Diette and Uwaifo Oyelere (2014) considered the potential of heterogeneity across gender and race in the effect of LE students. They report no effects on White or female students on average but small negative effects on Black students and male students. These results highlight potential heterogeneity in effects of LE students.

Cho (2012) also focuses on students with limited English proficiency, those classified as English Language Learners (ELL) in the U.S. She examines the effect of ELL students on academic achievement in math and reading for non-ELL students in kindergarten and first grade using a nationally representative sample. She finds negative effects for reading but not math when school fixed effects are included. She also finds that the negative effects are concentrated among females and those with low-family income and no effect on males or children from incomes above $25,000.

[6] Also see Cortes (2006) who considers immigrant peer effects on immigrants in Miami and San Diego noting no significant effects.
[7] Santillano (2009) explores 4th and 5th graders while Diette and Uwaifo Oyelere (2012) examine 4th through 8th grade.

As mentioned above, one major difference between most of these earlier papers and this study is our focus on investigating possible LE student effects and LA student effects across gender and race. While Diette and Uwaifo Oyelere (2014) consider LE student effects across gender and race, LA student effects are not examined. Furthermore, heterogeneity across achievement levels are also not considered, while they were considered by Santillano (2009) he estimates average effects for all students within an achievement group instead of separately by race or gender. In addition we also present results using an individual level fixed effects model which, though susceptible to bias due to potential time varying unobservables, is commonly viewed as a possible identification strategy. Also while Cho (2012) considers gender effects, a different identification strategy is employed and younger children are the focus. Specifically, Cho (2012) makes use of school, grade and child fixed effects to identify the impact of exposure to ELL on test scores.[8]

3. Data

For this analysis we make use of administrative records from the state of North Carolina.[9] These data contain detailed information on both students and teachers across school years.[10] For our analyses we use data from 1998 to 2006. We select these years of data because they have consistent information on key variables across time. In particular, the free lunch variable is a proxy for income level of a student's family and economic condition. This variable is not available in earlier years of data. Similarly, the variable Limited English is redefined in 2007. This change makes it difficult to consistently identify LE students after 2006. In order to identify native students, the focus of our analysis, we only include students who have never been identified as LE at any point in their third through eighth grade career. This method of identifying native students has clear limitations. Specifically, it includes immigrant children who

[8] Two potential limitations of Cho's identification strategy are the use of a dummy variable to capture exposure versus ELL student concentration and the focus on a child fixed effects approach, which cannot address time varying omitted variables which could be correlated with a child's exposure to ELL students.

[9] The data are captured in public schools and aggregated by the North Carolina Department of Public Instruction. This data are cleaned and maintained by the North Carolina Education Research Data Center (NCERDC) at Duke University.

[10] For additional details on North Carolina administrative data see Clotfelter, Ladd, and Vigdor (2009).

do not get identified as LE and excludes those who are native but may get classified as LE.[11] We also limit the analysis to the native students who are classified as either White or Black.[12]

We define the share of LE students in their grade as the share of peers who are currently classified as LE. We measure LE shares at the grade level instead of the classroom level because classroom composition is endogenous. An investigation of possible peer effect of current LE students on native student performance is appropriate for testing the hypothesis that limited English proficiency is the potential mechanism for influencing native student academic achievement. We define LA student shares as the share of students who identify their ethnicity as Hispanic within a grade.

As noted above, our analysis is focused on students in North Carolina. Why North Carolina? North Carolina is one of the many states to have recently eyed a tougher stance against illegal immigration. Between 1990 and 2000, North Carolina ranked highest among all states in the change in its immigrant population. North Carolina had a foreign born population of just 1 percent in 1990 which rose to 7 percent by 2008 and currently children in immigrant families as a share of all children in the state is 18 percent. Moreover according to 2013 data, as reported by the Migration Policy Institute, North Carolina has about 102,300 English Language Learners (ELLs) in K-12 grade, the 8th highest in the country. The largest proportion of immigrants in North Carolina are from Mexico (about 41 percent). Moreover, 60 percent of immigrants (less than 14 years) in North Carolina currently are from Latin American (CPS 2014).

4. Descriptive Statistics

In Table 1 we summarize the mean and standard deviation of the shares of LE and LA students that native students have in their grade within their school as well as the mean z-scores in both

[11] An example of the latter case would a person born in the U.S. but raised in a household that does not use English as a primary language and the family spent their early childhood in a non-English speaking country.
[12] The students are assigned to one of 6 categories on the state form: White, Black, Hispanic, Asian, Native American, or Multiracial.

math and reading.[13] The table reports these means for all students in the sample, as well as when the analysis sample is stratified by gender and then we stratify the sample by race.

<<Insert Table 1>>

On average, Limited English students represent 2.7 percent of the peers for native students in North Carolina in fourth through eighth grade. Students identified as Hispanic comprise 4.9 percent of peers for native students. While there are no differences in the peer composition by gender, black students have a slightly higher average share of LE and LA students in their grades in their school than their White counterparts (3.2 percent compared to 2.5 percent for LE and 5.8 percent and 4.5 percent respectively for LA). We find that boys and girls have similar average z-scores in math, but girls outperform boys by 0.15 of a standard deviation in reading. In addition, we report the significant black-white achievement gap that exists in North Carolina public schools for both math and reading.

<<Insert Table 2>>

Table 2 summarizes the distribution of students first by gender and then by race within the math and reading z-score distribution within their grade within their schools. Over 46 percent of black students are in the bottom tercile of z-scores within their school in both subjects. In contrast over 41 percent of white students are in the top third in both math and reading within their school.[14] The statistics in Tables 1 and 2 highlight the racial academic achievement gap and the importance of disentangling the potential effects of LE or LA students on Black and White native students separately and across the achievement distribution within a school.

[13] The z-scores were calculated using the entire student population who took the exams within the grade in that particular year. The mean z-score for Limited English students is below that of native students and therefore the mean z-score for students in our analysis is greater than zero.

[14] It is important to note that the differences across race in Table 2 are more pronounced if we define achievement terciles across schools instead of within schools.

5. Methodology

We perform the analysis using a traditional value added model where current academic achievement is a function of previous academic achievement as well as other inputs into the education production function. This model in its basic form can be represented by equation (1).

$$(equation\ 1)\quad Z_{igst} = \beta_0 + \gamma Z_{i(t-1)} + \beta_1 LE_{gst} + \beta_2 LA_{gst} + \delta X_{igst} + \mu T_{st} + \delta S_{sgt} + \rho_t + \sigma_g + \varepsilon_{igst}$$

In equation 1, Z_{igst} is the z-score in math (or reading) for student *i* in grade *g* and school *s* in time period *t*. $Z_{i(t-1)}$ captures an individual's achievement in the same subject in the prior period, period *t-1*. In the standard value-added model this variable is intended to control for the students' knowledge, skills, and ability at the start of the school year. LE_{gst} is the LE students' share of the student population in grade *g* in school *s* in time period *t*. LA_{gst} is the share of Latino students of the student population in grade *g* in school *s* in time period *t*.

Given the significant correlation between the share of the Limited English students and Latino students in North Carolina schools, we worry about potential multicollinearity bias in both estimated coefficients when we include both LE shares and LA shares in the same equation. To attenuate our concerns, we first estimate a specification that excludes the LA share and then a specification that excludes the LE share. Finally, we estimate the full model specification including both LE and LA shares – as represented in equation (1). Comparing estimated effects of LE and LA shares using the aforementioned specifications allows us to detect multicollinearity related issues as estimated effects will vary erratically across specifications if this is the case. Despite the potential limitations of a specification with both LE and LA shares, including both allows us to examine whether estimated peer effects of LA students changes once a control for the share of LE students is added.

In equation (1) *X* is a matrix of individual characteristics which includes an indicator for females in the estimates for Black or White students and includes an indicator for Black students in

estimations for female or male students. *X* also includes indicators of parent education level and ever being eligible for free or reduced price lunch—a proxy for family income.[15] *T* is the vector of observable teacher traits that may affect achievement and includes the share of female teachers, share of first year teachers, the share of teachers with a master's degree, the mean z-score of teachers on teacher exams, and the shares of teachers who are classified as Asian, Black, and Hispanic. *S* is a vector of school level and grade level variables that may affect achievement. These include the urbanicity of the school, whether the school is a charter school or magnet school, the school's pupil-teacher ratio, the number of students in the grade, the percent of the grade ever eligible for free or reduced price lunch, the pupil teacher ratio, status as a charter or magnet school, school level free and reduced price lunch eligibility. We also control for the share of students eligible for free and reduced priced lunch and urbanicity of the school. We also include time fixed effects, ρ_t, and grade level fixed effects, σ_g, in the model. In each model the standard errors are corrected for heteroskedasticity and are clustered at the school-grade-year level. We estimate both the LE peer effects and LA student peer effects separately for girls and boys and also separately by Black and White students.

Given the non-random selection into schools, an ordinary least squares (OLS) estimation of potential peer effect for equation (1) will lead to biased estimates. To address this potential problem in our analysis, we estimate equation (1) including an added variable – school level fixed effects. This model will help us address the non-random selection into schools and hence control for unobserved school attributes that correlate with grade-level LE and LA student shares. This technique has been used frequently in the literature but could still potentially create biased estimates of our variables of interest in an analysis that combines data over time. In particular estimated effects could still be biased if there are time varying unobservables within a school that are correlated with LE shares and also students' achievements. An alternative approach commonly used in the literature is to estimate equation (1) including individual level fixed effects. The strength of this methodology is that we are comparing how an individual's achievement responds to changing shares of LE and LA students. The challenge with individual

[15] We do not use the yearly response of students to the question of if they are using the free lunch or reduced lunch program given the noted trend that older kids may not want to reveal they are on this program because of the potential stigma. We use these variables to capture family income levels which are also potentially important variables that affect achievement.

fixed effects is that estimated effects could still be biased. This scenario is possible if there are time varying unobservables an individual faces that are correlated with the share of LE or LA students and are also correlated with achievement. Diette and Uwaifo Oyelere (2014) provide examples of these potential unobservables including parental effort.

To deal with the potential limitations of the individual level fixed effects model and the school fixed effects model, we estimate a model similar to equation (1), but we include school-by-year fixed effects. This is our preferred approach as it addresses the problem of bias arising from unobservables over time. This approach allows us to identify the impact of LE and LA shares on natives' achievement because even though the total number of LE and LA students in a school at a particular time is non-random, within the school the number of LE and LA students in a specific grade at time t is due to random factors, such that endogeneity is overcome by identifying impacts across grades at a particular point in time. We estimate our empirical model using the three specifications highlighted above by gender and for Black and White students for both math and reading.

Finally, we repeat the analysis using the school-by-year fixed effects model to identify heterogeneous LE and LA student peer effects across the achievement distribution within a school. We divide students into thirds (top third, middle third bottom third) based on their ranking in the school on the standardized test in the previous year. Running separate regressions by achievement level is especially important because the quality of education may vary systematically by achievement level within schools given the prevalence of tracking systems in many public schools in the U.S. Moreover, by looking at these subgroups, we can avoid constraining the school-by-year and grade fixed effects for these various groups to be equal. We restrict our analysis sample to Black and White students. In particular, we are interested in the estimates of β_1 and β_2 in equation (1) for female, male, Black and White students. We hypothesize that the negative effect of LE students noted in Diette and Uwaifo (2014) stems from language barriers and is not a reflection of some negative peer effect of LA students in North Carolina.

6. Results

6.1 Results by Gender

<<Insert Table 3>>

Table 3 and 4 each summarize the results of 18 regression estimations by gender for math (Table 3) and reading (Table 4). Columns (1) and (4) report estimated effects using the school fixed effects model. The individual level fixed effects model estimates are in-columns (2) and (5) while the estimates from our preferred model, school-by-year fixed effects, can be found in columns (3) and (6).[16] The student's z-scores in the relevant subject for the current year is our dependent variable. Each table is divided into three panels. Panel A contains estimates of the effect of LE student in specifications that do not control for the ethnicity of peers. Panel B contains estimates of LA student effects without controlling for the share of LE students in the grade. Panel C, reports estimates of the specification where both LE and LA student shares are included. We present the results using the school fixed effects model as a base line for comparison with our preferred estimates, but we focus our discussion on the individual and school-by-year fixed effects models.

<<Insert Table 4>>

Given our interest in a consistent estimate of LA effects and the potential that this estimate could be confounded in the specification when we include both LE and LA effects, we focus our discussion more on the results in Panels A and B in Tables 3 and 4. In Table 3 the individual fixed effects model results, column (2), suggest negative effects on native female students of LE and LA peers in math. However, when we use our preferred model (school-by-year fixed effects), we note no significant negative effect of either LE or LA students. We also note differences in inference for males. The individual FE model specifications suggests positive effects of LE students and negative effects of LA students, shown in column (5) of Panels A and B respectively. This does not make sense intuitively. In contrast, when we focus on our preferred model summarized in column (6), we find on average no peer effects on males in math. This finding is similar to what we found with females. Table 4 captures the results for reading and the inconsistency in estimates is evident when using the individual level model in comparison to our

[16] Full regression output with all coefficient estimates are available on request.

preferred model. Results in column (3) suggest no LE peer effects on females in reading. In contrast, we find negative peer effects for males (column (6) Panel A). We also do not find credible evidence of negative peer effect of LA students on males or females in reading.[17]

The negative effect of LE students on boys is consistent with some prior research. Warrington (2000) suggests that boys on average do not work as hard as girls in school and Legewie and Di Prete (2012) use data from Germany and argue that boys are more sensitive than girls to school resources.[18] In this scenario, native boys' performance may suffer if the teacher has to devote more time to LE students, while girls may be better at adjusting to a decrease in supervision or teacher interaction. Next we search for heterogeneity in the impact of LE students between Black and White students.

<<Insert Table 5>>

6.2 Results by Race

The approach to examining potential heterogeneous effects of LE or LA students by race parallels our approach to gender differences. In Tables 5 and 6 we summarize the results estimated by race for math and reading achievement. As in Tables 3 and 4, we present the results using the three methods but focus on our preferred model in interpreting these results. These results for math suggest no evidence of negative LE or LA peer effects for either Black or White students. However, in Panel C for reading, we find some evidence of negative LE student effects but no LA student effects for Black students. In contrast, for White students we find no LE student effects but some evidence of negative LA student effects. This effect disappears when we control for the share of LE students (Panel C).

<<Insert Table 6>>

[17] Although estimate in Panel B column (3) suggests negative LA student effects on females, this effect disappears when we control for LE students (Panel C).
[18] Also see Flannery (March 5, 2013) op-ed in NEA today, "Why Girls Are Outperforming Boys in School."

Finding racial heterogeneity is consistent with prior work on peer effects. Hanushek, Kain and Rivikin (2009) find negative effects on achievement for Black students of having more Black peers in Texas while noting no effect on White students. A similar finding was made by Angrist and Lang (2004) when looking at the impact of Metco on students in the receiving districts. They find little evidence that White students are affected but Black students appear more sensitive to this change. These authors provide various possible explanation for these finding drawing on the literature suggesting behavioral, social, and peer culture differences and the "acting white"' phenomena (see Fryer (2006) and (2010) for a discussion of some of these views).

While the results in Tables 3 through 6 suggest some negative LE student effects, consistent with Diette and Uwaifo Oyelere (2014, 2012), it is important to emphasize that these effects are not of magnitudes that will raise policy concerns. The largest estimated coefficient for LE student share is -0.128, the effect on Black students in reading from Table 6, Panel C in column (3). This coefficient predicts that a 10 percent increase in LE student shares would be associated with a decline in reading scores of 0.013 standard deviation—an incredibly small change in performance. Another important finding from Tables 3-6 is that Black and male students, the two groups who have small negative LE peer effects in reading, are not impacted by LA peers. This suggests is that if we hold the number of students with limited language skills constant, an increase in Latin American students in the classroom will not have any effect on the performance of Black or male native students. Therefore, LE students negatively affect natives in the classroom due to limited English language skills and not racial or ethnic difference. As suggested in section 6.1, a teacher likely has to dedicate more time to students with limited English skills and as a result substitute resources away from other students. This effect could operate through the attention of primary classroom teachers or teacher aids.

<<Insert Table 7>>

7. Heterogeneity within the Achievement Distribution

Following Diette and Uwaifo Oyelere (2012), we test for differential effects of LE and LA peers across the achievement distribution, but here we examine difference by gender and race. We divide male and female students into terciles based on their previous year performance in either math or reading compared to their peers in their school.[19] We then estimate our value added model with school-by-year fixed effects, our preferred specification, for each group. Table 7 provides estimates of peer effects on natives in math from 18 different regressions (9 regressions on females and 9 on males) while Table 8 does the same for reading scores. Table 9 reports the results when we run separate regressions for Black and White students by math achievement tercile and Table 10 mirrors Table 9, but uses reading achievement. Just as in Tables 3 through 6, estimates in Panel A capture LE student effects from a specification that does not include a control for the share of LA students. Panel B reports the estimate of LA student shares when we do not control for the presence of LE students. In Panel C, we present estimates from a specification that includes both LE and LA student shares.

<<Insert Table 8>>

In columns (1) and (4) of Tables 7-10, we present results for the top tercile. In columns (2) and (5) results for the middle tercile are summarized and in columns (3) and (6) we report the estimated effects for the bottom tercile.

<<Insert Table 9>>

The results in Table 7 provide evidence of the importance of looking within the achievement distribution. While on average we still find no LE student effects on females, the results suggest that when we look at the top, middle and bottom terciles, negative peer effects exist for males in the top tercile in math. With respect to LA peer effects, we find no evidence of negative or positive peer effects. In Table 8, we still find no evidence of an effect of LE students on female

[19] Diette and Uwaifo Oyelere (2014) divide into top 25 percent, bottom 25 percent and middle 50 percent based on performance ranking in grade across schools. We also explore dividing students based on their performance ranking across all students in their grade across schools, but we divide into terciles to be consistent with this paper and get similar results.

students in reading. For male student, we find that the previous negative effect of LE student shares on male reading performance is concentrated solely in the top tercile of the achievement distribution. It is also worth highlighting that though the magnitude of the effects are larger than the estimates in Table 4, the economic significance is still negligible. With respect to potential LA effects, Table 8 confirms the results in Table 4 that LA students do not create negative peer effects on native's performance in reading across gender or terciles.

In Table 9 and 10, we turn our attention to investigating heterogeneity across terciles by race. Table 9 summarizes the results for math and Table 10 summarizes the results for reading. In Table 5, we noted no LE or LA peer effects on math performance for both Black and White students and our analysis within specific terciles finds no effects either.

In Table 6, we report negative effects on reading for LE students on Black students in the specification that includes both LE and LA student shares. Table 10 provides evidence of significant heterogeneity in the impact of LE students on performance in reading across race and the achievement distribution. These results suggest that the negative LE share effects on Black students are concentrated both at the top and the bottom of the achievement distribution within the school. However, there is more robust evidence for LE effects on Black students in the bottom tercile given significant LE effects are noted in both specifications (with or without controlling for LA shares). In addition, we find some evidence of negative LA effects at the bottom tercile (Panel B) but this effect does not appear robust and is insignificant in the specification which also includes the share of LE students (Panel C).

In Table 6, we also report some evidence of negative effects of LA student shares on White students in reading, but no effects of having LE peers. However, when we look across terciles (Table 10), our results provide more consistent evidence of negative LE effects in the top tercile. We also note a positive effect in the middle tercile, this is only in the specification with both LE and LA student shares. The positive effect of LE students seems odd and should be treated cautiously given the potential collinearity issues with this specification highlighted above and also because the estimated coefficient on LA student share is negative and of the same magnitude.

<<Insert Table 10>>

Overall the results above suggest some heterogeneity across race by tercile. Finding similar effects across race in the top tercile is consistent with a story of possible teacher resource constraint effects. This means that the increase in the share of LE students may lead teachers to focus more on low performing students and less on the students at the top in schools. However, finding negative effects in reading in the bottom tercile for Black students may suggest the shift in resources is not to the low performing students in reading in general but to LE students. These results also suggest the need to go beyond looking at just average effects when investigating peer effects. Notice that if we did not look within the achievement distribution, our conclusion would have been that LE students have no effect in math or on White native students and we would have missed the differential effects across the achievement distribution.

8. Inferences, Summary and Conclusions

In this paper we focus on three basic questions: First, do significant shares of LE students in a school affect the academic performance of boys and girls or Black and White students differently? Second, does the shares of LA students in a school affect the academic performance of boys and girls or Black and White students? Third are the gender and racial differences in LE and LA peer effects, if any, distributed differently within the achievement distribution?

We address our three questions within the value added model approach while controlling for the potential endogeneity of our variables of interest by using a school-by-year fixed effects method. Our findings show that on average, LE student shares have no effect on girls both in math and reading, but have a significant negative effect on test performance on boys in the top of the achievement distribution in math and reading. We also find negative effects on Black students in the top and bottom terciles of the achievement distribution in reading, but no effects in math. For White students, we find negative LE peer effects in reading only in the top third of the achievement distribution. With respect to LA peer effects, though we find some evidence of negative LA peer effects on Black students in the bottom third of the achievement distribution

this effect is not robust to also controlling for LE shares. Moreover, we find no other credible evidence of negative LA peer effects.

Why are these results important? First, these results provide some evidence that increased exposure to LE students do create very small, negative peer effects and these effects are not homogenous within the population. Our results suggest boys on average are affected negatively by LE student shares while girls are not, though effect is not substantial. Our finding is in contrast to Angrist and Lang (2004) who find negative peer effects on girls but not boys from the METCO program in Massachusetts. This differences in who is impacted by increased exposure to disadvantaged peers underscores the need not to generalize findings for North Carolina to other states. Further, the presence of heterogeneous effects in our study provides evidence in support of looking for peer effects across race, gender, and achievement level. Our results are also important because they highlight that individuals with Latin American heritage do not create negative peer effects on native students. Instead, it is a language deficit that may come with immigrants that can lead to small negative impacts. Hence, our findings are useful for policy makers with respect to focusing more on initiatives or programs that would aid faster English language skill development in children who are English Language Learners. In addition, the provision of extra resources to schools with ELL students are not adequate to prevent a negative externality, no matter how small on other students. Our results also highlight the limitation of other estimation approaches and the importance of controlling for across school unobservables and possible within school unobservables over time. As highlighted in our results, alternative approaches and estimates not accounting for these unobservables may be biased.

It is important to mention again that our results have some limitations. Our school-by-year fixed effect model is assuming that there is no selection across grades within a school at a given point in time. Such an assumption, though consistent with what we know about North Carolina and the public school stem in the U.S in general, may not always be valid. Furthermore all our estimates in panel C of Tables 3-10 may be less precisely estimated given the correlation between LES shares and LAS shares. Finally, since we are identifying our effects over variation across grade solely, variation is limited which could lead to wrongly failing to reject the null of no effects.

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Tables

Table 1: Exposure to Limited English Students and Average Test Scores

		Share of Limited English	Share of Latino Peers	Math Z-Score	Reading Z-Score[a]
	Observations	Mean (Std. Dev.)	Mean (Std. Dev.)	Mean (Std. Dev.)	Mean (Std. Dev.)
All	2,922,581	0.027 (0.039)	0.049 (0.054)	0.057 (0.987)	0.061 (0.976)
Female	1,456,834	0.027 (0.039)	0.049 (0.054)	0.069 (0.955)	0.142 (0.934)
Male	1,465,747	0.027 (0.039)	0.049 (0.055)	0.045 (1.018)	-0.019 (1.010)
Black	939,173	0.032 (0.045)	0.058 (0.062)	-0.487 (0.843)	-0.451 (0.904)
White	1,983,408	0.025 (0.035)	0.045 (0.050)	0.314 (0.945)	0.303 (0.914)

[a]The numbers of observations for the Reading Z-Score column are: 2,913,227 All, 1,454,549 Females, 1,458,678 Males, 934,602 Black, and 1,978,625 White.

Table 2: Distribution of Demographic Groups by Achievement within Schools

Panel A By Math Score				
	Top Tercile	Middle Tercile	Bottom Tercile	Total
Female	33.9%	33.9%	32.2%	100%
Male	34.8%	32.0%	33.2%	100%
Black	20.1%	32.8%	47.2%	100%
White	41.1%	33.0%	25.9%	100%
Panel B By Reading Score				
	Top Tercile	Middle Tercile	Bottom Tercile	Total
Female	36.8%	33.7%	29.5%	100%
Male	32.3%	32.2%	35.5%	100%
Black	20.8%	33.0%	46.2%	100%
White	41.0%	32.9%	26.1%	100%

Notes: Students are divided into terciles for Math and Reading based on their performance in the same subject in the prior year relative to their peers within their grade within their school.

Table 3: Effect of Increase in LE Share and Share Latino on Math Achievement by Gender

	Female			Male		
	School Fixed Effects	Individual Effects	School by Year Fixed Effects	School Fixed Effects	Individual Effects	School by Year Fixed Effects
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	-0.003	**-0.030***	-0.006	0.003	**0.044****	-0.082
	(0.038)	**(0.018)**	(0.056)	(0.037)	**(0.019)**	(0.057)
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.008	**-0.087*****	-0.018	-0.002	**-0.033***	-0.025
	(0.032)	**(0.016)**	(0.045)	(0.031)	**(0.017)**	(0.046)
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	-0.037	-0.036	-0.011	-0.049	0.008	-0.115
	(0.056)	(0.025)	(0.071)	(0.055)	(0.027)	(0.071)
Share of Latino	0.012	**-0.066*****	-0.013	0.026	-0.038	0.028
	(0.045)	**(0.022)**	(0.056)	(0.045)	(0.023)	(0.055)
Observations	1,456,834	1,456,834	1,456,834	1,465,747	1,465,747	1,465,747

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year math Z-Score, own race, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10

Table 4: Effect of Increase in LE Share and Share Latino on Reading Achievement by Gender

	Female			Male		
	School Fixed Effects	Individual Fixed Effects	School by Year Fixed Effects	School Fixed Effects	Individual Fixed Effects	School by Year Fixed Effects
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	-0.017	**0.039****	-0.031	-0.009	**0.089*****	**-0.076***
	(0.026)	**(0.019)**	(0.044)	(0.030)	**(0.021)**	**(0.046)**
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.018	-0.017	-0.055	0.006	**0.032***	-0.043
	(0.020)	(0.018)	(0.035)	(0.023)	**(0.019)**	(0.038)
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	-0.038	**0.055****	-0.017	-0.070	**0.089*****	-0.082
	(0.071)	**(0.027)**	(0.039)	(0.045)	**(0.030)**	(0.057)
Share of Latino	0.003	**-0.050****	-0.048	0.045	-0.020	-0.005
	(0.028)	**(0.024)**	(0.043)	(0.034)	(0.026)	(0.046)
Observations	1,452,793	1,452,793	1,452,793	1,453,974	1,453,974	1,453,974

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year reading Z-Score, own race, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10

Table 5: Effect of Increase in LE Share and Share Latino on Math Achievement by Race

	Black			White		
	School Fixed Effects	Individual Effects	School by Year Fixed Effects	School Fixed Effects	Individual Effects	School by Year Fixed Effects
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	0.012	**0.041****	-0.057	0.013	-0.003	-0.041
	(0.041)	**(0.020)**	(0.068)	(0.042)	(0.018)	(0.062)
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.017	-0.027	-0.017	-0.0001	**-0.052*****	-0.025
	(0.037)	(0.019)	(0.055)	(0.035)	**(0.016)**	(0.047)
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	-0.035	-0.034	-0.118	-0.052	-0.024	-0.035
	(0.064)	(0.029)	(0.083)	(0.059)	(0.024)	(0.078)
Share of Latino	0.003	-0.007	0.040	0.028	**-0.039***	-0.010
	(0.053)	(0.026)	(0.063)	(0.048)	**(0.021)**	(0.060)
Observations	939,173	939,173	939,173	1,983,408	1,983,408	1,983,408

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year math Z-Score, gender, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10

Table 6: Effect of Increase in LE Share and Share Latino on Reading Achievement by Race

	Black			White		
	School Fixed Effects	Individual Effects	School by Year Fixed Effects	School Fixed Effects	Individual Effects	School by Year Fixed Effects
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	-0.009	**0.053****	-0.078	-0.019	**0.068*****	-0.043
	(0.037)	**(0.022)**	(0.061)	(0.028)	**(0.019)**	(0.042)
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.007	-0.034	-0.030	-0.020	0.029	**-0.069****
	(0.029)	(0.021)	(0.047)	(0.022)	(0.018)	**(0.034)**
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	-0.078	0.048	**-0.128***	-0.047	**0.070*****	-0.002
	(0.083)	(0.033)	**(0.057)**	(0.040)	**(0.026)**	(0.052)
Share of Latino	**0.038***	**-0.063****	0.032	0.006	-0.011	-0.068
	(0.066)	**(0.029)**	(0.041)	(0.031)	(0.023)	(0.041)
Observations	931,381	931,381	931,381	1,975,386	1,975,386	1,975,386

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year reading Z-Score, gender, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10

Table 7: Effect of Increase in LE Share and Share Latino on Math Achievement by Gender and Prior Achievement Tercile

	Female			Male		
	Top Tercile	Middle Tercile	Bottom Tercile	Top Tercile	Middle Tercile	Bottom Tercile
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	-0.008	0.031	-0.015	**-0.142****	-0.059	0.005
	(0.069)	(0.071)	(0.069)	**(0.071)**	(0.076)	(0.067)
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.014	0.018	-0.085	-0.052	-0.031	-0.004
	(0.058)	(0.057)	(0.059)	(0.056)	(0.059)	(0.060)
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	-0.030	-0.027	-0.006	**-0.177****	-0.136	-0.051
	(0.087)	(0.088)	(0.085)	**(0.089)**	(0.093)	(0.082)
Share of Latino	0.000	0.031	-0.082	0.029	0.032	0.020
	(0.071)	(0.070)	(0.071)	(0.069)	(0.071)	(0.072)
Observations	493,179	494,255	469,400	509,569	468,960	487,218

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year math Z-Score, own race, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10

Table 8: Effect of Increase in LE Share and Share Latino on Reading Achievement by Gender and Prior Achievement Tercile

	Female			Male		
	Top Tercile	Middle Tercile	Bottom Tercile	Top Tercile	Middle Tercile	Bottom Tercile
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	-0.072	0.083	-0.067	**-0.106***	0.006	-0.092
	(0.055)	(0.060)	(0.076)	**(0.057)**	(0.066)	(0.073)
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.068	-0.027	-0.081	-0.040	-0.062	-0.056
	(0.045)	(0.051)	(0.062)	(0.050)	(0.055)	(0.063)
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	-0.084	0.089	-0.042	**-0.152****	0.054	-0.135
	(0.085)	(0.068)	(0.074)	**(0.082)**	(0.070)	(0.081)
Share of Latino	-0.029	-0.068	-0.062	0.030	-0.087	0.006
	(0.071)	(0.055)	(0.061)	(0.072)	(0.060)	(0.066)
Observations	534,638	489,392	428,763	469,085	468,098	516,791

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year reading Z-Score, own race, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10

Table 9: Effect of Increase in LE Share and Share Latino on Math Achievement by Race and Prior Achievement Tercile

	Black			White		
	Top Tercile	Middle Tercile	Bottom Tercile	Top Tercile	Middle Tercile	Bottom Tercile
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	-0.117	-0.020	-0.024	-0.056	-0.017	0.004
	(0.011)	(0.087)	(0.071)	(0.068)	(0.074)	(0.076)
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.031	-0.036	-0.045	-0.026	0.002	-0.023
	(0.088)	(0.074)	(0.060)	(0.053)	(0.057)	(0.065)
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	-0.210	-0.115	-0.076	-0.072	-0.053	0.013
	(0.143)	(0.104)	(0.085)	(0.085)	(0.094)	(0.097)
Share of Latino	0.074	0.019	-0.008	0.007	0.026	-0.029
	(0.109)	(0.087)	(0.071)	(0.066)	(0.072)	(0.080)
Observations	188,468	307,726	442,979	814,280	655,489	513,639

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year math Z-Score, gender, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10

Table 10: Effect of Increase in LE Share and Share Latino on Reading Achievement by Race and Prior Achievement Tercile

	Black			White		
	Top Tercile	Middle Tercile	Bottom Tercile	Top Tercile	Middle Tercile	Bottom Tercile
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Share of Limited English (only)						
Share of Limited English	-0.116	0.064	**-0.150***	**-0.088***	0.047	-0.033
	(0.088)	(0.079)	**(0.082)**	**(0.047)**	(0.058)	(0.076)
Panel B: Race Composition of Peers (only)						
Share of Latino	-0.012	0.014	**-0.114***	-0.062	-0.066	-0.053
	(0.081)	(0.068)	**(0.066)**	(0.064)	(0.040)	(0.048)
Panel C: Share of Limited English and Racial Composition of Peers						
Share of Limited English	**-0.214****	0.008	**-0.180***	**-0.097***	**0.123***	-0.025
	(0.109)	(0.097)	**(0.101)**	**(0.057)**	**(0.070)**	(0.093)
Share of Latino	0.095	0.010	-0.029	-0.019	**-0.122****	-0.041
	(0.071)	(0.090)	(0.077)	(0.048)	**(0.057)**	(0.078)
Observations	193,866	307,527	429,988	809,857	649,963	515,566

Notes: The specification in Panel A includes the share of Limited English students, but not the racial composition of the student's peers. Panel B reports the specification that includes the racial composition of the student's peers, but not the share of Limited English students. Panel C includes both the share of Limited English and the racial composition of their peers.
This table summarizes the estimates of the impact of LE shares and share of Latino peers on test scores from 18 separate estimations using three types of fixed effects. In all specifications we control for previous year reading Z-Score, gender, indicators for Parent Education level, indicators for free or reduced price lunch, year fixed effects, grade fixed effects, number of students in the grade, indicators for school location by urbanicity, pupil-teacher ratio, charter school, magnet school, percentage of the school eligible for free or reduced price lunch, indicators for the share of teachers who are Black, Asian, and Latino, share of first year teachers, share of teachers who are female, share of teachers with a master's degree, and the average teacher score on licensing exams. School-by-year fixed effect regression includes all the above variables except those that do not vary within a school in a given year. The estimated coefficients for all variables are available upon request.
Robust clustered standard errors in parentheses and clustered at the school-year-grade level, *** p<0.01, ** p<0.05, * p<0.10