The Latino Paradox? School Segregation and Latino Student Achievement

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Abstract

Research on school racial composition suggests that Latino students may actually perform better in predominantly Latino schools. These studies, however, confound proportion Latino with targeted school programs and resources that develop in response to a growing Latino and limited English proficient (LEP) population. Using data from the National Educational Longitudinal Study, this paper assesses the relationship between school racial composition and student test performance in the 10th grade. Using OLS regression, we found a positive association between proportion Latino and student achievement for LEP and Latino youth after controlling for SES and overall school quality. This positive association was, in part, explained by predominantly Latino schools' effectiveness at administering targeted resources that catered to the needs of Latino and LEP students.

I. Introduction

The increased segregation of Latino youth in US schools has raised concerns about the system's ability to foster the academic adaptation of this group. Latinos have surpassed African Americans as the most segregated racial/ethnic group (Orfield and Lee 2005), and limited English proficient (LEP) youth, the majority of whom are Latino, are even more segregated with 70% of the LEP population attending only 10% of all US schools (Gándara and Contreras 2009). Extant research has shown that Latino youth, especially LEP Latinos, score lower on standardized tests and have the highest dropout rate of any racial/ethnic group (Ryabov and Van Hook 2006).

The educational implications of this increased segregation are unclear. On the one hand, segregation literature, which has focused on proportion black, indicates that the concentration of disadvantaged students, and the lower school quality associated with segregated schools hinders academic achievement (Borman and Dowling 2010; Hanushek and Rivkin, 2009; O'Connor et al 2009). On the other, evidence suggests that Latino youth, especially immigrant youth, may benefit from the targeted resources and supportive cultural environment that develop in predominantly Latino schools. In fact, several studies have identified a positive association between proportion Latino and student achievement (Goldsmith 2003; Hampton et al 1995; Lee 2007; Portes and Hao 2004), but no study has fully determined why this positive effect exists.

One explanation for the positive effect of proportion Latino that has not been thoroughly assessed is the potential for economies of scale. By clustering students with similar needs, predominantly Latino schools may be able to provide more effective services that target Latino youth, 65% of whom are children of immigrants and 18% of whom speak English with difficulty (Fry 2008). Several studies have found that once a critical mass of the student population is

Latino, schools become more responsive to their specific needs by providing English language services, hiring more Latino teachers, and providing additional education services (e.g., after-school; Gándara and Contreras 2009; Weiher 2000).

In this paper, we explore whether the positive association between proportion Latino in a school and student achievement is due to the targeted resources that develop in these schools because of economies of scale. We first replicate previous research by Goldsmith (2003) to show proportion Latino is positively associated with student achievement. We then examine which students benefit from proportion Latino by using two-way interactions between school racial composition and two student need indicators: Latino and LEP. Finally, using three-way interactions we assess whether predominantly Latino schools provide more targeted school resources and are more effective at administering them.

II. Background

A. Research on School Racial Composition

While far from uniform (Armor 1995), most research on school racial composition has found that youth who attend high minority schools on average learn less than their peers in more racially integrated schools, even after controlling for family background differences (O'Connor et al 2009). This negative effect largely stems from the strong correlation between racial and economic segregation. Predominantly black and minority schools also tend to be high poverty schools, which have a number of characteristics that consistently reduce student achievement, including an urban location, larger class sizes, lower teacher skills, higher teacher shortages, and lower academic rigor (Orfield and Lee 2005; Ryabov and Van Hook 2006). Additionally, according to the school social context literature, the concentration of disadvantaged youth coupled with the negative teacher perceptions and limited educational opportunities afforded in segregated minority schools leads to the development of negative peer effects that detract from the school's normative climate and hinder student motivations (Valenzuela 1999).

B. Latino School Segregation

While early correlation studies suggested that, like predominantly black schools, predominantly Latino schools hinder achievement (Espinosa and Ochoa 1986; Jaeger 1987), more recent studies, using multivariate regression, have found that proportion Latino is positively associated with achievement for all students, especially Latinos (Goldsmith 2003; Hampton et al 1995; Lee 2007; Portes and Hao 2004). Of these studies, Goldsmith (2003) provides the strongest evaluation. Using 12th graders, Goldsmith found that compared to predominantly black and white schools, predominantly Latino schools had the worst school quality, as measured by class size, student-teacher ratios, and proportion of teachers with advanced degrees. Once he controlled for school quality, however, proportion Latino was positively associated with math and history test scores for all races, but only Latinos benefited from the positive effect on reading and science. Moreover, the large presence of immigrant parents in predominantly Latino schools partially accounted for the effect on reading and fully accounted for the effect on history. Goldsmith argued that the diffusion of optimism that immigrant parents and their children bring to the school increased overall student achievement (Kao and Tienda 1995).

Goldsmith also ran checks to assess whether less acculturated Latino youth (i.e. spoke English as a second language or had an immigrant parent) were driving the results either because they benefited from an "ethnic enclave" effect that eased their transition into the US or from targeted school programs. While he found no acculturation effect, his results should be interpreted cautiously. In his study, he did not include any school program measures and his acculturation measure clustered together students with different levels of English proficiency.

There are several reasons to believe school racial composition effects may differ for Latino and LEP youth. For one, the homogenous academic needs of Latino immigrant youth enable predominantly Latino schools to capture economies of scale in curriculum and labor. Similar to other immigrant children, Latino immigrant youth face many unique barriers (e.g., English language proficiency and lack of understanding of the US educational system) that can hinder their academic achievement (Suárez-Orozco and Suárez-Orozco 2001). Unlike other racial/ethnic immigrant groups, however, Latino immigrant youth may benefit from their relatively larger size. The density of the Latino immigrant population—which accounts for 58% of the children of immigrant population and 79% of the LEP population enrolled in public schools—makes the development of specialized services for Latino youth more cost-effective and a higher priority (Murray et al 2007). Consequently, as the Latino population increases, schools develop targeted language, cultural, and academic services (including in-service teacher trainings) to meet their specific needs (Gándara and Contreras 2009; Weiher 2000). Thus, we expect that Latino youth will benefit more from proportion Latino than other racial/ethnic groups.

While all Latino youth may benefit from these targeted services, many of these programs are designed to help youth who are LEP. One national-level study found that, compared to low concentrated LEP schools, high concentrated LEP schools offered more support programs (e.g., English language programs), had more teachers certified in ESL/bilingual education, and engaged in more LEP parental outreach (e.g., hiring parent liaisons; Cosentino de Cohen et al 2005). Given that approximately 25% percent of LEP children receive no language assistance and that many teachers who teach LEP students have never received LEP training, these support programs are essential (Schmid 2001). Because both Latino and non-Latino LEP youth enroll in these programs, we expect that proportion Latino will be more beneficial for LEP students, no matter their ethnic background, than non-LEP students.

Additionally, all youth, no matter their LEP status or ethnic/racial group, may benefit from attending a predominantly Latino school. Similar to Goldsmith's immigrant parent optimism result, the school social context literature argues that schools with a large Latino population may benefit from a more positive social context than other minority segregated schools. This positive social context stems from the large presence of children of immigrants, who distill academic optimism (Kao and Tienda 1995; Goldsmith 2003), and minority teachers, who promote racial/ethnic equality and serve as positive role models (Goldsmith 2004).

Finally, research suggests that, in addition to adopting more targeted services, concentrated immigrant schools are more effective at administering these services. Economies of scale enable these schools to devote more resources towards ensuring these targeted programs effectively balance the academic and linguistic needs of Latino and LEP youth. For instance, Callahan, Wilkinson, and Muller (2008) found that ESL placement was positively associated with college preparatory outcomes in schools with a high concentration of immigrants but negatively associated in schools with a low concentration. The authors argued that because the ESL population was larger in high concentrated schools these schools could devote significant resources to ensure ESL courses incorporated rigorous academic coursework. In contrast, schools with a low concentration of immigrant students only provided basic language services in order to avoid diverting significant resources to a small group of students.

C. The Present Study

This study unravels a key paradox in Latino education: understanding why youth, especially Latino youth, perform better in predominantly Latino schools even though these are the most impoverished schools (Fry 2005). We argue that because Latino and LEP youth tend to have homogenous academic needs predominantly Latino schools can focus their limited resources towards developing targeted programs. We also argue that predominantly Latino schools are more effective at administering these programs because school segregation makes it easier to target resources to the dominant group.

III. Methods

A. Data

Following Goldsmith, we utilize the restricted version of the National Educational Longitudinal Study (NELS), which is a panel study of approximately 24,599 eighth graders from a sample of 1,052 schools (NCES 2002). The cohort was originally surveyed in the spring of 1988 with follow-ups conducted in 1990, 1992, 1994, and 2000. For the first three in-school waves of data collection, students, school administrators and teachers were surveyed, and parents were surveyed in the base-year and second follow-up.

In order to expand on Goldsmith's results, we follow his analysis to construct our sample and measures with a few noted exceptions. While Goldsmith focused on 12th grade youth, we use data on 10th grade youth from the first follow-up because 1) this wave has more information about targeted school resources, and 2) sample attrition is smaller than in the 12th grade. Additionally, we only use the in-school sample since our analysis focuses on school-level variables. Our baseline sample of 10th graders was 16,030.

To replicate Goldsmith's study, we limited our sample to black, white, and Latino students and made similar efforts to avoid reducing the sample size due to missing data. To minimize loss of data, school-level information was imputed from the 12th grade if the student attended the same school in 10th and 12th grade. At the individual level, if data were missing in the first-follow-up, values were imputed from other years provided that the variable was not time dependent (e.g., LEP status). If class size data, which comes from the teacher survey, was missing, we imputed the mean class size for the school based on other teachers' reports. If a variable was missing on more than 3% of the sample after these imputations, we then performed multiple imputations by chained equations using the ICE command in STATA.

In contrast to the dummy variable adjustment (DVA) method used by Goldsmith, multiple imputation methods preserve data variability and provide more accurate estimates of the standard errors by incorporating random error (Allison 2002). Using a series of multiple regressions, this method replaces missing values with plausible substitutes based on each conditional density of a covariate given other covariates. This process is followed five times, creating five different datasets (each with unique estimates and standard errors), which are then combined through averaging formulas into one set of parameters. Lastly, in order to be consistent with Goldsmith's work we used list wise deletion for the remaining variables missing fewer than 3 percent of the cases. The final sample (rounded to the nearest ten as required) varied by test score: 14,970 for reading, 14,950 for math, and 14,870 for science.

With multiple imputation it is possible to impute missing values for all variables. As a check, we ran our models using the full imputed dataset. While the trends were similar, the results were less robust due to differences in the samples analyzed. Students lost to list wise deletion were more likely to have low test scores, be Latino, attend predominantly Latino schools, and come from disadvantaged backgrounds. The lack of robustness suggests that predominantly Latino schools were more effective at improving the achievement rates of Latino youth from advantaged backgrounds than youth from disadvantaged backgrounds. Disadvantaged Latino youth, who were not protected by familial economic resources, may have been influenced more by the negative characteristics (i.e. economic segregation and lower school quality) than the positive characteristics (i.e. targeted resources) associated with predominantly Latino schools. Thus, the results we present represent the effect of proportion Latino on more advantaged Latino youth.

B. Measures

Test Scores. We used the National Center for Education Statistics' (NCES) selected measure for test performance, called "IRT-estimated number right," for three[i] test areas: math, reading, and science.

School Racial Composition. Using school administrator data, we created four indicators of the school's racial/ethnic composition: proportion Latino, proportion black, proportion other non-white (i.e. Asian/Pacific Islander and Native American), and proportion white. Because these racial proportions sum to one, we excluded proportion white. The interpretation of the coefficient of proportion Latino is the mean difference in the outcome in an all Latino school relative to an all white school (see Goldsmith, p91) with other ethnic proportions held at 0.

Targeted School Resources. We used administrator data to identify three targeted school resources likely to develop in schools with a large immigrant population (Cosentino de Cohen et al 2005). The first two measures indicate whether the school addressed immigrant youth's English language needs by: 1) developing specialized courses for language minority youth, and

2) hiring certified ESL teachers. For the former, we created a dummy variable classifying schools as offering language minority (LM) courses if: 1) they offered at least one LM course, or 2) the percent of students enrolled in ESL or bilingual education courses was greater than 0. For the latter, we constructed a proportion of certified ESL teachers by dividing the number of certified bilingual/ESL teachers by the total number of teachers assigned to ESL/bilingual classes. If no teachers were assigned to these classes, we coded the variable as 0. Our third measure indicates the proportion of full-time teachers who were a racial/ethnic minority.[ii]

Individual and School Controls. We created similar individual and school level controls used by Goldsmith.[iii] Individual variables include dummy indicators identifying student's race/ethnic origin (i.e. black and Latino; white is the reference group), gender, family structure (i.e. single-mother family, single-father family, and other non-traditional family; two-parent biological family is the reference group), and highest parent education (i.e. high school degree/some college and college degree or higher; less than a high school degree is the reference group). We also controlled for student's socio-economic status (SES) by using NELS' standardized SES scale, which combines information on the mother's and father's education, income, and occupation.

To control for immigrant youth's unique educational experiences, we included two indicators: 1) number of years in the U.S. (natives coded as 15), and 2) English fluency. English fluency is based on student's self-reported scores about their reading, writing, listening, and speaking ability and ranges from 1="not very well" to 4=" very well" with native English speakers coded as 6. Additionally, we created a more nuanced immigrant generation measure (i.e. 1st generation: both child and parents were foreign-born; 2nd generation: child was US-born and parents were foreign-born; and 3rd generation: both child and parents were US born) than Goldsmith and a dummy indicator identifying whether the student was LEP. We followed the

NELS definition and classified students as LEP if any of the student's teachers indicated he/she was LEP or if the student indicated "not very well" on any of the self-reported English language scores. Lastly, we controlled for prior student achievement by including the 8th grade IRT test score in the same subject, a specification which allows us to calculate a value added model that assesses the impact of school racial proportions during the high school years only.

At the school level, we controlled for the following school-level characteristics: mean SES and proportion of immigrant parents in the school (constructed by aggregating individual data within the school); proportion of single parents as reported by school administrators; class-size based on teacher reports and classified into three dummy variables (large classes with 30+ students, medium classes with 20-29 students, and small classes with less than 20 students); school type (1=public, 0=else); and region (Northeast, North Central, West, and South).

C. Analytic Strategy

We used OLS regression to assess the effect school racial composition had on test scores. A baseline model including only school racial proportions indicates the total effect of each school racial composition. The magnitude of the coefficient represents how many more questions the student would answer correctly in an all Latino school versus all white school. We then added controls for individual and school characteristics to verify the robustness of Goldsmith's finding that proportion Latino is positively associated with student achievement. We then focused on understanding which students benefit from proportion Latino in a school by including two-way interaction terms between school racial composition and student ethnic/racial group and LEP status. Next, we assessed the influence of the school's targeted resources for each of these groups of students by including three-way interactions. All models correct for design effects by using sample weights, robust standard errors, and a correction for the clustering of students in schools.[iv] Lastly, we note marginal significance ($p<.10$) to be consistent with Goldsmith's work and to address multicollinearity associated with interaction terms, which increases the standard errors, reduces statistical power, and makes hypothesis tests too conservative (Shieh and Fouladi 2003). Table 1 provides the mean values and ranges of all the variables.

IV. Findings

A. The Effects of School Racial Composition on Selected Student Groups

1. All Youth

In the unadjusted models (Table 1, Model 1), we found that proportion Latino and proportion black were negatively associated with each test score, while proportion other non-white was positively associated with each test score. These school racial composition effects, however, were largely a result of the different student populations attending each school. Once we accounted for differences in individual, family, and immigrant characteristics, proportion Latino had no effect on reading and math test scores and a marginal effect on science (Model 2). The coefficients on proportion black decreased but remained negatively associated with math and science. Proportion other non-white still had a marginally significant effect on math.

After adjusting for variation in school characteristics, particularly the higher presence of low SES families in all Latino schools (Model 3), we found that youth in all Latino schools now performed significantly better in all three subject areas relative to youth in all white schools. The largest effect size was in math (2.29) followed by reading (1.67) and then science (0.90). This positive effect persisted in all subject areas (though only marginally significant in math and science) even after we controlled for prior achievement (Model 4). Thus, the positive effect of attending an all Latino school was cumulative across all years of schooling as well as just during the early high school years.

2. Race and Ethnicity

Having replicated Goldmsith's finding that proportion Latino is positively associated with achievement, we now examine whether this effect varies by student need indicators by adding interaction terms to the final baseline model (i.e. Table 2, Model 4). Similar to Goldsmith, we found that Latino youth, in particular, benefited from attending an all Latino school compared to an all white school (Table 3, part A). The interaction term between proportion Latino and Latino indicates that proportion Latino had a significant positive effect on Latino student achievement in reading (.18+1.92=2.10) and math (-.32+2.64=2.32) and a marginally significant positive effect in science (-.05+1.25=1.20). Additionally, the non-significant main effect of proportion Latino and the non-significant interaction term between proportion Latino and black indicate that white and black youth were not affected by the concentration of Latino youth in their school.

3. Limited English Proficient Students

Given that Latino youth make up a disproportionate share of LEP youth, it may be that LEP status rather than Latino ethnicity is driving our results. This would occur if the main benefit of attending a Latino school is the provision of English language services. Thus, we added LEP status and interactions between LEP status and school racial proportions to the final baseline model (Table 3, part B).

We found mixed evidence that LEP status was driving the relationship between proportion Latino and student achievement. On the one hand, proportion Latino had a stronger effect on LEP students' reading (1.30+4.01=5.31) and science (.58+2.23=2.81) test scores than that found for Latinos. On the other, non-LEP youth also benefited from proportion Latino in a school, though the effect was smaller. We found that proportion Latino, as indicated by its main effect, had a positive but smaller influence on non-LEP students reading test scores (1.30 vs. 5.31 for LEP youth) but no influence on their science test scores.

Similar to the effect of proportion Latino, we found that proportion other non-white, which consisted of mostly Asians, was positively associated with LEP student achievement in reading and math but had no effect on non-LEP student achievement. Given that many Asian youth are children of immigrants, schools with a large Asian population may be just as likely as predominantly Latino schools to adopt English language services.

B. The Effect of Targeted Resources by Student Need and School Composition

Is the positive association between proportion Latino and student achievement due to the provision of targeted resources for needy students? We test this hypothesis by adding our targeted resource variables to the final baseline model (Table 2, Model 4) to see whether they enhance student outcomes. Results from these models are shown in the first three columns of Table 4. Almost all the direct effects of targeted resources were negative, though only statistically significant for LM courses in reading. This is because targeted resources are directed at precisely the schools that need them (i.e. have low outcomes). This is borne out by the stark increase in the main effect of proportion Latino in these regressions which is explained by the well-known omitted variable bias formula. That is, these main effects were biased downwards (i.e. too low) in Table 3 due to the omission of the targeted resources variables which are positively correlated with proportion Latino but negatively correlated with test scores, leading to the negative bias in those estimates. Thus, the direct effect of proportion Latino increased from 1.34 (Table 2, Model 4) to 2.14 in the first column of Table 4, and so on for the other estimates.

But do these targeted resources help the specific students they are presumably directed at? And are they more effective in segregated schools? We answer these questions by including triple interaction terms to the model,[v] between each targeted school resource, each student need indicator, and proportion Latino. This assesses the specific effect these targeted resources have on the students they were designed to help, and compares their relative impact between all Latino and all white schools. Results are shown in the second two panels of Table 4. In these models, the main effect of proportion Latino represents the mean difference in non-Latino student performance in all Latino schools relative to all white schools. The variable of interest, however, is the triple interaction term (also referred to as the difference-in-differences estimator), which represents the mean difference in the effect of targeted resources on the performance of Latino youth in all Latino versus all white schools. We expect this effect to be positive, indicating that the effects of these targeted resources are greater for Latino youth when the school is more segregated. In other words, predominantly Latino schools are more effective at administering targeted resources because they benefit from economies of scale.

The middle panel of Table 4 presents the interactions with the targeted resource of LM course offerings in the school and proportion ESL certified teachers for Latino students (we only report significant triple difference effects). The triple interaction term was marginally significant and positive for math and science for LM courses and for math only for proportion ESL qualified teachers. The last column of Table 4 shows the results for the targeted resource of LM course offerings for LEP students and finds a positive and significant effect for math only. These results are consistent with the idea that the impact of targeted resources on Latino and LEP children is much greater in all Latino schools relative to all white schools, and helps us understand how it is that student achievement is higher in segregated schools.

In two cases, the two-way interaction terms were negative. The first was between proportion Latino and LM courses (marginally significant) and indicates the effect of LM courses on non-Latino children in Latino versus white schools. The negative coefficient indicates that non-Latino children suffered from the presence of targeted resources in all Latino schools, a result which no doubt reflects the fact that resources are scarce at the school level and more targeted resources take away from resources available to other students. This negative effect, however, only offset the academic gains non-Latino youth derived from attending an all Latino school. The positive and marginally significant main effect of proportion Latino indicates that non-Latino youth in Latino schools had higher math scores than non-Latinos in white school, but if these Latino schools offered LM courses then non-Latino youth derived little benefit (8.48+.05-.8.44=.09). The second negative interaction was between proportion Latino and LEP and indicates the effect of proportion Latino on LEP youth enrolled in Latino versus white schools for schools that do not offer LM courses. The negative coefficient indicates that LEP youth do worse in Latino schools than white schools if Latino schools do not respond to their specific language needs (5.40-6.44=-1.04).

V. Discussion

We examined why proportion Latino in a high school is positively associated with student achievement by assessing which students benefit and why. We answered these questions by assessing whether Latino and LEP youth, both of whom have unique immigrant academic needs, accounted for the positive association between Latino school segregation and student achievement. We then assessed whether predominantly Latino schools provided more targeted programs that benefited Latino and LEP youth and were more effective at administering them.

We found that school segregation both hindered and promoted educational achievement. Demonstrating the need for racial integration, we found that segregated minority schools were challenged with educating a largely at-risk student population with few economic resources, low-levels of parental education, and low familial support. Consistent with other studies, the lower average familial SES and higher representation of single parent families in these schools further exacerbated individual disadvantage and consistently reduced achievement (Orfield and Lee 2005; Ryabov and Van Hook 2006).

Once we accounted for economic segregation, however, we found that proportion Latino, and to a lesser extent proportion black, had a positive influence on achievement. Compared to youth in predominantly white schools, youth attending predominantly Latino schools had higher test scores in reading and math, while youth attending predominantly black schools had higher reading scores. The positive effect of proportion black stemmed from youth's educational experiences prior to high school, while the positive effect of proportion Latino was influential both before and during youth's high school years. We also found that during the high school years proportion other non-white had a positive influence on math scores. Overall, these results verify the robustness of Goldsmith's (2003) and other's finding that proportion Latino is positively associated with achievement.

Expanding on Goldsmith's research, we found that part of the benefit of attending a predominantly Latino school stemmed from the school's ability to meet the unique needs of LEP youth. In both predominantly Latino and predominantly other non-white (mainly Asian) schools, LEP youth had higher achievement than their LEP peers in predominantly white schools. Given that Latinos and Asians are the two largest immigrant groups in the US, predominantly Latino and Asian schools may be more responsive to the English language needs of immigrant youth.

Non-LEP youth, however, also benefited (though to a smaller extent) from attending predominantly Latino schools, which indicates that the benefit of these schools extends beyond English language services. Moreover, we found that Latino youth, no matter their LEP status, also benefited from attending these schools. Unlike Goldsmith, though, we did not find that black and white youth benefited from attending predominantly Latino schools, but we also found no adverse effect. Other targeted resources not measured in our study such as bilingual parent liaisons and multicultural programs may explain the positive effect on Latino youth.

The most important finding of our study is that segregated schools were more effective at administering targeted resources as suggested by the three-way interactions. The impact of targeted resources on Latino and LEP youth was much greater in all Latino schools relative to all white schools. And there was some evidence that non-Latino students suffered when targeted resources increased in segregated schools (though this negative effect merely offset academic gains non-Latino youth derived from attending Latino schools). The results help us understand how segregated schools were able to cater to the needs of Latino and LEP students, and why we observed a positive association between Latino school segregation and student achievement after controlling for SES and overall school quality. On the one hand, the results are reassuring in that they confirm that high proportion Latino schools are effectively using their targeted resources to the benefit of those in need. On the other, the results indicate that this success comes at the expense of non-Latino student achievement in predominantly Latino schools and highlights the hard trade-offs that school administrators face in the presence of students with heterogeneous needs.

VI. Implications for Latinos and Education

Our results suggest that school integration for Latino and LEP youth poses a potential tradeoff between school quality and school effectiveness. Because one group is dominant predominantly Latino schools can more effectively target their resources to meet the homogenous needs of Latino and LEP youth. The benefit of these resources, however, does not compensate for the severe economic segregation and poor school quality found in predominantly Latino schools. The difficult task for educators is to design schools that meet the unique educational needs of LEP and Latino youth, while still attracting white middle-class students who generate positive peer effects and improve overall student achievement (Ryabov and Van Hook 2006).

One potential solution is to adopt dual-immersion programs that attract non-immigrant parents who want their child to learn a second language. To be effective, however, these programs must not privilege the curricular needs of English speakers over those of Spanish speakers (Gándara and Contreras 2009). An alternative policy option is to make racially integrated schools more responsive to LEP and Latino youth's needs by providing targeted grants based on the size and growth of the LEP and Latino student populations. Set up as part of the No Child Left Behind Act, these grants are currently only based on the LEP population and fail to recognize that all Latino youth—70% of whom speak a non-English language at home (Fry 2008)—could benefit from additional supports. To be effective, these grants should be expanded to include Latino and other immigrant youth and be used to develop more targeted school resources (Murray et al 2007). To inform these policy decisions, researchers should continue to evaluate why proportion Latino has a positive effect on student achievement by examining other grade levels, more student need indicators, and more targeted resources.

NOTES

[i] We did not include history, since Goldsmith fully explained the positive association between proportion Latino and history test scores.

[ii] We could not examine the effect of proportion Latino teachers, many of whom have immigrant ties and speak Spanish, due to multicollnearity problems. Proportion of Latino teachers and proportion of Latino students were highly correlated (r=.78).

[iii] Unlike Goldsmith, we did not include neighborhood level data in order to simplify our models. Given that we replicated his results, we do not believe this omission biased our results.

[iv] Because the within-school sample size was sufficiently small (over 70% of our observations came from high schools with fewer than 20 students) and the intraclass correlations were low ($ICC_{Reading}$=.19; ICC_{Math}=.24; $ICC_{Science}$=.23) hierarchical linear models were not appropriate (Maas and Hox 2004). Instead, we used robust standard errors, which provide more consistent and more conservative estimates of the covariances of the regression coefficients (Maas and Hox 2004).

[v] Mathematical derivation of these interpretations are available from authors upon request.

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Table 1. Mean Values of Dependent and Independent Variables				
	M	(SD)	Min	Max
Dependent Variable				
Reading	30.46	(0.16)	10.15	48.80
Math	43.30	(0.23)	16.37	72.76
Science	21.53	(0.10)	10.00	34.68
School Racial Proportions				
Prop. Latino	0.09	(0.01)	0.00	1.00
Prop. black	0.13	(0.01)	0.00	1.00
Prop. other non-white	0.03	(0.00)	0.00	0.99
Individual-Level				
Latino	0.10	(0.01)	0.00	1.00
Black	0.13	(0.01)	0.00	1.00
Male	0.50	(0.01)	0.00	1.00
SES	0.00	(0.02)	-2.93	2.76
Parent H.S.	0.63	(0.01)	0.00	1.00
Parent B.A.	0.28	(0.01)	0.00	1.00
Single-mother family	0.16	(0.01)	0.00	1.00
Single-father family	0.02	(0.00)	0.00	1.00
Other nontrad. family	0.15	(0.00)	0.00	1.00
Years in U.S.	14.79	(0.02)	0.50	15.00
1st Gen	0.02	(0.00)	0.00	1.00
2nd Gen	0.08	(0.01)	0.00	1.00
English fluency	5.70	(0.02)	1.00	6.00
LEP	0.02	(0.00)	0.00	1.00
School-Level				
Mean SES	-0.02	(0.02)	-1.59	1.78
Public	0.91	(0.01)	0.00	1.00
Prop. single parent	0.29	(0.01)	0.00	1.00
Prop. immigrant parent	0.12	(0.01)	0.00	1.00
Medium classes	0.62	(0.01)	0.00	1.00
Large classes	0.16	(0.01)	0.00	1.00
Northeast	0.19	(0.01)	0.00	1.00
North Central	0.27	(0.01)	0.00	1.00
West	0.17	(0.01)	0.00	1.00
8th grade reading	27.08	(0.14)	10.47	43.83
8th grade math	36.07	(0.21)	15.81	66.81
8th grade science	18.83	(0.08)	9.46	32.88
Offers lang. minority (LM) courses	0.52	(0.02)	0.00	1.00
Prop. minority teachers	0.10	(0.01)	0.00	1.00
Prop. ESL teachers certified	0.01	(0.00)	0.00	0.21
N[1]=	14970			

[1] The N is smaller for the following dependent variables: math N=14950; science N=14870. Data weighted and sample sizes rounded to the nearest 10 as required by NCES.

Table 2. Effect of School Racial Proportion on Tenth-Grade Test Scores in Three Subject Areas

	Reading				Math				Science			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Race Proportions												
Prop. Latino	-5.99 ***	-0.02	1.67 *	1.34 *	-9.85 ***	-1.17	2.29 *	1.38 †	-4.54 ***	-0.68 †	0.90 †	0.66 †
Prop. black	-6.44 ***	-0.24	1.53 *	0.81	-12.33 ***	-2.70 **	0.29	0.31	-6.13 ***	-1.64 ***	-0.43	0.03
Prop. other non-white	5.49 **	2.12	1.16	-0.59	8.61 **	3.53 †	2.75	2.66 *	2.44 *	0.68	0.53	0.70
Individual Level												
Latino		-1.51 **	-1.53 **	-0.22		-3.24 ***	-3.26 ***	-0.51		-1.40 ***	-1.39 ***	-0.59 **
Black		-4.09 ***	-4.22 ***	-0.84 **		-6.35 ***	-6.49 ***	-1.14 **		-3.12 ***	-3.14 ***	-1.27 ***
Male		-2.24 ***	-2.23 ***	-0.44 **		-0.03	-0.01	-0.03		1.36 ***	1.36 ***	0.79 ***
SES		4.07 ***	3.33 ***	0.84 ***		5.77 ***	4.55 ***	0.73 ***		2.06 ***	1.65 ***	0.52 ***
Parent H.S.		0.02	0.05	0.09		0.45	0.42	0.87 **		0.27	0.24	0.21
Parent B.A.		1.62 **	1.46 **	0.52		3.20 ***	2.89 ***	1.30 **		1.69 ***	1.55 ***	0.91 ***
Single-mother family		0.15	0.11	-0.23		0.04	-0.02	-0.37		-0.11	-0.11	-0.25 *
Single-father family		-3.25 ***	-3.15 **	-1.23 †		-4.20 **	-3.99 **	-1.95 *		-2.01 **	-1.96 ***	-0.94 *
Other nontrad. family		-0.61 †	-0.47	-0.06		-1.95 ***	-1.70 ***	-0.53 †		-0.76 ***	-0.68 ***	-0.27 †
Years in U.S.		-0.05	-0.06	-0.01		-0.19	-0.19	-0.06		0.03	0.03	0.04
1st Gen		1.56	1.23	1.41 †		2.38	2.02	0.50		1.06	1.12 †	0.85 †
2nd Gen		1.46 **	1.11 *	0.40		3.22 ***	2.81 ***	1.22 †		0.73 **	0.77 **	0.30
English fluency		0.93 ***	0.94 ***	0.37		1.14 ***	1.17 ***	0.43 **		0.49 ***	0.49 ***	0.23 **
8th grade test				0.87 ***				0.97 ***				0.80 ***
School Level												
Mean SES			1.84 ***	0.70 *			3.44 ***	0.41			1.37 ***	0.84 ***
Public			-0.96 *	-0.19			-0.55	-0.75 *			0.50 †	0.07
Prop. single parent			-1.77 *	-0.64			-2.28 *	-0.82			-1.04 *	-0.25
Prop. immigrant parent			-0.64	-0.72			-0.96	-0.47			-1.25 *	-0.37
Medium classes			1.20 ***	0.53 *			1.76 ***	0.70 **			0.48 **	0.13
Large classes			0.80 *	0.50 *			1.37 **	0.52			0.26	-0.05
Northeast			1.54 ***	0.39			2.11 ***	0.38			0.95 ***	0.55 ***
North Central			0.62 *	-0.02			2.02 ***	0.17			0.72 ***	0.53 ***
West			0.62 †	0.19			0.64	-0.13			0.42 †	0.32
Intercept	31.65	27.15	26.94	4.79	45.50	39.98	38.19	6.30	22.64	17.81	16.73	3.61
N=	14970				14950				14870			

† p<.10, * p<.05, **p<.01, ***p<.001

Data weighted and sample sizes rounded to the nearest 10 as required by NCES.

Table 3. Regression Models Containting Interaction Terms between School Racial Proportions and Student Need Indicators

	Reading			Math			Science		
	b	(s.e.)		b	(s.e.)		b	(s.e.)	
A. Latino									
Latino	-0.70	(0.42)	†	-0.92	(0.44)	*	-0.89	(0.26)	**
Black	-1.29	(0.42)	**	-1.14	(0.52)	*	-1.23	(0.25)	***
Prop. Latino	0.18	(0.88)		-0.32	(1.27)		-0.05	(0.56)	
Prop. Latino x Latino	1.92	(0.95)	*	2.64	(1.32)	*	1.25	(0.68)	†
Prop. Latino x Black	2.69	(1.93)		2.70	(2.76)		1.08	(1.08)	
Prop. black	0.44	(0.76)		0.88	(0.97)		0.30	(0.44)	
Prop. black x Latino	1.07	(1.41)		-1.47	(1.81)		-0.12	(0.73)	
Prop. black x Black	0.88	(1.12)		-0.58	(1.42)		-0.40	(0.58)	
Prop. other non-white	-0.38	(1.16)		2.90	(1.29)	*	0.67	(0.59)	
Prop. other non-white x Latino	-0.37	(1.92)		1.01	(3.12)		0.92	(1.44)	
Prop. other non-white x Black	0.52	(3.52)		-3.17	(4.50)		-0.20	(3.27)	
B. Limited English Proficiency									
LEP	-4.60	(1.60)	**	-3.09	(1.24)	*	-1.94	(0.96)	*
Prop. Latino	1.30	(0.60)	*	1.49	(0.78)	†	0.58	(0.36)	
Prop. Latino x LEP	4.01	(1.96)	*	1.63	(1.42)		2.23	(1.11)	*
Prop. black	0.79	(0.51)		0.33	(0.74)		0.05	(0.29)	
Prop. black x LEP	3.22	(2.37)		0.72	(2.41)		-0.02	(1.33)	
Prop. other non-white	-0.67	(1.09)		2.38	(1.10)		0.69	(0.61)	
Prop. other non-white x LEP	8.94	(4.12)	*	11.92	(4.88)	*	3.39	(3.10)	
N=	14970			14950			14870		

† p<.10, * p<.05, **p<.01, ***p<.001

Notes: Models include the same variables as those included in model 4 from Table 1.

Data weighted and sample sizes rounded to nearest the 10 as required by NCES.

Table 4. Regression Models Containting Significant Triple Interaction Terms between School Racial Proportions, Student Need Indicators, and Targeted School Resources

	Baseline Targeted Resource Models			Latino Targeted Resource Models			LEP Targeted Resource Model
				Offer LM Courses	Offer LM Courses	Prop. ESL Certified	Offer LM Courses
	Read	Math	Science	Math	Science	Math	Math
	b (s.e.)	b (s.e.)	b (s.e.)	b (s.e.)	b (s.e.)	b (s.e.)	b (s.e.)
Main Effects							
Prop. Latino	2.14 (0.77) **	2.17 (0.86) *	0.98 (0.42) *	8.48 (4.34) †	1.75 (1.32)	4.08 (2.52)	5.40 (2.31) *
Latino	-0.22 (0.34)	-0.50 (0.37)	-0.58 (0.20) **	-1.15 (0.71)	-0.95 (0.34) **	-1.14 (0.51) *	-0.51 (0.38)
LEP	-- --	-- --	-- --	-- --	-- --	-- --	-1.65 (1.14)
Offers lang. minority (LM) courses	-0.49 (0.22) *	-0.17 (0.25)	-0.17 (0.14)	0.05 (0.27)	-0.15 (0.15)	-0.20 (0.26)	-0.06 (0.26)
Prop. minority teachers	-1.13 (0.97)	-1.06 (0.94)	-0.72 (0.46)	-1.42 (0.95)	-0.77 (0.46)	-1.12 (0.95)	-1.18 (0.94)
Prop. ESL teachers certified	-0.02 (0.35)	-0.36 (0.29)	0.10 (0.18)	-0.28 (0.28)	0.11 (0.19)	-0.12 (0.33)	-0.32 (0.28)
Two-Way Interaction							
Prop. Latino*Latino	-- --	-- --	-- --	-4.23 (4.32)	-1.41 (1.36)	-1.38 (2.60)	-- --
Prop. Latino*LEP	-- --	-- --	-- --	-- --	-- --	-- --	-6.44 (2.91) *
Latino*Offers LM courses	-- --	-- --	-- --	0.19 (0.81)	0.24 (0.40)	-- --	-- --
LEP*Offers LM courses	-- --	-- --	-- --	-- --	-- --	-- --	-0.45 (1.51)
Prop. Latino*Offers LM courses	-- --	-- --	-- --	-8.44 (4.44) †	-1.46 (1.39)	-- --	-3.52 (2.22)
Latino*Prop.ESL certified	-- --	-- --	-- --	-- --	-- --	0.43 (0.83)	-- --
Prop. Latino*Prop. ESL certified	-- --	-- --	-- --	-- --	-- --	-4.63 (2.98)	-- --
Three-Way Interaction	-- --	-- --	-- --	-- --	-- --	-- --	-- --
Prop. Latino*Latino*Offers LM courses	-- --	-- --	-- --	7.28 (4.40) †	2.54 (1.49) †	-- --	-- --
Prop. Latino*Latino*Prop. ESL certified	-- --	-- --	-- --	-- --	-- --	4.82 (2.89) †	-- --
Prop. Latino*LEP*Offers LM courses	-- --	-- --	-- --	-- --	-- --	-- --	7.74 (3.19) *
N=	14970	14950	14870	14950	14870	14950	14950

† $p<.10$, * $p<.05$, ** $p<.01$, *** $p<.001$

Notes: Models include the same variables as those included in model 4 from Table 1. Data weighted and sample sizes rounded to the nearest 10 as required by NCES.