Does Diversity Still Matter?
—Revisiting the Role of Racial and Socioeconomic Diversity in K-12 Education

by

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DEDICATION

This dissertation is dedicated to all the brutally freezing winters and glaringly bright summer days I spent in Ann Arbor.

“Choose to use your heart
If even towards the harshest fate…”

—Lady Lamb. (2013) “The Nothing Part II”. *Ripely Pine.*

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ABSTRACT

Despite efforts toward school integration following the historical U.S. Supreme Court ruling in the case of Brown vs. Board of Education in 1954, evidence shows that American schools have continued to see de-facto segregation along both racial and socioeconomic lines. This dissertation focuses on racial and socioeconomic diversity in the school context and strives to understand whether and how de-facto school segregation might shape educational inequality in the long run.

In the first empirical chapter, I use survey data from the Monitoring the Future Study (MTF) to examine the influence of school socioeconomic context on students' educational expectations. The results pointed to context-specific meanings of diversity. In particular, in low-SES schools, the positive association between diversity and educational expectation is more pronounced among students with less educated parents than among their peers with more educated parents. However, an opposite pattern was found in medium- and high-SES schools, where students' relative socioeconomic disadvantage in school acts as a moderator that attenuates the association between diversity and expectations. Consequently, in more advantaged schools, socioeconomically disadvantaged students benefit less from socioeconomic diversity than their more affluent peers, while in less-advantaged schools they benefit more. This chapter thereby points to both the benefits and potential drawbacks of school socioeconomic integration policies

and suggests that socioeconomically disadvantaged students might not always be the ones who benefit most from such policies.

In the second empirical chapter, I revisited the relevance of school racial diversity by applying a quasi-experimental design. Using data from the 2010 U.S. census and Monitoring the Future (MTF), I examined whether school racial context might play a role in shaping students' race-related values. The results showed that even after adjusting for selection bias with the use of a full matching technique, students who attend less racially diverse high schools are significantly more likely to hold pro-segregation school preferences. I argued that ongoing school segregation may have a self-perpetuating tendency—schools lacking racial diversity might themselves become the soil in which pro-segregation ideologies are reproduced.

The last empirical chapter moves above school-level analysis and considers the variation in racial and socioeconomic diversity at the school-district level. Using data from the Common Core Data (CCD) and the Stanford Education Data Archive (SEDA), I applied a longitudinal perspective to explore whether diversity trajectories differ across different school districts and examine the association between diversity trajectories and district-level test scores. The findings showed that predominantly-white school districts saw slight increase in racial diversity but remained the type of school districts with the lowest racial diversity. In comparison, mostly-nonwhite school districts saw noticeable decline in racial diversity, which was particularly driven by the decline in share of white students and increase in the proportion of low-income and Hispanic students. The results also suggested that school districts that underwent faster withdrawal of white students also tended to see decreases in district-level test scores over time.

Taken together, this dissertation contributes to the literature on both diversity and educational equity by offering a more refined understanding of racial and socioeconomic diversity in schools and school districts, and their implications for educational stratification. Findings from these analyses are particularly relevant given the continued debates regarding the effectiveness of school integration efforts and can provide crucial insights for policy makers who aim to tackle ongoing challenges of school segregation.

CHAPTER I: Introduction

The Empirical Relevance of School Diversity

More than six decades have passed since the milestone U.S. Supreme Court decision of Brown v. Board of Education, but it still remains a challenge for policymakers to achieve student body diversity in K-12 education. Mostly due to persistent residential segregation and growing income inequality, American schools continue to be segregated along both racial and socioeconomic lines (Reardon, Yun & Eitle 2000). Although the level of school racial segregation declined significantly from 1970 to 1990, scholars have pointed out that the trend slowed down and even reversed afterward (Logan, Zhang and Oakley 2017; Orfield, Siegel-Hawley & Kucsera 2014; Logan, Oakley and Stowell 2008). For instance, black students' exposure to white peers in school decreased noticeably from 1989 to 2010 (Orfield et al. 2014). Additionally, due to the overlap between racial and income-based school segregation, racial minority students have become increasingly likely to be concentrated in schools with higher levels of poverty compared to their white peers (Saporito and Sohoni 2007; Logan, Minca, and Adar 2012, Orfield et al. 2014).

Given the ongoing challenges of de facto segregation faced by many American K-12 schools, this dissertation revisits the role of school diversity – the racial/ethnic or socioeconomic composition of the student body - and explores its association with students' educational outcomes. The three empirical chapters strive to search for better answers to the following questions: 1) Does school socioeconomic diversity shape students' educational expectations? 2) Does school socioeconomic diversity matter in shaping students' race-related school preferences? 3) How did the student body diversity of different types of school districts evolve in the U.S. from 2001 to 2018, and did this matter for student educational outcomes? Collectively, the three empirical chapters aim to provide a more comprehensive understanding of school diversity and its implications for educational stratification in the long run.

School Socioeconomic Diversity Revisited

Following the retreat from court-ordered racial desegregation plans since the late 1970s, American schools have started to see a resurgence of segregation. In addition to race-based school segregation, evidence also points to a rise in segregation between students from low-SES and high-SES families (Saporito and Sohoni 2007). In such acontext, policy debates emerged around whether socioeconomic school integration may become an efficient alternative to race-based school desegregation (Kahlenberg 2012). Nevertheless, despite the increasing empirical relevance of class-based school segregation, the role of school socioeconomic diversity has remained an understudied area in the literature on school context. Noticeably, even within the literature on school socioeconomic context, the most commonly used indicator is school mean SES, which indicates the average level of family SES of students who attend that school, but fails to fully capture how diverse/homogeneous the student body is. The first empirical chapter of this dissertation therefore focuses on the role of school socioeconomic diversity, which takes into account not only how many different socioeconomic groups the student body in each school is composed of, but also the proportion each group represents. Utilizing multilevel mixed-effects ordered logistic regression, this chapter examines whether there is a significant association between the levels of school socioeconomic diversity and student's educational expectation. Additionally, the analyses pay particular attention to differential association between school socioeconomic diversity and educational expectations both in different types of schools and across students with different socioeconomic characteristics.

In particular, I consider two competing mechanisms in the analysis. On the one hand, according to the cultural transmission theory, schools with a higher proportion of high-SES students can create a context that fosters positive peer effects and thus compensates for the lack of social/cultural capital among disadvantaged/lower-resourced students. From this perspective, students in low-SES schools might benefit from school socioeconomic integration as they would be exposed to more high-SES peers as the student body of their school becomes more socioeconomically diverse. Alternatively, the frog pond and relative deprivation theories argue that the presence of more affluent peers may indicate dominance of such groups and thus engender low self-esteem among disadvantaged students. Consequently, low-SES students might experience feelings of relative deprivation when comparing themselves to their more affluent peers. While my results found evidence for the cultural transmission theory in predominantly low-SES schools, the opposite mechanism was observed in high-SES schools. The differential associations suggest that it is important to recognize and understand the context-specific meanings of school diversity. Findings from this chapter provide important implications regarding whether the effort to increase socioeconomic diversity might narrow or reproduce existing SES-based disparity in educational expectations.

School Racial Diversity Revisited

It has been well established in the literature that racial context matters in shaping interracial relations and race-related attitudes. Scholars have also pointed out that interracial contact is structured by the demographic composition of local contexts (such as schools, neighborhoods, and workplaces), thus more racially diverse contexts could create more opportunities for interracial interactions (Powers and Ellison 1995, Stein, Post and Rinden 2000). While some studies have found support for the threat hypothesis, showing that living in areas with a large proportion of African American residents triggers anti-black sentiments among whites (Glaser 1994, Taylor and Mateyka 2011), others found results that are more in line with contact theory, which argues that interracial contact and friendship in neighborhoods are associated with positive attitudes toward different race groups or positive views regarding racial relations (Sigelman and Welch 1993, Yancey 1999).

In contrast to the amount of research on the influence of residential context on racial attitudes, only a limited number of studies explicitly explored the formation of racial attitudes within the school context (Jacobson 1979, Smith, Atkins, & Connell, 2003, Marschall & Stolle 2004). Within the literature on school context, although scholars have well examined the immediate impact of school racial segregation on students' academic aspiration and achievement, the association between school racial context and students' racial attitudes and preferences remains an understudied area (Wells and Crain 1994). Nevertheless, given that school serves as the primary site where students spend most of their daily lives and most of their social interactions with peers take place, exploring the formation of racial attitudes among students within the school context is an important step toward understanding whether the social reproduction of certain racial attitudes may occur through school attendance.

Methodologically speaking, a key challenge faced by studies on the role of school context is the threat of selection bias, given the lack of random assignment of students into their current schools (Nash 2003). Therefore, in the second empirical chapter, I revisit the relevance of school racial diversity by utilizing a quasi-experimental design. In particular, in order to minimize the influence of selection bias, I utilize full matching to improve the covariate balance between students who attend racially diverse schools and those attending schools with less diverse racial composition. Using the matched sample, I find that students attending racially diverse high schools are less likely to develop pro-segregation racial values than their peers in racially homogeneous schools. Findings from this chapter offer new insight into understanding the importance of school racial context. Additionally, the analysis holds important implications regarding whether current school racial segregation has the tendency to reinforce itself in the long run through the reproduction of pro-segregation racial attitudes.

Diversity Trajectories Over Time

While the first two chapters provide valuable insights into how diversity shapes students' educational expectations and racial attitudes at the school level, it remains unclear how diversity evolves over time at a more macro level. Therefore, the third empirical chapter of my dissertation moves from school-level analyses to a more macro district-level comparison to better understand the trajectories and patterns of change in racial diversity over time. I choose to focus on the school-district level instead of cross-school comparison for two reasons. First, scholars have pointed out that school segregation between school districts began to surpass within-school district segregation starting in the 1980s (Reardon, Yun and Eitle 2000; Bischoff 2008). Over the 2000s, the educational landscape also witnessed widespread fragmentation of school districts, making each school district more racially distinct from one another (Bischoff 2008, Ayscue & Orfield 2014). Therefore, tracing the trajectories of diversity change at the district level is more empirically meaningful than tracing how diversity of a particular school changes over time. Second, the demographic composition of any school is to a large extent structured by the student body composition in the local school district. Therefore understanding the patterns of diversity change at the district level can complement insights driven from the first two chapters. Compared to the first two chapters, the longitudinal perspective of this chapter also allows us to understand school segregation as a dynamic process (Zwiers, van Ham & Manley 2018), as opposed to a stagnant context.

In this chapter, I utilized latent class mixed models (LCMM) to investigate whether there is heterogeneity in terms of diversity trajectories different school districts followed from 2001 to 2018. Additionally, I also explored whether district-level test scores vary across districts that have followed different diversity trajectories. The results suggest that diversity trajectories are indeed heterogeneous. In particular, noticeable differences were found between predominantly-white and predominantly non-white districts. Consistent with the white flight theory, the results showed that mostly-nonwhite districts in general saw declines in racial diversity, which was driven by a decreasing share of white students. In addition, students in mostly non-white districts also had higher levels of exposure to poverty compared to students in predominantly-white districts. In terms of educational outcomes, I also found that school districts that went through white flight had on average lower standardized test scores in math. Taken together, this chapter offers additional evidence regarding the association between the changing school demographic landscape and educational stratification.

Contribution and Implications

Collectively, the empirical chapters of this dissertation contribute to the literature on diversity, school context, and educational inequality in several ways. First, school segregation still remains empirically relevant in the post-Brown era. By paying particular attention to school segregation along both racial and socioeconomic lines, my dissertation offers a more refined understanding of whether and how different types of diversity matters. Second, as class-based school segregation is on the rise, findings from the first empirical chapter are particularly relevant and shed light on the effectiveness of school socioeconomic integration policies in closing SES-based gaps in educational outcomes. By conceptualizing school mean SES and school socioeconomic diversity as two different dimensions of school socioeconomic context , the first empirical chapter also offers a more comprehensive understanding of not only whether socioeconomic diversity matters, but also the heterogeneous effects of socioeconomic diversity across students with different SES and across different schools. Third, findings from the second empirical chapter can shed light on the long-term influence of school racial segregation on students' racial attitudes. By illustrating how the social reproduction of racial values depends upon school racial context, findings from the chapter bring together scholarship on school effects and attitude formation. Lastly, by drawing attention to how the trajectories and patterns of school segregation evolve over time, the last empirical chapter of my dissertation can provide useful insights into school segregation as a dynamic process. The various diversity trajectories identified in this chapter may also serve as a meaningful starting point for future research aimed to understand the heterogeneity in the longitudinal trends of school segregation.

CHAPTER II:
Mix Together, Expect Better?—the Role of School Socioeconomic Diversity in Shaping Students' Educational Expectations

Introduction

School effects, especially the influences of school socioeconomic and racial contexts on students' educational outcomes, have been one of the most frequently discussed topics among education-focused scholars. Simply put, does school context matter? How would changes in school racial and socioeconomic composition affect students' educational outcomes? Following the historic Brown v. Board of Education of Topeka decision in 1954, continued empirical research and policy debates regarding the role of school racial composition have made racial desegregation the center of attention for a long time (Condron 2009; Frost 2007; Goldsmith 2004; Palardy, Rumberger and Bulter 2015). Nonetheless, the past several decades have witnessed not only the retreat from court-ordered racial desegregation, but also growing class-based segregation in American schools. As a result, an increasing number of racial minority and lower-resourced students are concentrated in high-poverty schools where fewer resources and opportunities are available (Saporito and Sohoni 2007). In such a context, socioeconomic school integration has been discussed as an intriguing policy alternative to race-based school desegregation (Kahlenberg 2012). Such policies usually aim to achieve a more balanced socioeconomic composition in each school by reducing the concentration of economically disadvantaged students, bringing together students of different family SES, and promoting socioeconomic diversity. However, despite the rising empirical relevance of class-based school integration, the role of school socioeconomic diversity remains an understudied area in the school effects literature. Therefore, this study strives to fill the gap and explore the mechanisms through which ongoing class-based school segregation might transform or reproduce existing disparities in students' educational expectations.

Even though school socioeconomic context has not been discussed as frequently as racial context, some scholars have called attention to its undeniable importance. As early as the publication of the Coleman Report in 1966, for example, Coleman and colleagues (1966) found that the proportion of white students was positively associated with students' educational achievement. Nonetheless, they argued that this effect was attributable to the student body's 'educational background' rather than to 'school racial composition per se' (Coleman et al. 1966:307). They further concluded that controlling for children's own family SES, the contextual effect of school socioeconomic composition seemed to be more directly related to students' attainment than that of any other school-level characteristics (Coleman et al. 1966). Building on the findings from the Coleman Report, Alexander (2016), in his review article, further suggested that while persistent residential segregation has largely limited socioeconomic diversity in schools, changes in school socioeconomic composition may have the potential to weaken the association between family SES and students' educational outcomes.

Despite both the policy relevance and theoretical significance of school socioeconomic context, its role has not been thoroughly investigated. Past research primarily focused on school mean SES as the sole indicator of school socioeconomic context, usually measured as the proportion of students eligible for free lunch, proportion of students with college-educated parents, or the average educational level of students' parents in each school. These measures can represent the average level of SES within each school, but fail to capture how socioeconomically segregated or integrated each school is, which can be important in its own right. Additionally, school socioeconomic diversity mirrors the extent to which students of different socioeconomic backgrounds are segregated across schools, but school mean SES alone contains no such information. For instance, in a hypothetical case, if we compare a middle-class school from an extremely segregated district where students attend schools only with peers with exactly the same family SES (school A) with another middle-class school from a more integrated district (school B), the two schools may have exactly the same average level of mean SES, but still differ drastically in socioeconomic composition. While school A has no socioeconomic diversity, the student body of school B may consists of a large proportion of middle-class students and a small proportion of both low-SES and upper-middle class students, resulting in a higher level of socioeconomic diversity. If school mean SES is used as the only indicator of school socioeconomic context, the important difference in socioeconomic diversity between school A and B might be overlooked.

Therefore, this study pursues a more comprehensive perspective by conceptualizing school mean SES and socioeconomic diversity as two related, yet independent, dimensions of school socioeconomic context. I examine whether school socioeconomic diversity plays a role in shaping students' educational expectations, after controlling for the influence of mean SES. This study is based on the assumption that students may compare their SES to their peers' and form their perceptions of their position on the socioeconomic spectrum and estimate their chances for future educational success accordingly. Therefore, I hypothesize that school socioeconomic diversity may affect how optimistic/realistic students are in forming such perceptions and developing their educational expectations.

The next section provides a brief overview of the following three questions. I first summarize trends in school segregation to provide a better understanding of "what" we know about school socioeconomic diversity. Next, I review relevant studies to discuss "why" it is important to examine whether school socioeconomic diversity affects educational expectations. I then introduce the theoretical framework regarding "how" (through what mechanisms) school socioeconomic diversity might matter, before moving on to my hypotheses and analysis.

Background: School Segregation In The Post Brown Vs. Board United States

Following the historic Supreme Court ruling in Brown vs. the Board of Education of Topeka in 1954, subsequent policy reforms and court-ordered desegregation plans contributed to moderate improvement in school racial diversity. Scholars showed that the level of school segregation declined most substantially from 1970 to 1990 (Logan, Oakley and Stowell 2008; Logan, Zhang and Oakley 2017; Orfield, Siegel-Hawley & Kucsera 2014). Despite all the progress achieved, the efforts at school racial desegregation encountered challenges partly due to changes in the political climates over the 1990s, resulting in the slowdown or even reversal of the trend toward desegregation (Stroub and Richards 2013). On average, black students' exposure to white students in school dropped significantly from 1989 to 2010 (Orfield et al. 2014). Importantly, scholars have pointed out that the increase in school diversity observed in certain areas in this period were mainly driven by the increase in Hispanic population, instead of the increase in white-nonwhite exposure (Orfield et al. 2014, Reardon, Yun and Eitle 2000). Additionally, the interplay between racial and income-based school segregation has led to the growing prevalence of high-poverty schools and an increasing proportion of racial minority students attending such schools (Logan, Minca, and Adar 2012; Orfield et al. 2014; Saporito and Sohoni 2007). Scholars also pointed out that school segregation between school districts began to surpass within-school district segregation since the 1990s (Ayscue and Orfield 2015; Bischoff 2008). Most of these changes occurred in tandem with the noticeable increase in economic inequality and the persistence of residential segregation, which further complicated the landscape of school segregation (Owens 2016; Owens, Reardon and Jencks 2016; Quillian 2012).

Although the trends and patterns of school segregation have been relatively well-documented, the consequences of such segregation have yet to be sufficiently examined (Reardon and Owens 2014). On a more macro level, Quillian (2014) utilized metropolitan-level data and found that residential segregation by race and by income lowers the academic attainment of racial minority and poor students, but has no effect on their white and non-poor peers. Focusing on income segregation between school districts, both Owens (2018) and Mayer (2002) revealed that more economically segregated areas exhibit wider income-based achievement gaps. Clark and Maas (2012), on the other hand, found that there is no significant relationship between racial segregation and district-level test scores after district-level mean SES is adjusted for.

Comparatively, fewer studies examined the consequences of economic segregation at the school-level. Nevertheless, as the primary site where students spend most of their daily lives and most of their social interactions with peers take place, the school context can theoretically exert more direct impact on students than the larger neighborhood contexts or school district areas do. Although existing patterns of residential segregation and school district fragmentation may largely structure the school choices available to students and shape the demographics of the school they eventually attend, segregation at a higher level (such as the school-district level) may not exactly mirror the segregation at a lower level (such as the school-level). For instance, Sohoni and Saporito's study (2009), found that for most school districts they examined, racial segregation within schools is higher than that in the 'catchment areas' from which students are drawn, which can to some extent be attributable to the presence of alternative schooling options, such as private, charter, and magnet schools. Given these observed gaps in segregation at different levels, more research is needed to examine whether the association between segregation and educational outcomes found at the district or a higher level would hold at the school level. To that end, this study contributes to the literature on consequences of economic segregation from a school-level perspective.

School Contexts and Educational Expectation

The outcome variable of this study is educational expectation, which is defined in this chapter as how likely each student thinks it is that they will graduate from a four-year college. This study focuses on students' educational expectations, instead of educational aspirations, as the outcome variable for two reasons. First, educational aspiration mirrors students' ambition or hope of attaining a college degree, which may depend more on idiosyncratic preferences and not necessarily be restrained or affected by one's socioeconomic surroundings. Educational expectation, on the other hand, reflects students' own estimates of the likelihood that they would actually attend and graduate from college, which theoretically is not only conditioned by students' own socioeconomic background but also influenced by how they perceive/estimate their chance for success compared to their peers. This chapter thus hypothesizes that school socioeconomic diversity as a contextual factor affects how optimistic/realistic such perceptions/estimates would be.

Second, the expansion of educational opportunities during the past decades has been accompanied by a trend toward universally high educational aspirations across students of all race and socioeconomic backgrounds (Goyette 2008; Kao and Tienda 1998; Reynolds and Pemberton 2001). As a result, educational aspiration has become less useful as a predictor of future academic attainment than educational expectation. Educational expectation, nonetheless, has been well documented in the literature to play a role in shaping students' eventual educational attainment even in an era of educational expansion when high educational aspirations are rapidly becoming the norm (Andres et al. 2007; Bates and Anderson 2014; Cabrera and Nasa 2001; Reynold and Johnson 2011; Sewell, Haller and Portes 1969;). Reynolds and Burge (2007), for instance, argued that the widening gender gap in educational attainment is partially attributable to the rapid growth in educational expectations among females.

Building on the Wisconsin framework of status attainment (Sewell, Haller and Portes 1969; Sewell, Haller and Ohlendorf 1970), scholars have theorized educational expectation not only as one of the major predictors of students' future educational attainment (Domina, Conley and Farkas 2011; Reynolds and Pemberton 2001), but also as a key outcome variable which is itself emblematic of the educational stratification process (Buchmann and Dalton 2002; Hossler and Stage 1992; Kao and Tienda 1998). Previous literature showed that both the level of educational expectation and its actual realization are conditioned by one's socioeconomic characteristics and shaped by the cultural and social resources one's family can provide (Behtoui 2017; Fryer and Levitt 2004; Goyette and Xie 1999; Karlson 2015; Reynolds and Johnson 2011; Wells et al. 2011). Hence, educational expectation can be conceived of as a mediating factor between students' ascriptive characteristics, such as race and SES, and their eventual educational outcomes. In this sense, exploring school-level factors that may shape students' educational expectations in the first place is a key preliminary step toward understanding the process through which school segregation may reproduce or transform existing educational inequalities.

Going beyond an individual-level explanation for the disparities in educational expectations, a few studies emphasized the influence of peers and school environment. Feliciano's study (2006), for example, highlighted the role of group-level educational status in shaping the educational expectations of immigrants' children. Similarly, building on Bourdieu's concept of habitus, Barrett & Martina (2012) argued that attending a high-achievement school may have the potential to alter disadvantaged students' "perceptions of what is possible" and improve their academic outcomes. Focusing on school racial context, Frost (2007), found that school racial composition has an independent effect on educational expectations for all students regardless of their own race/ethnicity, even after other school-level characteristics (such as school mean SES and average achievement) and individual-level variables are adjusted for.

School Effects Revisited: Toward a Refined Understanding

Investigating the effect of school socioeconomic diversity in the context of emerging class-based school segregation is not only empirically relevant, but also theoretically valuable. Within the literature on school effects, scholars have pointed out that school socioeconomic context does have an effect on students' educational outcomes, but no consensus has been achieved regarding either the direction of such effect or the mechanisms through which such an effect occurs (Caldas and Bankston 1997; Nelson 1972; Wells 2010). Frequently discussed theories of the role of school socioeconomic context generally fall into two lines of thinking: cultural transmission theory and relative deprivation. The former suggests that the presence of more affluent peers in school with better cultural capital could play a positive role in transmitting values that are conducive to achieving academic success (Meyer 1970). Consistent with the cultural transmission theory, studies have shown that students who go to school with a higher proportion of middle-class or high-SES peers generally benefit from the school's learning environment and have better academic performance (Morgan and Sørensen 1999; Palardy 2013; Perry and McConney 2010). As for the mechanism, scholars argued that the presence of middle-class or high-SES students in a particular school could have significant impact on school policies and instructional practices, enabling the accumulation and transmission of social and cultural capital at the school level (Lin 2000;

Thrupp 1997). On the other hand, relative deprivation theory emphasizes that the feelings and well being of individuals are influenced by how their own status compares to that of their reference groups (Davis 1966). The theory hence argues that due to the perceived lack of resources relative to their more affluent peers, low-SES students who attend schools with a high proportion of affluent peers may develop feelings of relative deprivation, which can negatively affect their academic performance (Marsh 1987; Marsh and Hau 2003). Some studies have found that attending high-attainment schools may actually engender low self-esteem and lead to negative educational outcomes, especially among lower-resourced students who have to face more competition and deal with the shortage of social and cultural capital when compared to their more affluent peers (Alexander and Eckland 1975; Bernburg, Thorlindsson, and Sigfusdottir 2009; Crosnoe 2009; Khattab 2005;).

Given these contrasting theories and mixed findings, it is crucial to consider under which circumstances the advantages of attending schools with more affluent peers (as implied by the cultural transmission theory) would outweigh its risks potential drawback (as suggested by the relative deprivation theory). However, it remains unclear in the literature what kind of school settings would enable lower-resourced students to benefit most from socioeconomic integration. This study, therefore, pays special attention to whether the effect of socioeconomic diversity varies across schools with different levels of mean SES and students with different socioeconomic backgrounds.

Hypothetically, if the cultural transmission theory is more relevant, we would expect school socioeconomic diversity to have a positive effect on students' educational expectation, especially for low-SES students. More exposure to peers with various socioeconomic backgrounds may help them look beyond their current situation and form more positive ideas regarding their chances of moving up the social ladder. On the other hand, thinking solely from the relative deprivation perspective, we would expect to see little or even a negative effect of school socioeconomic diversity among lower-resourced students. This might be especially true if poor students only compose a small percentage of the student body, such as in integrated schools with medium to high level of mean SES. The socioeconomic disadvantages of poor students might become more salient in such settings than in predominantly low-SES schools where the lack of cultural capital is the norm. Consequently, lower-resourced students in more integrated schools with medium to high level of mean SES might experience relative deprivation and become less optimistic about their chances in higher education. Combining both scenarios, I hypothesize that the cultural transmission mechanism may be more evident than the relative deprivation mechanism when lower-resourced students constitute the majority in their school (such as in low-SES school), leading to a positive effect of socioeconomic diversity. On the other hand, when poor students only constitute a small fraction of the student body, such as in medium- or high-SES schools, I hypothesize that relative deprivation theory may be more relevant and lead to a weaker or no positive effect of socioeconomic diversity among disadvantaged students.

Therefore, this chapter will focus on testing the following three hypotheses in all three kinds of school settings—schools with low-, medium-, high- mean SES, respectively:

Hypothesis 1. Overall positive effect: Adjusting for individual-level and other school-level characteristics, students who attend schools with higher socioeconomic diversity are more likely to expect to graduate from a four-year college than their counterparts in more socioeconomically homogeneous schools.

Hypothesis 2. <u>Differential effect</u> by individual-level SES (derived from the cultural transmission theory): If school socioeconomic diversity has an overall positive effect on students' educational expectations, such effect would be **stronger** for students with less-educated parents. This mechanism might be especially evident in low-SES schools.

Hypothesis 3. <u>Differential effect</u> by <u>relative socioeconomic disadvantage</u> (derived from the relative deprivation theory): If school socioeconomic diversity has an overall positive effect on students' educational expectations, such effect would be **weaker** for students who experience relative deprivation at school. This mechanism might be especially evident in medium- and high-SES schools.

Data and Method

The study utilizes data from the Monitoring the Future study (MTF), a nationally representative sample of approximately 16,000 high school seniors (12^{th} graders) annually drawn from around 130 public and private schools since 1975. Since MTF's main focus has been on substance use, it remains under-utilized in the education-focused literature. However, one unique advantage of MTF is that a relatively large proportion of students, if not all, are sampled from each school. More specifically, up to 350 high school seniors can be selected from each school, with almost all students sampled for schools with less than 350 twelfth graders. Compared with other commonly used education-focused datasets (such as NCES national datasets collected by the Department of Education), which usually selected around 30 students from each high school, the sampling design of MTF makes it possible to construct a reliable measure of socioeconomic diversity for each school's 12^{th}-grade cohort utilizing the individual-level data of all or a large proportion of high school seniors in that school. I include cross-sectional data from the following eight years—1978, 1980, 1988, 1990, 1998, 2000, 2008, 2010 (N=126,689) in my analysis. For the purpose of constructing measures of school socioeconomic and racial contexts that utilize information from as many students in each school as possible, missing values in individual-level independent variables are imputed. After omitting observations with missing values in the outcome variable, 116,034 students out of 126,689 students who were originally in the data from 1,051 schools are included in my analysis.

Outcomes Variables

The MTF questionnaire has the following question on students' educational expectations, 'how likely is it that you will graduate from a four-year college'. Four answer choices are provided: 'definitely won't, probably won't, probably will and definitely will'. Consistent with the well-documented trend toward rapidly increasing educational expectation over recent decades, almost half (49 percent) of all students in the sample fall into the last category 'definitely will'. However, since each of the other three categories denotes a qualitatively different message regarding one's estimated chance of going to college, instead of converting the dependent variable into a binary variable, I apply multilevel mixed-effects ordered logistic regression so that all four categories will be taken into account in the models.

Explanatory Variables: School-Level Variables

Since information on family income or wealth is not included in the MTF survey, this study uses parents' education as the proxy for family SES to construct the two school-level socioeconomic variables—school mean SES and socioeconomic diversity. Although parental education might not be able to capture all the potential variation in family resources, prior research has found that parents' education and income are highly correlated and parents' education in general is a reliable indicator of one's family SES (Cowan et al. 2012; Davis-Kean 2005). MTF measures the education of a student's father and mother in six ordinal categories— 'completed grade school or less, some high school, completed high school, some college, completed college, and graduate or professional school'. I choose the highest level of education among each student's parents as a proxy for their family SES, and then convert the highest level of parental education into years of schooling. The six ordinal categories of parental education listed above are converted to 8, 10, 12, 14, 16, and 18 years of schooling, respectively, with a 2-year interval between each level. In the following analyses, the term 'parental education' and 'family SES' are used interchangeably and both refer to this variable.

School mean SES for each school is calculated as the average years of schooling of students' parents. School socioeconomic diversity is quantified for each school using the Theil Index T_T. This measure is chosen over other similar measures for diversity, such as standard deviation and coefficient of variation, because the Theil Index takes into account not only how far away the SES of each student is from the school mean SES, but also how many different SES groups are there in each school and what proportion of the student body each SES group accounts for. In this context, higher value of the Theil

Index suggests that the distribution of students' SES in a school is more dispersed, therefore, is indicative of higher socioeconomic diversity. The formula for calculating the Theil Index for school j is presented below in Equation (1), where f_{k_j} is the fraction of students in school j with k years of parental schooling, μ_j is the average years of parental schooling (mean SES) for school j, and k ranges from 8 to 18 years. After standardizing the original values of the Theil Index, the socioeconomic diversity measure for schools in the whole sample ranges from -2.8 to 5. As for school racial composition, one of the most commonly used measures for school racial segregation, the proportion of black students in each school, is calculated and controlled for in the analysis. Additionally, the chapter also utilizes the racial diversity index (see Moody 2001) to consider the full spectrum of racial composition in each school, including five racial/ethnic categories. The racial diversity index is constructed as the probability that two students randomly selected in each school are from different race/ethnic groups, ranging from 0 to 1. The formula for the racial diversity index is presented below in Equation (2), where r_{ij} represents the number of students of the i race/ethnicity in school j, and n_j is the total number of seniors in that school.

$$T_{Tj} = \sum_{k=8}^{18} f_{k_j} \frac{k}{\mu_j} \ln(\frac{k}{\mu_j}) \qquad (1)$$

$$Racial\ Diversity_j = 1 - \sum_{i=1}^{5} \left(\frac{r_{ij}}{n_j}\right)^2 \qquad (2)$$

Individual-Level Variables

In addition to parental years of education as the main predictor of educational expectation, the following demographic and socioeconomic factors are taken into account: students' race (five categories: white, black, Hispanic, Asian, and other), gender (female coded as 1), and whether or not being raised in a single-parent household. I also adjusted for the following variables that may indicate or affect students' academic performance: whether the student's high school program is college-preparatory, previous GPA, and absenteeism. Since data in the sample are from eight different years, I create a survey year variable to account for potential cohort differences. Given the generally linear across-cohort increase in students' educational expectations found in the data (as shown in Figure 2.1), the year variable is coded in the following way: the 1978 senior cohort is coded as 0, 1988 as 10, 1998 as 20, and 2008 as 30.

[Figure 2.1 about here]

Additionally, I construct an individual-level relative disadvantage variable to measure the relative socioeconomic standing of each student compared to their peers in the same school, as the proxy for the level of relative deprivation they are likely to experience at school. For each student, I first calculate the percentile rank of their parents' education in their school, and subtract the value from 1 to calculate their relative disadvantage (ranging from 0 to 1). For example, if a student's parents' education is only higher than 25% of all students in the school they attend, this student's relative disadvantage will be quantified as 0.75. Higher value suggests that more relative disadvantage compared to their peers and higher likelihood of experiencing relative deprivation at school. Importantly, although this variable and student's parents' education can be highly correlated (students with highly educated parents are less likely to experience relative deprivation), they are conceptually different.

A student's parental education level remains the same regardless of what kind of school they attend, but the relative disadvantage variable is a measure contingent on the specific socioeconomic composition of the school they go to. For instance, even among all students with college-educated parents, depending on the specific kind of school they attend (for example, attending a medium-SES school vs. a high-SES school), the SES of their reference group at school would change, leading to different level of relative disadvantages they may experience at school.

It is important to point out that, since the regression models will control for the mean SES of a student's school, the coefficient of parental education that is estimated in the model will be the same as that of school-mean centered parental education. For this reason, one might argue that school-mean centered parental education alone is able to capture how a student's parental education background compares to their peers at school. However, there are meaningful differences between school-mean centered parental education and relative socioeconomic advantages, even if school-mean SES is controlled for in the analysis. The scenario below can serve as an example to show how each of the two measures would shape the ways in which the effect of school diversity is conceptualized and estimated.

Assume a simplified scenario, shown in the table below, where we are comparing two schools—school A and school B, each has 6 students. Assume that all 12 students are similar in all individual-level characteristics except parental education. At the school level, assume that school A and school B are similar in all school-level characteristic and the only difference between the two schools is that the level of socioeconomic diversity is higher in school B than in school A. If one were to estimate the influence of school socioeconomic diversity on student's educational expectations, each individual from school A would be compared to their counterpart in school B. Using student A1 as an example, in a model where parental schooling years is used as the proxy of individual-level SES, A1 would be compared to B2, their counterpart in school B. Both have parents whose highest education is a high school diploma and the only factor that varies between A1 and B2 is their school's socioeconomic diversity. Therefore, the marginal effect of school socioeconomic diversity could be calculated as the difference in their educational expectation.

School A

School-Level Characteristics						
School Mean SES	14 years					
School Socioeconomic Diversity (Theil T)	.003					
Individual-Level Characteristics						
Student	A1	A2	A3	A4	A5	A6
Parental Education (years of schooling)	12	14	14	14	14	16
School-Mean Centered Parental Education	-2	0	0	0	0	2
Relative Socioeconomic Disadvantage (Relative Deprivation)	100%	20%	20%	20%	20%	0%

School B

School-Level Characteristics						
School Mean SES	14 years					
School Socioeconomic Diversity (Theil T)	.017					
Individual-Level Characteristics						
Student	B1	B2	B3	B4	B5	B6
Parental Education (years of schooling)	10	12	14	14	16	18
School-Mean Centered Parental Education	-4	-2	0	0	2	4
Relative Socioeconomic Disadvantage (Relative Deprivation)	100%	80%	40%	40%	20%	0%

However, if instead of parental education we use relative socioeconomic disadvantage as the proxy of one's SES, A1 would instead be compared to B1, since they both ranked at the bottom of their school in terms of socioeconomic background and both have the highest likelihood of experiencing relative deprivation. Consequently, the coefficient of school socioeconomic diversity would be estimated differently compared to the model using parental education.

In addition to the difference in how the marginal effect of school socioeconomic diversity is estimated, depending on whether students' SES is measured using parental education or relative socioeconomic disadvantage, the cross-level interaction between diversity and individual-level SES indicators would also be estimated differently. If one were to estimate whether the effect of socioeconomic diversity varies between individual A1 and A6, the model using students' parental education, as shown in Approach 1 below, would first compare A1 to their counterpart B2 to estimate the effect of diversity for someone with high-school-educated parents, and compare A6 to their counterpart B5 to estimate the effect of diversity for someone with college-educated parents. The differential effect of diversity would then be calculated by taking the difference between the two estimated effects. However, in a model where relative socioeconomic disadvantage is instead used as the proxy of individual-level SES, as in Approach 2, A1 would be compared to B1 to estimate the effect of diversity for someone with the highest likelihood of experiencing relative deprivation, and A6 would be compared to B6 to estimate the effect of diversity for someone who ranked top at their school in terms of socioeconomic background. Consequently, the cross-level interaction term would capture the differential effect of diversity depending on one's likelihood of experiencing relative deprivation, which is both numerically and conceptually different from the differential effect estimated in the model that uses parental education.

	Approach I	**Approach II**
Individual-level SES Measure	Parental education	Relative socioeconomic disadvantage
Estimated Effect of Diversity on A1	$Edu\ Exp.of\ B2 - Edu\ Expec\ of\ A1$	$Edu\ Exp.of\ B1 - Edu\ Expecof\ A1$
Estimated Differential Effect of Diversity between A1 and A6	$(Edu\ Exp.of\ B2 - Edu\ Expec\ of\ A1) - (Edu\ Exp.of\ B5 - Edu\ Expec\ of\ A6)$	$(Edu\ Exp.of\ B1 - Edu\ Expec\ of\ A1) - (Edu\ Exp.of\ B6 - Edu\ Expec\ of\ A6)$

It is worth noting that the parental education and relative deprivation variables will not be included in the same model simultaneously. While the former will be utilized as the primary individual-level predictor in models derived from the cultural transmission theory (Model 2 and 4), the latter will be used in the models based on the relative deprivation theory (Model 3 and 5).

Analytical Strategy

Given that diversity may convey different messages in different school contexts, I choose to test the effect of school socioeconomic diversity separately for different types of schools (schools with low, medium, and high mean SES). Socioeconomic school integration can have very different meanings depending on the mean SES of each school. For instance, for a predominantly low-SES school, the increase in socioeconomic diversity may be achieved by enrolling some middle-class students. However, in order for a high-SES school to increase diversity, it will likely require recruiting some lower-resourced students. Therefore, even if these two schools have achieved a similar level of socioeconomic integration (as measured by the Theil Index), due to the difference in their school mean SES, these two schools might still have distinct socioeconomic compositions. While the disadvantages associated with being a low-SES students (such as the lack of cultural or socioeconomic capital) may be the norm in a predominantly low-SES school, these disadvantages may become especially visible in the high-SES school. Hence, without categorizing schools into different types, the analysis will not be able to fully capture different implications of diversity in different school settings.

I split the analysis sample into three subsets of similar size based on the mean SES of each school. After adjusting for the year-average of school mean SES, high schools with mean SES that falls into the bottom one-third of the school SES distribution are categorized as low-SES schools. Similarly, the middle one third are categorized as medium-SES schools, and the top one third as high-SES schools. After doing so, the average mean SES of each type of schools are 13, 14.3, and 15.6 years of students' parental schooling, approximately corresponding to average parents' education levels of high school diploma, some college, and college degree, respectively. All models will be run separately on each of the three subsets.

It is worth noting that given the uneven geographical distribution of educational resources and school options, students are not randomly assigned to the school they attend. For this reason, the concern of selection bias (Nash 2003) has often been pointed out as a criticism against the literature on school effects. For instance, students who get to attend high-SES schools in the first place may also have better socioeconomic resources or more cultural capital and thus may differ inherently in unobserved socioeconomic characteristics than those who go to low-SES schools. This study has paid particular attention to the differences in the characteristics of students who are enrolled in different schools by looking at the effect of diversity at low-, medium-, and high-SES schools separately. Nevertheless, there are still some relevant factors that the study is unable to account for. For instance, since there is no information regarding the socioeconomic composition of students' neighborhood or school district in the data, this study does not take into account the macro- or meso- level mechanisms that could have selected students into schools with different level of diversity in the first place. Therefore, the analysis is not free from potential selection bias and the results found here should be interpreted with caution.

As the first step of my analysis, I use descriptive statistics to explore the association between school mean SES and socioeconomic diversity, whether such association has evolved over the past four decades, and how schools in each subset differ in the average values of school- and individual-level characteristics. Next, for each subset, I run three multilevel ordered logistic regression models (Model 1 to Model 3) to examine whether there is an overall effect of school socioeconomic diversity on educational expectation. The educational expectation of student i in school j is written as y_{ij}, which can be modeled as following:

$$y_{ij} = \begin{cases} \text{Definitely won't} & if\ y_{ij}^* \leq threshold\ 1 \\ \text{Probably won't} & if\ threshold\ 1 < y_{ij}^* \leq threshold\ 2 \\ \text{Probably will} & if\ threshold\ 2 < y_{ij}^* \leq threshold\ 3 \\ \text{Definitely will} & if\ threshold\ 3 \leq y_{ij}^* \end{cases}$$

Specifically, y_{ij}^* denotes the latent continuous response for student i in school j, from which the student's observed educational expectation is generated. As shown in Equation (23), (4) and (5), I start with only school-level variables and then explore whether the influence of school socioeconomic diversity persists after adjusting for individual-level predictors.

$$y_{ij}^{*} = \beta_{0j} + r_{ij} + \epsilon_{ij} \tag{3}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}\boldsymbol{SocDiversity_j} + \gamma_{02}Mean\ SES_j + \gamma_{03}Racial\ Context_j + U_{0j}$$

$$y_{ij}^{*} = \beta_{0j} + \beta_1\boldsymbol{ParentEdu_i} + \beta_2 Controls_i + r_{ij} + \epsilon_{ij} \tag{4}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}\boldsymbol{SocDiversity_j} + \gamma_{02}Mean\ SES_j + \gamma_{03}Racial\ Context_j + U_{0j}$$

$$y_{ij}^{*} = \beta_{0j} + \beta_3\boldsymbol{RelativeDeprivation_i} + \beta_2 Controls_i + r_{ij} + \epsilon_{ij} \tag{5}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}\boldsymbol{SocDiversity_j} + \gamma_{02}Mean\ SES_j + \gamma_{03}Racial\ Context_j + U_{0j}$$

Finally, I apply random-effect ordered logistic regression models (Model 4 and 5) with cross-level interaction terms to assess whether there is differential effect of school socioeconomic diversity across students with different socioeconomic characteristics. Specifically, two mechanisms are considered, as shown in Equation (6) and (7). If the cultural transmission theory is true, the cross-level interaction term in Equation (6) between students' parents' education and school socioeconomic diversity should have a negative coefficient, meaning that socioeconomic diversity will have a stronger positive effect among low-SES students. If, on the other hand, the relative deprivation theory is supported, the coefficient for the interaction term in Model (7) should be negative, meaning that those who experience more relative deprivation benefit less from attending socioeconomically diverse schools.

$$y_{ij}^{*} = \beta_{0j} + \beta_{1j}\boldsymbol{ParentEdu_i} + \beta_2 Controls_i + r_{ij} + \epsilon_{ij} \tag{6}$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\boldsymbol{SocDiversity_j} + \gamma_{02}Mean\ SES_j + \gamma_{03}Racial\ Context_j + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\boldsymbol{SocDiversity_j} + U_{1j}$$

$$y_{ij}^{*} = \beta_{0j} + \beta_{3j}\boldsymbol{RelativeDeprivation_i} + \beta_2 Controls_i + r_{ij} + \epsilon_{ij} \quad (7)$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\boldsymbol{SocDiversity_j} + \gamma_{02}Mean\ SES_j + \gamma_{03}Racial\ Context_j + U_{0j}$$

$$\beta_{3j} = \gamma_{30} + \gamma_{31}\boldsymbol{SocDiversity_j} + U_{3j}$$

It is noteworthy that the cross-level interaction terms in the random-effect models can also be interpreted in a different way. For example, if the interaction term between parents' education and school socioeconomic diversity is significantly negative, it also suggests that the slope of parental education is smaller in more socioeconomically diverse schools than in schools that lack diversity. In this scenario, the gap in educational expectations between low-SES and high-SES students will be expected to be narrower in socioeconomically integrated schools than in segregated ones. In this sense, the random-effect models can also provide useful insights into how changes in school socioeconomic diversity may shape existing disparities in educational expectations.

Results

First, I examine whether there were changes in the relationship between school mean SES and school socioeconomic diversity over time. As shown in Figure 2.2, the association between the two variables evolved into a more linear relationship over time, with high-SES schools being the most socioeconomically homogenous. Figure 2.3 presents the changes in socioeconomic diversity for schools with extremely low and high mean SES (schools with the 10th and 90th percentile mean SES) and schools falling into the middle 80 percent. Noticeably, both the extremely high- and low-SES schools became less socioeconomically diverse during the 2000s. It is worth pointing out that although the scatterplot indicates that socioeconomic diversity is strongly negatively correlated with school mean SES in the whole sample (r = -.7), the correlation coefficient is actually much smaller in each subset with the exception of the high-SES schools subset (r is around -.4 for both low- and medium-SES schools, and -.7 for high-SES schools). The high correlation observed in the third subset can partly be explained by the fact that in order for a school to maintain a high mean SES, inevitably there is less room allowed for diversity. That being said, even for the high-SES schools subset, the variance inflation factors (VIFs) of all predictors are around 1.5 (the largest VIF=2.6), suggesting that collinearity is not necessarily a concerning issue for the following analysis.

[Figure 2.2 and 2.3 about here]

Next, I compare whether the three types of schools differ in socioeconomic diversity and other school- and individual-level characteristics, as presented in Table 2.1. On average, students who go to schools with lower mean SES have substantially lower educational expectations than those attending high-SES schools. In terms of school socioeconomic diversity, high-SES schools are substantially more homogenous than low- and medium-SES schools. The proportion of black students and school racial diversity are both higher in low-SES schools than in medium- and high-SES schools, indicating that predominantly black schools also tend to be schools with concentrated poverty.

[Table 2.1 about here]

Turning to inferential analysis, Model 1 shows that despite the negative correlation between school socioeconomic diversity and school mean SES, the two school-level variables are both positively associated with students' educational expectations across all three subsets. Model 2 and 3 suggest that the positive effect of socioeconomic diversity on students' educational expectation remains statistically significant even after individual-level characteristics are adjusted for. The effect of school racial context, on the other hand, is not as robust as that of socioeconomic diversity. After controlling for individual-level variables, the proportion of black students and school racial diversity are no longer significant among students who attend high-SES schools. Nonetheless, the consistently significant coefficients of school socioeconomic diversity across all three types of schools lend support to my first hypothesis that students who attend more socioeconomically diverse schools develop higher educational expectations than their counterparts in more homogenous schools.

[Inset Table 2.2 about here]

As for individual-level predictors, students with more educated parents, those who are not from a single-parent household, and those who are less likely to experience relative deprivation at school are more likely to expect to graduate from college. The results also show disparities in educational expectations across students of different race. Holding all other characteristics constant, both Asian American and African American students are more likely to have high educational expectations than their white peers. The results from all three types of schools confirm the black-white gap in educational expectations pointed out by Morgan (1996). Academically speaking, students with higher previous GPA, on the college-prep track, or those who never skipped school are more likely to expect a college degree.

The results from Model 4 show that the interaction term is only significant for students attending low-SES schools. Its negative coefficient suggests that for students in low-SES schools, the positive association between socioeconomic diversity and educational expectation is more pronounced among low-SES students than among their peers with more educated parents. This finding lends support to the cultural transmission theory. Table 2.4 presents specific differential average marginal effects of socioeconomic diversity in low-SES schools across students with different parental education. Among students whose parents didn't go to college, every one unit increase in school socioeconomic diversity (as measured by the standardized Theil Index) is associated with an approximately 4 percent increase in the probability that they expect to graduate from college. Nevertheless, such mechanism is not evident in medium-SES and high-SES schools, where students with less-educated parents do not benefit more from school socioeconomic diversity than their peers with more educated parents.

[Table 2.3 and 2.4 about here]

I then turn to investigating whether the benefit of attending socioeconomically diverse schools is contingent on students' relative economic disadvantage compared to their peers. The coefficient for the interaction term in Model 5 is negative for both medium-SES and high-SES schools and especially significant for high-SES schools. The results thus suggest that for students who attend these two types of schools, the positive association between socioeconomic diversity and educational expectation is attenuated among students whose socioeconomic background put them at a disadvantage compared to their peers. This finding aligns with the mechanism suggested by the relative deprivation theory.

Table 2.5 shows the differential average marginal effects of diversity based on the level of relative deprivation students may experience at school. Noticeably, for students who go to medium-SES or high-SES schools, the positive effect of socioeconomic diversity becomes insignificant for those who experience high level of relative deprivation. The results partially supports Crosnoe's (2009) conclusion that the potential risks of school socioeconomic integration can in some situations outweigh its benefits. Yet such mechanism is not found in low-SES schools.

[Table 2.5 about here]

Based on the coefficients from Model 4 and 5, I further calculate the predicted probability of students thinking they "definitely will" or "definitely won't" graduate from college in low-SES and high-SES schools, given that the cross-level interaction term is particularly significant for the two types of schools. As shown in Figure 2.4, in low-SES schools, the influence of socioeconomic diversity is stronger among students with less educated parents. Accordingly, the parental-education-based disparity in educational expectations becomes narrower as school socioeconomic diversity increases. Turning to Figure 2.5, the results call particular attention to the potential drawback of school socioeconomic integration plans, especially in high-SES schools where lower-resourced students only constitute a small proportion of the student body. Contrary to the mechanism found in low-SES schools, lower-resourced students attending high-SES schools actually benefit less from socioeconomic diversity than their more advantaged peers do. Hence, the gap between disadvantaged students and their peers with higher relative socioeconomic standing would widen as the socioeconomic composition of the student body becomes more diverse.

[Figure 2.4 and 2.5 about here]

Discussion and Conclusion

While de facto school segregation along racial lines continues to shape the landscape of secondary education, the increasing economic segregation between and within school districts has driven students of different socioeconomic background further apart (Quillian 2012; Saporito and Sohoni 2007). In such a context, examining how school socioeconomic context shapes students' educational expectations can offer useful insights into the consequences of class-based school segregation. To that end, this study provides a more comprehensive picture of school effects by conceptualizing school mean SES and school socioeconomic diversity as two related, yet different dimensions of school socioeconomic context. The analysis goes beyond whether attending socioeconomically diverse schools helps low-SES students by investigating the differential effect of diversity across students of various socioeconomic backgrounds in three kinds of school settings.

Taken together, the positive association between socioeconomic diversity and educational expectation found in all three kinds of schools provides useful evidence that school still serves as an important site for shaping the way students estimate their chance for future educational success. In this sense, as suggested by school socioeconomic integration proponents, increasing the socioeconomic diversity of high-poverty schools has the potential to improve the educational expectations of all students and to some extent reduce the SES-based gap in expectations. Nonetheless, the results also point to the dilemma and potential drawback of school socioeconomic integration plans. Especially in the scenario where low-SES students are assigned to schools with medium or high mean SES. In this situation, although the effort to increase socioeconomic diversity will on average improve the educational expectations of all students, it might as well reproduce existing disparity in expectations, or even widen the educational expectation gap between the lower-resourced students and their more affluent peers. Based on these key findings, a few policy implications are discussed below.

First, it is especially worth noting that although the descriptive results show that school mean SES and school socioeconomic diversity have a negative correlation, their effects on students' educational expectations work in the same direction and are both significantly positive. This finding implicates one of the perils of class-based school segregation—for students attending high-poverty schools, their disadvantages resulting from the low mean SES of their schools may be even further exacerbated due to the concentration of poor students and thereby lack of socioeconomic diversity in these schools. In this sense, schools with concentrated poverty have the potential to benefit most from socioeconomic integration initiatives.

Second, the results point to heterogeneous effect of socioeconomic diversity depending on both individual-level socioeconomic background and the mean SES of one's school. Special attention should be paid to schools where lower-resourced students only account for a small proportion of the student body. In such kind of school settings, the socioeconomic disadvantages of lower-resourced students will likely become especially visible, leading to high level of relative deprivation among these students and making them unable to benefit from diversity as much as their more affluent peers. Therefore, it is crucial for policymakers to recognize the context-specific meanings of school diversity. In addition to school-level efforts to achieve more balanced socioeconomic composition, it might be beneficial to understand how increased socioeconomic diversity actually affects disadvantaged students' daily interactions with their peers and how such interactions shape their perception of their own SES.

Third, despite the differential effects of socioeconomic diversity across students with different characteristics, the positive association found between diversity and expectation is not restricted to students of certain socioeconomic background. From a policy implementation perspective, the finding implies that the benefit of attending socioeconomically diverse school for low-SES students does not have to come at the expense of their more affluent peers. Therefore, with appropriate admission incentives and continued policy efforts, there is a potential that families with more economic advantages will be willing to participate in such programs and send their kids to more integrated schools.

Importantly, since the framework of both the cultural transmission and relative deprivation theory focus mainly on lower-resourced students, additional theoretical interpretation is needed for the overall positive effect found here. As several previous studies have pointed out, the presence of peer effects might be contingent upon specific school contexts (see Burke and Sass 2013; Entorf and Lauk 2008; Minello and Barban 2012). From this perspective, one potential interpretation is, socioeconomically diverse school might in general create a learning environment that promotes positive peer effects and leads to educational optimism among all students. Especially given that unlike test scores or other educational outcomes, educational expectation is directly related to the way students perceive their chances of success in the educational system compared to their peers, and thus may be more susceptible to the influence of school context and peer effects. However, since this study does not directly test this interpretation, more future studies are needed to better understand whether school socioeconomic diversity fosters positive peer effects.

Lastly, the opposing mechanisms found in low-SES schools and high-SES schools suggest that the increase in school socioeconomic diversity doesn't necessarily guarantee that lower-resourced students will be the ones who benefit most from it. Importantly, policy makers should pay particular attention to understanding who constitute the majority of the student body in a particular school and how that may change the meaning of school diversity. Specifically, when socioeconomically disadvantaged students constitute the majority, such as in low-SES schools, increase in socioeconomic diversity may create a context that fosters positive peer effect. However, in schools where disadvantaged students are the minority, the presence of more affluent peers may indicate dominance of such students and thus inhibit disadvantaged students from benefiting from school socioeconomic integration. Therefore, in situations where economically disadvantaged students are assigned to integrated schools with higher mean SES, additional policy efforts to compensate for the lack of family resources among these students and help them better navigate diverse learning environments could potentially go a long way.

Table 2. 1: Descriptive statistics for dependent and independent variables

	Low-SES schools	Medium-SES schools	High-SES schools
Dependent variable (how likely to graduate from college)			
Definitely won't (Freq, %)	7,731 (21%)	6,124 (16%)	3,140 (8%)
Probably won't (Freq, %)	6,270 (17%)	5,402 (14%)	3,201 (8%)
Probably will and (Freq, %)	8,605 (23%)	9,086 (23%)	8,503 (21%)
Definitely will (Freq, %)	14,432 (39%)	18,246 (47%)	25,294 (63%)
School-level characteristics			
School socioeconomic diversity (standardized, ranging from -2.8 to 5.0)	.67 (1.03)	.01 (.64)	-.74 (.72)
School mean SES	13.01 (.64)	14.14 (.41)	15.46 (.71)
School racial diversity (ranging from 0 to 1)	.38 (.22)	.31 (.22)	.27 (.19)
Proportion of black students	.21 (.24)	.11 (.19)	.05 (.09)
Individual-level characteristics			
Parental education	13.14 (2.55)	14.25 (2.42)	15.55 (2.29)
Relative deprivation (ranging from 0 to 1)	.36 (.26)	.37 (.27)	.34 (.31)
Single-parent household (Yes coded as 1)	.34 (.47)	.28 (.45)	.20 (.40)
Gender (Female coded as 1)	.54 (.50)	.53 (.50)	.48 (.50)
Race: Black	.22 (.41)	.11 (.32)	.04 (.21)
Race: Hispanic	.15 (.36)	.06 (.24)	.04 (.20)
Race: Asian	.02 (.15)	.03 (.16)	.04 (.20)
Race: Other	.05 (.22)	.05 (.23)	.05 (.21)
College-prep track (Yes coded as 1)	.42 (.49)	.49 (.50)	.68 (.47)
GPA (ranging from 1 to 9)	5.82 (1.97)	5.98 (1.97)	6.28 (1.91)
Skipping schools (Yes coded as 1)	.30 (.46)	.33 (.47)	.31 (.46)
N (Students)	37,038	38,858	40,138
N (Schools)	385	342	324

Table 2. 2: Coefficients from fixed-effect ordered logistic regression models predicting students' educational expectations

	Low-SES schools			Medium-SES schools			High-SES schools		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
School-level									
School socioeconomic diversity	.193***	.174***	.197***	.189***	.078†	.099*	.302***	.158**	.168**
	(.030)	(.031)	(.031)	(.043)	(.046)	(.046)	(.055)	(.052)	(.052)
School mean SES	.317***	.155***	.295***	.712***	.451***	.620***	.971***	.564***	.691***
	(.044)	(.046)	(.046)	(.074)	(.079)	(.080)	(.055)	(.052)	(.052)
School racial diversity	.322*	.467**	.487***	.199	.483***	.503***	-.090	.212	.238
	(.145)	(.150)	(.150)	(.134)	(.146)	(.146)	(.170)	(.163)	(.163)
Proportion of black students	.515***	.196†	.201†	.598***	.587***	.593***	.250	.173	.173
	(.102)	(.111)	(.111)	(.124)	(.140)	(.141)	(.280)	(.271)	(.272)
Individual-level									
Parental education		.126***			.150***			.155***	
		(.004)			(.004)			(.005)	
Relative deprivation			-1.064***			-1.250***			-1.084***
			(.040)			(.038)			(.023)
Raised in single-parent household		-.070**	-.067**		-.092***	-.091***		-.140***	-.141***
		(.023)	(.023)		(.024)	(.024)		(.027)	(.027)
Gender (Female)		.081***	.080***		.024	.025		.052*	.049*
		(.021)	(.021)		(.021)	(.021)		(.023)	(.023)
Race: Black		.474***	.472***		.349***	.343***		.326***	.316***
		(.035)	(.035)		(.042)	(.042)		(.061)	(.061)
Race: Hispanic		.282***	.262***		.115**	.100*		.063	.013
		(.040)	(.040)		(.048)	(.048)		(.058)	(.057)
Race: Asian		.782***	.787***		.324***	.316***		.397***	.378***
		(.088)	(.087)		(.074)	(.074)		(.071)	(.071)

Race: Other		.166*** (.049)	.172*** (.049)		.047 (.048)	.044 (.048)		-.097† (.054)	-.109 * (.053)
College-prep track		1.473*** (.024)	1.482*** (.024)		1.489*** (.024)	1.495*** (.024)		1.233*** (.026)	1.245*** (.026)
GPA		.229*** (.006)	.229*** (.006)		.278*** (.006)	.278*** (.006)		.331*** (.007)	.331*** (.007)
Skipping schools		-.122*** (.023)	-.119*** (.023)		-.120*** (.022)	-.118*** (.022)		-.126*** (.025)	-.126*** (.024)
Year	.038*** (.003)	.035*** (.003)	.036*** (.003)	.023*** (.003)	.022*** (.003)	.022*** (.003)	.025*** (.003)	.021*** (.002)	.021*** (.002)
Threshold 1	75.110	70.289	71.375	43.701	44.230	44.418	46.906	41.895	42.239
Threshold 2	76.049	71.414	72.498	44.570	45.304	45.490	47.756	42.919	43.258
Threshold 3	77.115	72.743	73.823	45.634	46.700	46.883	49.023	44.504	44.838
Log likelihood	-46,934	-42,012	-42,083	-47,375	-41,188	-41,230	-38,559	-33,779	-33,822
N (Students)		37,038			38,858			40,138	
N (Schools)		385			342			324	

The significance levels are indicated as following: 90% (†), 95% (*), 99 %(**), and 99.9 %(***).

Table 2. 3. Coefficients from random-effect ordered logistic regression models predicting students' educational expectations

	Low-SES schools		Medium-SES schools		High-SES schools	
	Model 4	**Model 5**	**Model 4**	**Model 5**	**Model 4**	**Model 5**
School-level						
School socioeconomic diversity (SSD)	.170***	.199***	.077†	.104*	.154**	.174***
	(.031)	(.031)	(.046)	(.046)	(.052)	(.052)
School mean SES	.157***	.297***	.454**	.628***	.565***	.695***
	(.046)	(.046)	(.079)	(.080)	(.052)	(.052)
School racial diversity	.482***	.486***	.486***	.506***	.210	.233
	(.150)	(.151)	(.146)	(.146)	(.162)	(.164)
Proportion of black students	.186†	.193†	.568***	.579***	.165	.179
	(.111)	(.111)	(.140)	(.141)	(.270)	(.273)
Individual-level						
Parental education	.130***		.149***		.152***	
	(.005)		(.006)		(.007)	
Relative deprivation		-1.078***		-1.247***		-.1.070***
		(.047)		(.048)		(.048)
Raised in single-parent household	-.067**	-.066**	-.091***	-.091***	-.140***	-.141***
	(.023)	(.023)	(.024)	(.024)	(.028)	(.028)
Gender (Female)	.082***	.081***	.024	.024	.052*	.052*
	(.021)	(.021)	(.021)	(.021)	(.023)	(.023)
Race: Black	.482***	.480***	.360***	.360***	.337***	.335***
	(.036)	(.036)	(.043)	(.043)	(.061)	(.061)
Race: Hispanic	.263***	.259***	.092†	.088*	.040	.010
	(.041)	(.041)	(.049)	(.049)	(.059)	(.058)
Race: Asian	.779***	.786***	.323***	.316***	.392***	.374***
	(.088)	(.088)	(.074)	(.074)	(.071)	(.071)
Race: Other	.171***	.177***	.048	.047	-.093†	-.102†
	(.049)	(.049)	(.048)	(.048)	(.054)	(.054)
College-prep track	1.469***	1.480***	1.487***	1.491***	1.228***	1.235***
	(.024)	(.024)	(.024)	(.024)	(.026)	(.026)
GPA	.229***	.229***	.278***	.279***	.332***	.332***
	(.006)	(.006)	(.006)	(.006)	(.007)	(.007)
Skipping schools	-.121***	-.119***	-.119***	-.118***	-.126***	-.128***
	(.023)	(.023)	(.022)	(.022)	(.025)	(.025)
Year	.035***	.036***	.022***	.022***	.021***	.021***
	(.003)	(.003)	(.003)	(.003)	(.002)	(.002)
Cross-level interaction						
Parental education × SSD	-.016***		-.005		-.003	
	(.005)		(.008)		(.009)	
Relative deprivation × SSD		.044		-.126†		-.271***
		(.045)		(.073)		(.067)
Threshold 1	69.793	71.495	44.182	44.094	41.513	41.789
Threshold 2	70.922	72.620	45.259	45.170	42.543	42.815
Threshold 3	72.254	73.948	46.658	46.568	44.135	44.405
Log Likelihood	-41,995	-42,074	-41,173	-41,207	-33,760	-33,790
N (Students)	37,038		38,858		40,138	
N (Schools)	385		342		324	

Note: The significance levels are indicated as following: 90% (†), 95% (*), 99 %(**), and 99.9 %(***).

Table 2. 4. Average marginal effects (AMEs) of school socioeconomic diversity depending on students' parents' education (in low-SES schools)

Parents' education	AMEs of Diversity in Low-SES Schools
8 years of schooling	.039***
(Grade school or less)	(.006)
10 years of schooling	.036***
(Some high school)	(.005)
12 years of schooling	.033***
(Completed high school)	(.005)
14 years of schooling	.028***
(Some college)	(.006)
16 years of schooling	.023***
(Completed college)	(.006)
18 years of schooling	.017*
(Graduate or professional school)	(.007)

Note: N=37,038 students, 385 schools for the low-SES schools subset. The AMEs calculated here are the marginal effect of socioeconomic diversity on the "definitely will" responses. Coefficients used in the calculation are from Model 4. The significance levels are indicated by asterisks: 95% (*), 99 %(**), and 99.9 %(***).

Table 2. 5. Average marginal effects (AMEs) of school socioeconomic diversity depending on the level of relative deprivation (in medium-SES and high-SES schools)

Level of relative deprivation	AMEs of Diversity in Medium-SES Schools	AMEs of Diversity in High-SES Schools
Low	.027**	.043***
	(.010)	(.009)
Medium	.018*	.032***
	(.008)	(.009)
High	.010	.009
	(.009)	(.011)

Note: N=38,858 students, 342 schools for the medium-SES schools subset. N=40,138 students, 324 schools for the high-SES schools subset. The AMEs calculated here are the marginal effect of socioeconomic diversity on the "definitely will" responses. Coefficients used in the calculation are from Model 5. Low, medium, and high level of relative deprivation correspond to the 10^{th}, 50^{th}, and 90^{th} percentile points of relative socioeconomic disadvantage variable, respectively. The significance levels are indicated by asterisks: 95% (*), 99 %(**), and 99.9 %(***).

Figure 2. 1. Cross-Cohort Increase in Students' Educational Expectations

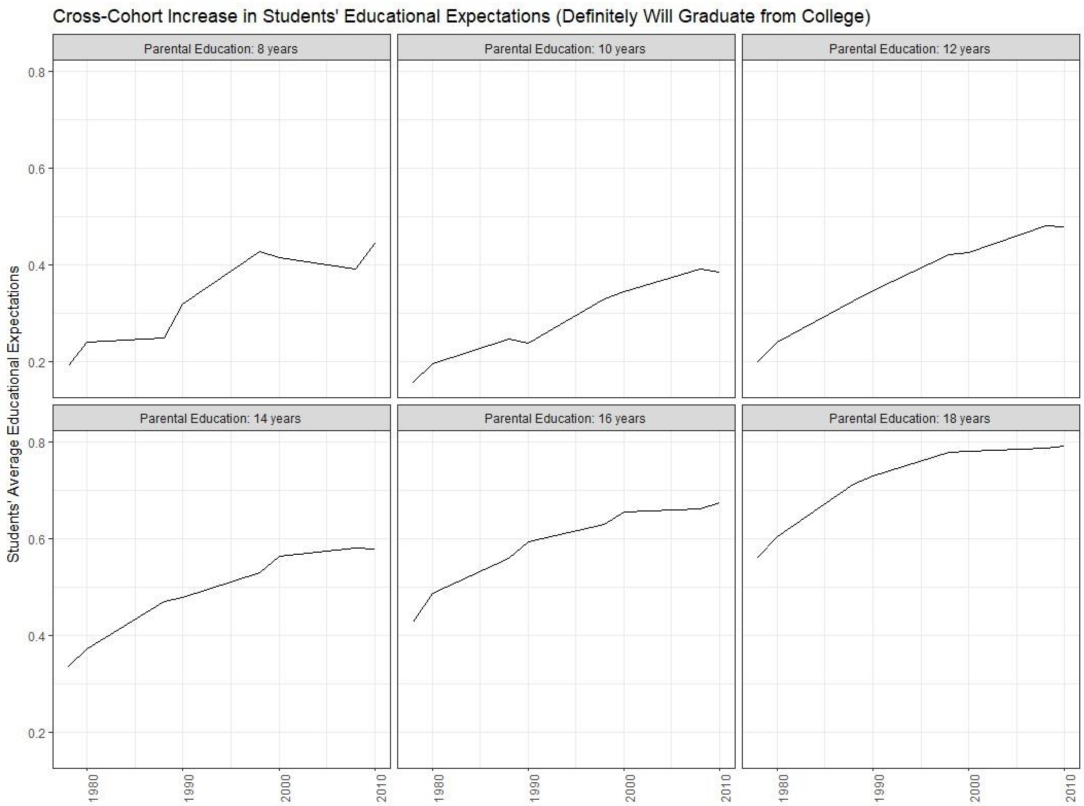


Figure 2. 2. The Association between School Mean SES and School Socioeconomic Diversity across Four Decades

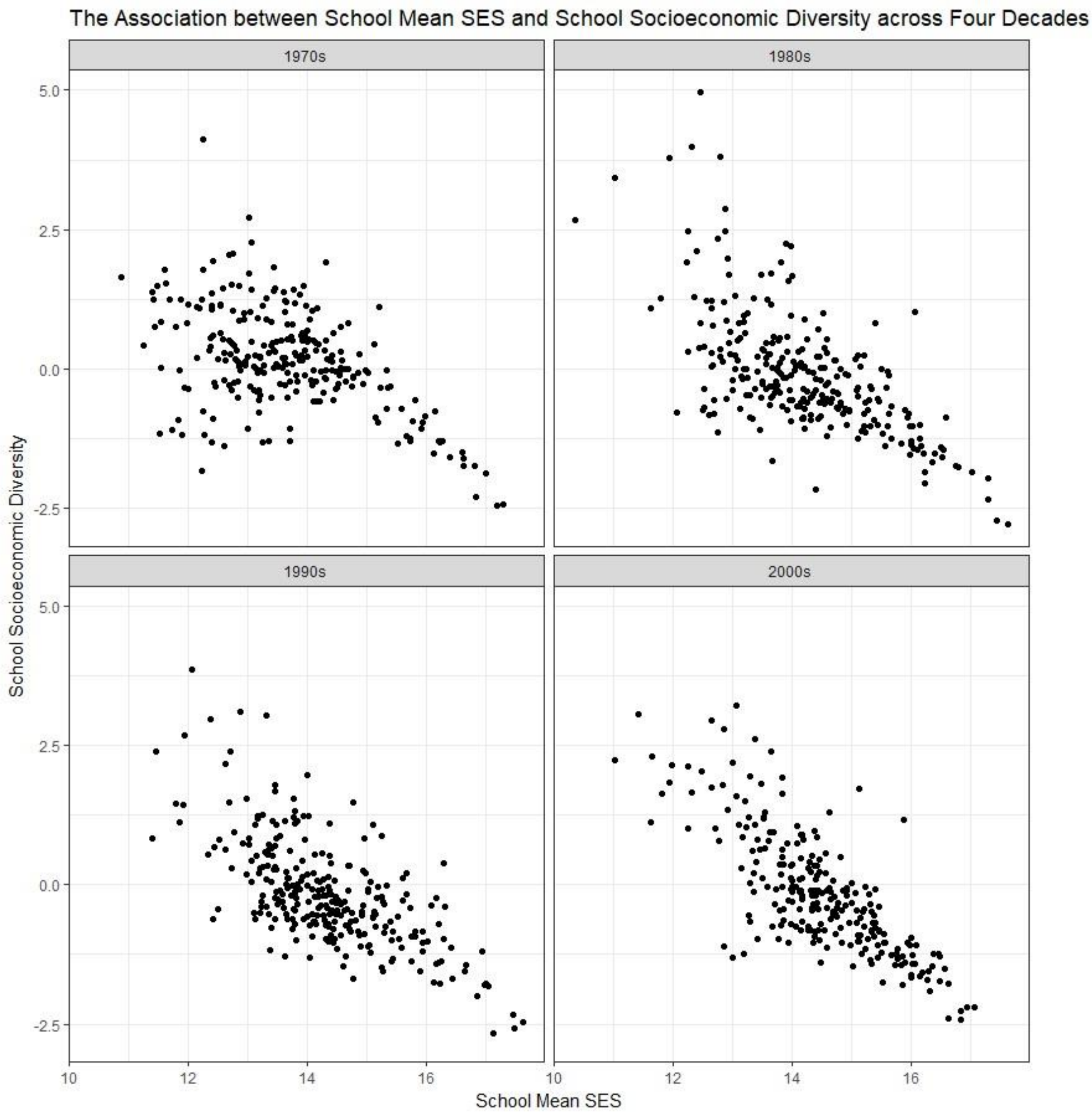


Figure 2. 3. Changes in School Socioeconomic Diversity across Four Decades

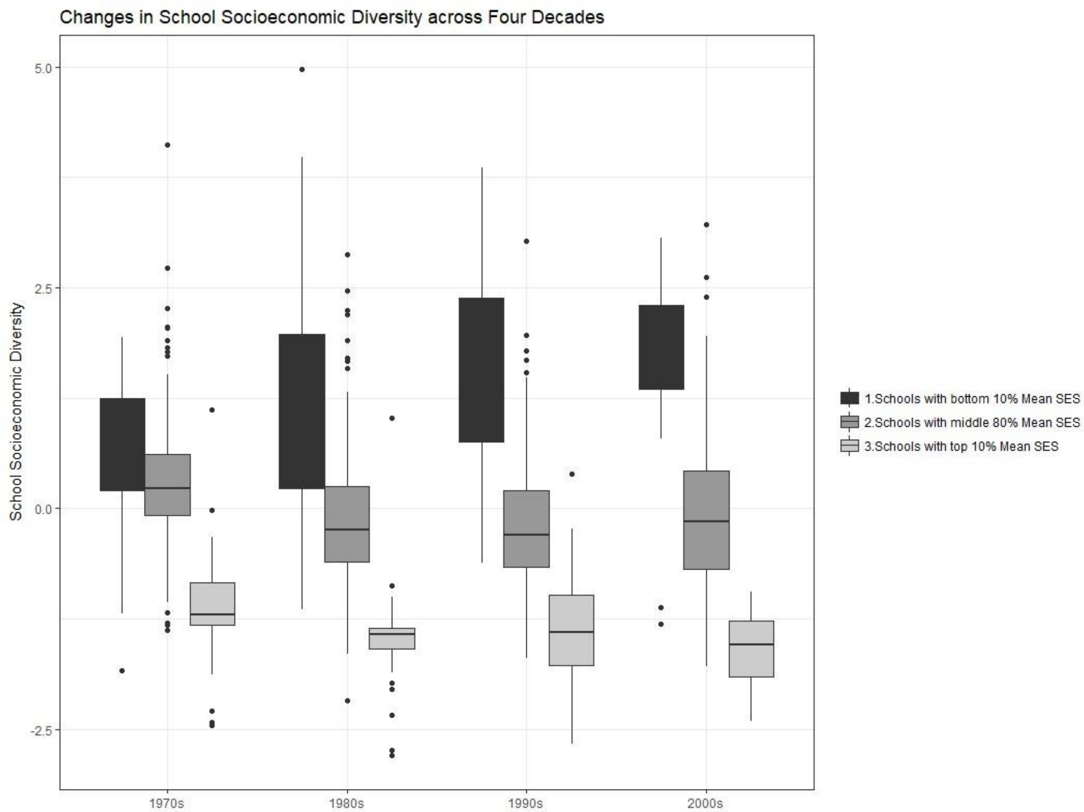


Figure 2. 4. Narrower Expectation Gap as Socioeconomic Diversity Increases in Low-SES Schools

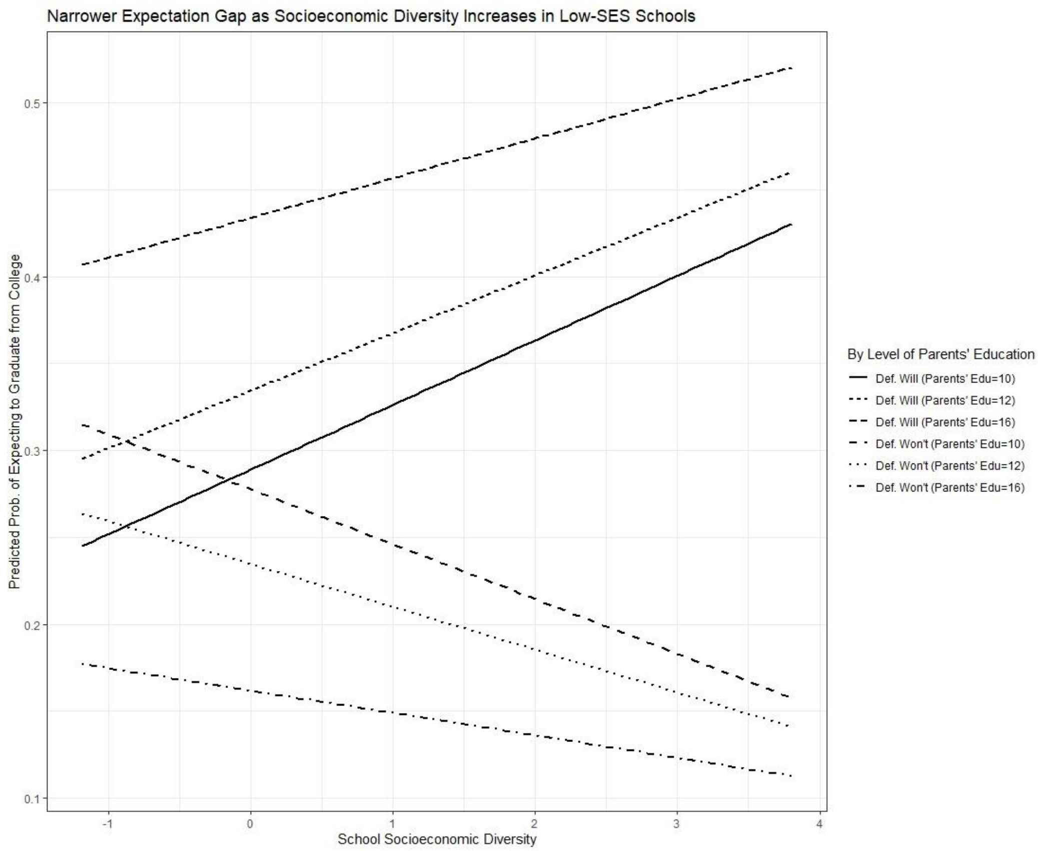
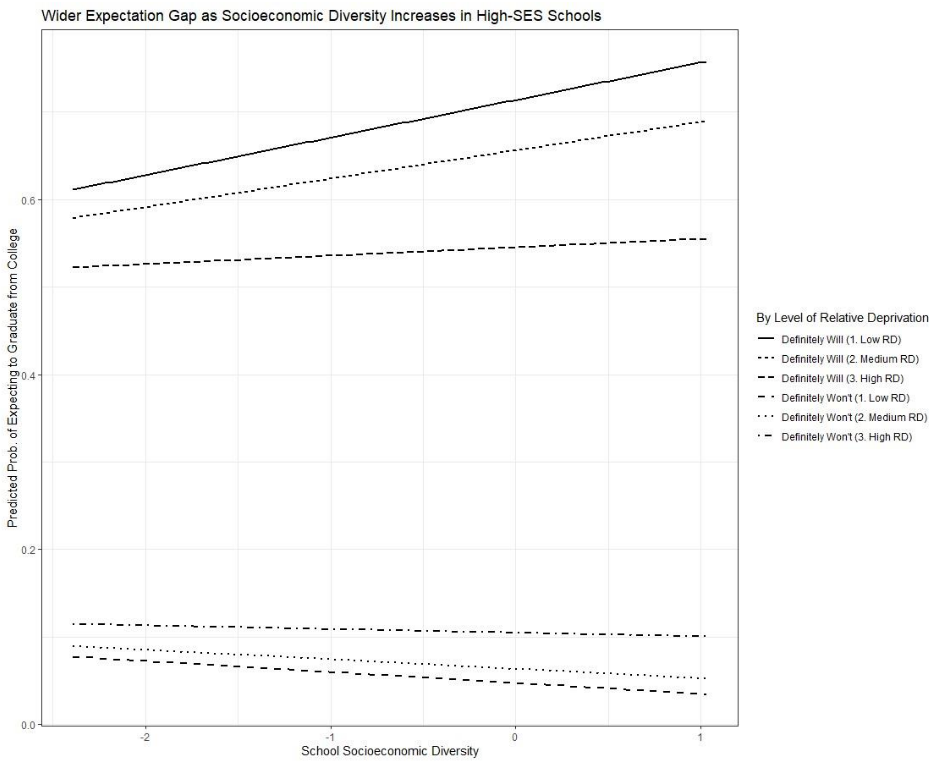


Figure 2. 5. Wider Expectation Gap as Socioeconomic Diversity Increases in High-SES Schools



CHAPTER III:
Is School Segregation Self-Perpetuating?—a Matching Analysis to Understand the Relationship Between School Racial Diversity and Students' Racial Preferences

Introduction

Increasing school racial diversity has often been seen as a key aspect of improving educational equity. Despite the milestone victory in the case of Brown v. Board of Education in 1954, de facto school segregation along the racial lines has remained a challenge for U.S. policy makers and educators. Largely due to persistent neighborhood segregation and the lifting of desegregation orders and retreat from forced busing, scholars have documented a slowdown or even a reversal of the trends toward school racial desegregation especially since the 1990s (Stroub and Richards 2013). Although the share of nonwhite students has grown steadily thanks to the continued increase of Hispanic and Asian population, it has been shown that black students' exposure to white students in American schools actually dropped from 1989 to 2010 (Orfield et al. 2014, Reardon, Yun and Eitle 2000).

A large amount of literature has been devoted to examining the relationship between school racial context and students' academic aspiration and achievement (Goldsmith 2004a; Rumberger and Palardy 2005; Mickleson 2002; Lee 2007; Mickleson, Bottia and Lambert 2013, Kainz and Pan 2014). For example, Berends and Penaloza

(2010) analyzed data across three decades and found that increase in school racial segregation is associated with larger white-nonwhite gap in test scores. Similarly, using data from Add Heath, Lee (2007) found that there is a significant relationship between school racial composition and students' test scores, even after the racial composition of a student's peer group is adjusted for. However, in comparison, the relationship between school racial context and students' racial attitudes or preferences remains an understudied area (Joyner and Kao 2000; Wells and Crain 1994). Nevertheless, exploring the formation of students' racial attitudes within the school context is a vital step toward understanding whether current school segregation, as well as pro-segregation racial attitudes, may have the tendency to reinforce themselves in the long run. To that end, this chapter aims to examine the relationship between school racial diversity and students' race-related school preferences and explores whether schools serve as a site where pro-segregation ideologies are reproduced or transformed. Methodologically, this analysis hopes to extend extant literature by applying propensity score matching methods to reduce potential selection bias due to nonrandom assignment of students into schools with different level of racial diversity.

Racial Attitudes, School Preferences and School Segregation

Education scholars have long been interested in understanding the persistence of de facto school segregation. Previous studies have shown that school preference, or parental school choice, has played a vital role in shaping the level of school segregation, especially in an era when forced busing faded as a policy priority and more alternative schooling options became available to parents (Billingham and Hunt 2016; Kimelberg and Billingham 2013; Roda and Wells 2013). On a more aggregated level, previous studies have shown that allowing parents to have school choice options tends to exacerbate school segregation (Sohoni and Saporito 2009; Garcia 2008), resulting in a higher level of racial segregation in schools than in the local areas where schools are located. In particular, parents who hold racial biases are least likely to enroll their children in schools with a higher share of racial minorities (Billingham and Hunt 2016). However, the opposite side of the causal link—whether attending racially homogenous schools leads to students' pro-segregation attitudes in the first place—has yet to be sufficiently examined. Answers to this question, nonetheless, could have important implications for understanding future dynamics of school segregation.

Within the broad literature on racial context, prior studies suggested that there are reciprocal relationships among racial context, interracial interactions, and racial attitudes. Particularly, interracial contact is usually structured by the demographic composition of the local context, and the amount of interracial contact will in turn influence how people perceive peers of other race and shape their race-rated attitudes. For example, evidence has shown that interracial friendship is more common when there is higher racial diversity in either school, neighborhood, or workplace (Joyner and Kao 2000; Moody 2001; Powers and Ellison 1995; Stein, Post and Rinden 2000). Moody (2001) further pointed out that while racial homophily (through the formation of friendship within the same race) tends to increase in moderately diverse schools, such friendship segregation declines in highly diverse schools. Additionally, Moody's study suggests that increased interracial interaction, such as through racial mixing within tracks, promote the formation of friendship with other races (Moody 2001).

Although scholars in general agreed that higher racial diversity in these contexts is usually associated with more intergroup interactions, no consensus has been reached regarding how increased interracial contact might affect racial attitudes. Prior studies have provided explanations that in general fall into two historical schools of thought—the contact hypothesis and threat theory. On the one hand, according to the contact hypothesis, more social interaction with members of a different racial group is likely to reduce prejudice and foster positive attitudes toward that race (Allport 1954, Barnard and Benn 1988). Consistent with the argument, several studies have shown that increasing interracial contact and friendship in schools, neighborhoods and other settings can contribute to positive attitudes toward other race groups (Powers and Ellison 1995, Jacobson and Johnson 2006, Fischer 2001, Sigelman and Welch 1993, Yancey 1999).

On the other hand, the threat hypothesis pays particular attention to how the proportion of racial minorities in an area shapes the ways the dominant race grorup members perceive racial minorities (Craig and Richeson 2014). It argues that as the share of a minority group grows in an area, increased interracial contact may trigger hostile attitudes toward the minority group among members of the dominant race. The theory further hypothesizes that this hostile reaction may be triggered especially when the dominant race group members perceive growing competition or threat posed by people of other races (Blalock 1967). Driven by this hypothesis, an increasing number of studies have begun to focus on how changes in racial composition affect interracial trust and other racial attitudes, especially in larger contexts, such as counties or metropolitan areas

(Oliver and Mendelberg 2000, Tolbert and Grummel 2003). For instance, a few studies found that living in areas with a large proportion of African American residents would increase the likelihood of holding anti-black sentiments among white residents (Glaser 1994, Taylor and Mateyka 2011, Kaufmann and Harris 2015).

Although the two theories seem to contradict each other, a few scholars pointed out that the threat theory actually can be conceived as an extension of the contact hypothesis. Whether intergroup contact reduces or intensifies prejudice may depend on the specific context (DeFina and Hannan 2009). Compared to the contact hypothesis, the threat theory tends to be more relevant in contexts where resources are limited or inequality of resources is more acute (Abascal and Baldassarri 2015). For example, Branton and Jones (2005) found that the association between living in a racially diverse area and showing lower level of support for race-related social issues only holds true in counties with low socioeconomic status. Other scholars argued that both the contact and threat/competition mechanisms may also co-exist in the same context (Schmid, Ramiah, and Hewstone 2014, Goldsmith 2004b), leading to mixed findings about the effect of diversity on racial attitudes.

Noticeably, the majority of studies examining the two theories focused on residential contexts, including neighborhoods, counties, and metropolitan areas. Only a limited number of studies explicitly explored the formation of racial attitudes within the school context (Jacobson 1979, Joyner and Kao 2000). Consistent with the contact hypothesis, multiple studies found evidence that attending a racially diverse school is associated with either more positive attitudes toward other races or higher likelihood of having interracial relationship/interaction later in life (Emerson, Kimbro and Yancey

2002, Braddock 1989, Butler 2010). On the other hand, partially consistent with the racial threat hypothesis, Longshore (1982) found that in general, a higher percentage of black students is linearly associated with greater white hostility within schools, but white students' attitudes toward school desegregation are most negative in schools with balanced racial composition. Combining the perspectives from both theories, Goldsmith (2004b) showed that the level of both interracial conflict and interracial friendliness are positively associated with the level of school racial heterogeneity. Importantly, Goldsmith (2004b) pointed out that students tend to avoid interracial interaction in schools where two races account for same percentage in the student population.

Despite not directly focusing on racial attitudes, another line of literature points out that school racial context plays an important role in shaping student's attachment or attitudes toward school (Goldsmith 2004a, Cheng and Klugman 2010). Although a large amount of literature has shown that attending racially heterogeneous schools can have a beneficial influence on students' academic outcomes, some scholars argued that it might be challenging for students to develop a sense of belonging when the majority of their peers are from different race or ethnic groups (Johnson, Crosnoe and Elder Jr 2001). For example, Johnson and colleagues (2001) found that students who attend middle or high schools where peers of their own race account for a larger proportion tend to develop high level of school attachment. Similarly, Goldsmith (2004a) found that for both Black and Hispanic students, those who attend predominantly minority schools are more likely to hold optimistic beliefs towards school than their peers in predominantly white schools. These finding suggests that despite increased exposure to peers of other races in a diverse environment, the challenges racial minority students face in developing school attachment may still discourage their involvement in school activities with their peers.

Given the mixed evidence mentioned above, it remains unclear whether attending schools with high racial diversity might curb or promote pro-segregation attitudes. If attending a diverse school is associated with increased interracial interaction and more positive attitudes toward other races as the contact hypothesis assumes, students who are in diverse school may tend to oppose school racial segregation. If a diverse school racial context actually triggers hostile sentiment against different race groups or makes it more challenging for students to find a sense of attachment, it might be possible that those who are in diverse schools would in turn prefer to attend schools with their own race and adopt pro-segregation attitudes. Furthermore, given that the majority of studies reviewed above did not account for potential bias due to non-random assignment of students into their current school, it might also be likely that students or their parents who are already against school segregation have selected themselves or their kids into attending more diverse schools. This chapter hopes to minimize the influence of selection bias by using a quasi-experimental design and provide new insights into the debate regarding how racial context shapes racial attitudes.

Methodological Challenges

Applying a causal inference framework, the outcome of interest in this study is students' race-related school preferences, while the treatment in this study can be conceived as attending a racially diverse school. It has been pointed out that the key methodological challenges while studying the influence of school contexts usually result from the lack of random treatment assignments and concerns of selection bias (Nash 2003). In an ideal experimental setting, in order to accurately capture the treatment effect, it is crucial to ensure random assignment of treatment so that treated and untreated individuals can be as similar as possible on other characteristics. However, given the uneven geographical distribution of available school options and various school preferences of students' parents, students are never randomly assigned to the school they attend. For this reason, it is likely that students who are enrolled in racially diverse schools may differ significantly in socioeconomic characteristics or previous schooling history. For example, it is possible that students who used to attend a diverse elementary school or who live in a diverse neighborhood are more likely to "select" themselves into attending racially diverse high schools. If so, estimating the influence of school racial context without considering potential selection bias may lead to biased results. Therefore, in order to minimize the influences of potential selection bias, this chapter will utilize matching methods, which facilitates estimation of causal effects in non-experimental settings by ensuring that individuals in the treatment group and those in the control group are as similar as possible in terms of the distributions of observed covariates.

As one of the most frequently used matching methods, propensity score matching relies on the key concept of conditional probability of being assigned to the treatment group, which is calculated as the propensity score. In principle, if two individuals are similar in all characteristics, their likelihood of receiving the treatment would also be similar (Austin 2011). Observations with similar propensity scores are then grouped together to achieve covariates balance between treated and untreated individuals, although different matching strategies can generate various matching results. For example, greedy matching optimizes one matched set at a time among the available pool of control individuals, although matched sets formed after the first few matches might perform poorly due to limited pool of leftover observations (Gu and Rosenbaum 1993). In contrast, optimal matching prioritizes minimizing total distance between treatment and control groups across all matched sets (Hosman and Gurm 2015, Rosenbaum 2002). Gu and Rosenbaum (1993) found that while optimal matching generates more closely matched pairs (measured as within-pair distance) than greedy matching, the two algorithms do not differ significantly in terms of the balance of matched sample. They also pointed out that the advantage of optimal matching over greedy matching is more noticeable when the number of controls available for matching is limited (Gu and Rosenbaum 1993).

Full Matching As an Alternative Approach

Alternatively, full matching combines the idea of stratification and matching by forming matched sets each consisting of either one treated observation and one or more untreated observations, or one or more treated observation and one untreated observations (Austin and Stuart 2015, Hansen 2004). While traditional matching methods, either pair matching or k:1 matching, requires each treated observation to be matched with the same number of control observations, full matching is considered a more flexible approach in the sense that it allows the size of matched set to vary in order to minimize the global distance between treated and control groups. Additionally, full matching prevents the issues of sample reduction after matching by utilizing all available observations (Hansen 2004).

Multiple studies have shown that full matching generates more balanced matched sets, especially when there is noticeable difference between individuals in treatment and control groups (Stuart and Green 2008; Hosman and Gurm 2015). Particularly, if there are many untreated observations at the lower end of the propensity score distribution, full matching will allow multiple untreated individuals to be matched with each treated individual. On the other hand, if there are only a few untreated observations at the higher end of the propensity score distribution, multiple treated individuals will be matched to one untreated observations (Hansen 2007; Stuart and Green, 2008). In doing so, full matching allows all available observations to be utilized and avoids discarding treated individuals without sufficient matches. Additionally, since the ratio of treated to control observations is flexible, full matching may sometimes produce matched sets that vary significantly in size. Therefore, compared to unconstrained full matching, constrained full matching allows the option to limit the treated to control ratio in each matched set (Hansen 2004). A common practice is to set such limit to no less than half of the actual ratio of treated to control in the sample and no larger than twice the actual ratio (Hansen 2004, Stuart and Green 2008).

Given the advantages mentioned above, this chapter will utilize full matching to maximize the covariate balance between students who attend racially diverse schools and those attending schools with less diverse racial composition. Both full matching without constraints and constrained full matching will be applied to search for the optimal covariance balance results. In addition, greedy 1:1 nearest neighbor matching and optimal 1:1 matching will be used as baseline reference points to evaluate if full matching is more effective in reducing covariance imbalance. In the results section, I will compare the matched samples generated from the four different matching approaches (greedy 1:1 nearest neighbor matching, optimal 1:1, unconstrained full matching, and constrained full matching) to determine which method exhibit best performance. The matched sample with the highest level of covariance balance will then be used for the second step of the analysis.

Data and Method

This study utilizes data from the Monitoring the Future study (MTF), a nationally representative sample of approximately 16,000 12th graders annually drawn from around 130 public and private schools since 1975. MTF selects up to 350 high school seniors within each school, with almost all students sampled for schools with less than 350 students. For the purpose of combing the MTF data with the most recent U.S. census data from 2010, I use cross-sectional MTF data from 2008 and 2010 in my analysis. MTF data from 2009 are not included because all selected schools participated in the MTF study for two consecutive years, with only half of selected schools being replaced with newly selected schools every year. Thereby half of the schools in the 2009 sample were actually the same as half of the 2008 sample. When the 2008 and 2010 samples are combined, 29,704 12th-grade students from 246 high schools participated in the MTF study. Based on the demographic characteristics of every student surveyed in each school, I construct several school-level variables to capture school-level socioeconomic and racial characteristics. In addition to the basic demographic and socioeconomic questions, multiple forms of questionnaires with emphasis on different topics were randomly assigned to a subsample of students in each school. One of the six forms contains a series of measures on race-related experiences, attitudes, and preferences. Therefore, students included in my analysis are those who responded to this form of the questionnaire. The group accounted for about 1/6 of the total number of respondents from 2008 and 2010. After omitting observations with missing values on racial attitudes-related items from this form, 4381 high school seniors are included in my analysis. Additionally, county-level census data from 2010 are combined with the MTF data to account for racial composition of the county where each school is located.

Outcome Variable

The outcome variable of the study is students' future school preferences regarding racial composition, based on students' answer to the following question: "How would you feel about having your (future) children go to schools where all the children are of your race". The response is coded as a scale ranging from 1 to 4, representing not at all acceptable, somewhat acceptable, acceptable, and desirable.

Attending Racially Diverse School as "Treatment"

School racial diversity is captured using the index of diversity. Similar to the heterogeneity index multiple studies have used to capture the racial distribution of a community (Moody 2001, Branton and Jones 2005), the racial diversity index is constructed as the probability that two students randomly selected from each school are from different race/ethnic groups, ranging from 0 to 1. Five race/ethnic categories are considered in creating the racial diversity index, including white, black, Hispanic, Asian, and other. The formula for the racial diversity index is shown in Equation (1), r_{ij}

represents the number of students of the i race/ethnicity in school j, and n_j is the total number of seniors in that school. A binary indicator is then created based on the distribution of racial diversity across all schools in the dataset to indicate whether a school has high racial diversity. The 75% percentile point is used as the cutoff for defining high-diversity school, which approximately corresponds to a racial diversity index of .6. In Moody's study (2001), he found that the likelihood of friendship within one's own race started to decline significantly as the racial diversity index moved above the intermediate range (approximately above .6). Therefore, the cutoff point is chosen to capture the potentially meaningful difference between highly diverse schools and schools with low or medium-levels of racial diversity.

$$\text{Racial Diversity}_j = 1 - \sum_{i=1}^{5}\left(\frac{r_{ij}}{n_j}\right)^2 \tag{1}$$

Matching Variables for Propensity Score Estimation

In order to estimate the propensity score, the likelihood of attending a highly racially diverse school is modeled using a logistic regression model. The logistic model is fit separately for white and non-white students, given that white and non-white population are likely to perceive and evaluate school racial composition differently (Lankford and Wyckoff 2006). The following covariates are included in the propensity score model: student's race (for the non-white subset), gender, parent's education level, previous interracial interactions through interracial friendship, in elementary school and neighborhood contexts, and how positive previous interracial interactions are. Students' parental education levels include six categories, ranging from completed grade school or less, some high school, completed high school, some college, completed college, to graduate or professional school. Previous interracial friendship is captured using the following six categories, including 1) all close friends are the same race, 2) almost all close friends are the same race, 3) most close friends are the same race, 4) half of close friends are the same race, 5) most close friends are other races, 6) and almost all close friends are other races. Similarly, depending on the race of a student's elementary school classmates and neighbors, the same six categories are used to measure students' interracial exposure in their elementary school and neighborhood contexts. To control for the racial composition in the local area, I also include a variable derived from the census data to adjust for the proportion of school-aged population of the same race in the county where that school is located. Additionally, previous studies have pointed out that school quality is an important consideration when parents select schools for their kids (Roda and Wells 2013) and school mean SES is often perceived as an indicator of school quality (Perry and McConney 2010; Crosnoe 2009). Therefore, I also include school mean SES in the propensity score model to account for school choices school quality. School mean SES is calculated as the average level of students' parents' education (in years of parental schooling).

Covariance Balance Evaluation

A key step in determining the effectiveness of the matching procedure is to evaluate the balance of observed covariates. A commonly used measure of balance is the standardized mean difference (SMD), which is calculated as the difference in means of a particular covariate between treatment and control groups divided by the standard deviation in the treatment group in the unmatched sample (Stuart, Lee, and Leacy 2013).

The closer the difference is to zero, the more balanced the treatment and control groups are with regard to a specific covariate. Previous studies usually recommend 0.1 and 0.25 as the thresholds for covariance balance (Rubin 2001). While a SMD smaller than .1 is desirable, a SMD between .1 and .25 may be considered reasonably acceptable bias. In addition to examining differences in covariance, previous studies also recommend utilizing the prognostic score, which can be calculated by fitting a model for the outcome variable among untreated observations and applying the model to predict baseline outcome under control condition for all individuals (Hansen 2008, Stuart, Lee, and Leacy 2013). Therefore, this study will compare SMDs in both covariates and prognostic score between treatment and control groups after matching.

Estimation of Treatment Effect

While estimating the treatment effect after matching, it is crucial to take into account the structure of the matched set based on the particular matching method. For matched set obtained from full matching, previous studies suggested two commonly used approaches for treatment effect estimation. First, a fixed-effect regression model can be utilized to allow for the random intercept or treatment effect to vary across different matched sets (Hansen 2004). The average treatment effect is then estimated by averaging the treatment effect across all matched sets. Second, a weighing approach instead calculates weights for each individual in the matched sample and applies these weights in the regression model of the outcome variable. The calculation of such weights depend both on the particular matching methods used and the causal inference estimator of interest. For example, In order to estimate the average treatment effect on the treated

(ATT), weights can be derived from the matched sets formed by the full matching strategy. ATT weights are calculated within every matched set as follows: each treated observation will be assigned a weight of 1, while the weight of each untreated observation is constructed as the number of treated observations in the specific matched set divided by the number of untreated observations in the matched set (Stuart and Green 2008). Additionally, the weights for control groups are scaled across all matched sets to equal the total number of uniquely matched control observations (Stuart and Green 2008). In this analysis, I will apply both approaches and compare the difference in the estimated treatment effect of attending a racially diverse school.

Results

As mentioned earlier, due to race-based school preferences, white and non-white parents may perceive the desirability of a school differently and make different school choices for their children. Therefore, I stratify the analyses by race and all models are run separately for white and non-white subsamples. First, for both the white and nonwhite subsamples, characteristics of students attending a high-diversity school (treatment group) and those attending a low-diversity school (control group) are summarized in Table 1a and 1b. Overall, regardless of students' race, those who are in high-diversity schools are more likely to have had friends of different races, or more exposure to other races in elementary school and neighborhood settings. The proportion of the school-aged population of same race and ethnicity in local area is also higher among students who go to low-diversity schools. However, students who go to high-diversity school do not differ from their peers in low-diversity schools in terms of how positive their previous interracial interaction experience was.

[Table 3.1 and 3.2 about here]

Figure 3.1 and 3.2 show the odds ratio of attending high-diversity schools associated with each matching variable. Consistent with the patterns observed in Table 3.1 and 3.2, for both white and non-white students, previous interracial friendship and exposure to other races in the neighborhood context are all significantly associated with higher likelihood of attending a high-diversity school. However, exposure to other races in elementary school is not a significant predictor among non-white students. The proportion of the school-aged population of the same race is negatively associated with the likelihood of attending a diverse school, especially among white students.

[Figure 3.1 and 3.2 about here]

Utilizing the propensity scores estimated from this model, five matching models are applied to achieve covariance balance, including greedy 1:1 matching, optional 1:1 matching, full matching, full matching with strict constraint, and full matching with loose constraint. Particularly, the full matching model with strict constraint allows the ratio of treated to controls to vary from half to twice the original ratio in the unmatched sample, while the model with loose constraint allows the ratio of treated to controls to vary from 1/10 to 10. To evaluate covariance balance in matched sample and compare the effectiveness of different matching methods, Figure 3.3 and 3.4 show the standardized mean differences (SMD) between treatment and control groups before and after using each matching method. The dashed lines indicate the .1 threshold. Compared with the unmatched sample, it can be seen that covariance imbalance is noticeably reduced in matched samples obtained using all five methods. For the white student sample, full matching with loose constraint generates best covariance balance with the SMDs of all variables falling with the .1 threshold. Among non-white students, all three full matching models generate desirable covariance balance, but overall full matching with loose constraint generates the smallest SMDs. Therefore, for the following analysis, the matched sample from full matching with loose constraint is used.

[Figure 3.3 and 3.4 about here]

To further evaluate the balance in terms of each covariate, Figure 3.5 and 3.6 present both the mean difference and the Kolmogorov–Smirnov statistic on the unmatched and matched sample. These balance statistics indicate that propensity score matching has effectively achieved good balance with the mean differences of all covariates and prognostic score below the .1 threshold. The improvement in balance is especially noticeable in the white-students sample. As an additional evaluation for covariance balance, Figure 3.7 and 3.8 compares the distribution of propensity scores among treatment and control groups. In the matched sample, the distribution of propensity scores among students attending high-diversity schools overlaps nicely with that among students who go to low-diversity schools, indicating that the matching procedure is efficient.

[Figure 3.5, 3.6, 3.7, and 3.8 about here]

Next, using the matched sample obtained from constrained full matching, the effect of attending a racially diverse school is estimated using both the fixed-effect model and weighting approaches. Table 3.3 presents the standardized coefficients of the treatment effect. Model 1 suggest that even after adjusting for imbalance in observed covariates between students attending high-diversity and low-diversity schools, there is a significant relationship between school racial composition and students' racial attitudes among both white and non-white students. Students who attend racially diverse schools are in general less likely to think that school segregation is desirable. In terms of the size of the treatment effect, every one standard deviation increase in school racial diversity is associated with a .1 standard deviation decrease in pro-segregation attitudes. Since racial diversity is originally measured as a continuous index, Model 2 uses the continuous measure to replace the simplified binary treatment indicator. The results are consistent with Model 1, indicating that attending schools with a higher level of racial diversity is indeed significantly associated with lower likelihood of having pro-segregation preferences. In general, it can be seen that both approaches produce similar estimates.

[Table 3.3 about here]

Sensitivity Analysis

Since propensity score matching is unable to account for the imbalance between treatment and control groups related to unobserved confounders, it is especially important to examine to what extent these unmeasured confounders will bias the validity of the estimated treatment effect. To that end, I use a sensitivity analysis proposed by Rosenbaum (2007) that uses Huber's M-statistics. When the sensitivity parameter Γ is set to 1, the test assumes that given the matched sample, the assignment of treatment is random or free from bias due to unobserved confounders. When Γ is set to be larger than 1, higher value of Γ assumes greater deviation from randomization due to unobserved covariates (Zubizarreta, Paredes and Rosenbaum 2014). Table 3.4 shows the confidence interval for the estimated treatment effect of attending a high racial diversity school, as well as the upper bound of p value given different values of Γ. As one would expect, the p value increases as more bias due to unobserved confounders is assumed. The upper bound on the one-sided p-value increased to 1.0 at Γ=1.4 among the white-student sample and at Γ=1.3 among the non-white-student sample. As shown in Formula (2) below, the sensitivity parameter Γ defines the extent to which the odds ratio of attending a high-diversity school would differ between two individuals who have different value in the unobserved covariate(s). Therefore, a Γ of 1.4 indicates that if unobserved covariate(s) is able to increase the odds ratio by more than 1.4 fold, the robustness of the analysis might be nullified.

$$\frac{1}{\Gamma} \leq \frac{\frac{\pi_j}{(1-\pi_j)}}{\frac{\pi_k}{(1-\pi_k)}} \leq \Gamma \qquad (2)$$

Using the odds ratio associated with observed covariates as reference points, it can be seen in Figure 3.2 and 3.3 that students who lived in a neighborhood where at least half of their neighbors are different races have odds ratio of attending a diverse school that is more than twice as high as that of peers with less interracial exposure in neighborhood contexts. Therefore, if there is an unobserved covariate that is as powerful as neighborhood interracial exposure in shaping students' likelihood of attending high-diversity schools, the hidden selection bias would jeopardize the robustness of the inference of this analysis. Given that the analysis is unable to control for all potential unobserved confounders, such as the racial attitudes of students' parents, the results found here might be vulnerable to unobserved selection bias and should be interpreted with caution. That being said, due to the correlation between parental racial attitudes and the neighborhood or school choices they have made (Krysan, Couper, Farley, and

Forman 2009), part of the influence of racial attitudes may have been controlled for in the analysis by taking into account students' interracial exposure in elementary school and neighborhood contexts.

[Table 3.4 about here]

Conclusion and Discussion

This chapter focused on the association between school racial diversity and students' pro-segregation preferences. I utilized propensity score matching to reduce potential selection bias. Methodologically, this analysis also showcases the effectiveness of full matching in achieving covariance balance while keeping all observations in the unmatched sample. Findings from this chapter offer new evidence that school racial context matters and selection bias alone does not explain the association observed between school racial diversity and students' racial attitudes. Using the matched sample, I found that for both white and non-white students, those who attend schools with high racial diversity are less likely to develop pro-segregation preferences than their peers in low-diversity school. The conclusion is more in line with the contact hypotheses than the threat hypothesis. This finding has meaningful implications for understanding the consequences of ongoing school segregation. It indicates that school racial context matters and school serves as an important site for the formation of students' race-related preferences.

However, the sensitivity check also suggests that the robustness of the findings might be sensitive to unobserved confounders if these confounders double the odds ratio of attending high-diversity schools. As mentioned previously, although the analysis accounted for students' previous history of interacting with peers of other races, no information is available in the data regarding the racial attitudes of students' parents or those of their close friends. Given the literature on the relationship between parents and children's racial attitudes (Degner, and Dalege 2013), it is worth exploring in future research whether these factors independently affect the likelihood of attending a high-diversity school (in particular, independently of parents' education status, which is controlled for here). However, it is equally important to point out that even if there are unobserved confounders, they would not necessarily nullify the findings, unless the effect size is as large as that of some observed covariates in the analysis, such as interracial exposure in the neighborhood context. Additionally, the sensitivity analysis used in the analysis mainly focuses on the effect of unobserved confounders on the propensity score, as opposed to the effect of these confounders on the outcome variable. This type of sensitivity check has a tendency to overstate the potential influence of unobserved bias and therefore produces particularly conservative results (Liu, Kuramoto, and Stuart 2013). In particular, if the unobserved covariate is strongly correlated with both the assignment of treatment and the outcome variable, one parameter sensitivity analysis based on Γ could be a helpful tool to capture the influence of selection bias resulted from this unobserved covariate. However, despite the influence of the unobserved variable on treatment assignment, if it is just moderately correlated with the outcome variable, one-parameter sensitivity check may overestimate the level of sensitivity (Rosenbaum and Silber 2009; Liu, Kuramoto, and Stuart 2013). Future research in this vein may also consider alternative sensitivity approaches that focus on the effect of unobserved variables on the treatment *as well as* that the outcome (Oster 2019; Hosman, Hansen, and

Holland 2010). In particular, Hosman and colleagues (2010) propose one such simultaneous method that utilizes observed variables to speculate about the effect of omitted variables, which could be a useful alternative strategy in future research.

In addition to the limitations related to unobserved confounders, since the data used here are a sample of high school seniors, the conclusion found here might not be able to fully reflect the experience of students who chose to change schools or drop out prior to their senior year. Furthermore, since students' racial attitudes were measured only once in the survey given the cross-sectional nature of the data, my analyses did not account for the changes in racial attitudes throughout high schools. Future studies might consider how malleable students' racial attitudes are, which might in turn provide insights regarding to what extent school racial context can influence students' pre-existing racial attitudes.

Using this analysis as a starting point, it would be theoretically meaningful to explore the mechanisms that may account for the association found between school racial context and students' racial preferences. Although attending diverse schools may naturally create more opportunities for students to be exposed to peers of different racial background, the amount of interracial interactions might not be indicative of the quality of these interactions. Kao and Joyner (2005), for example, argued that shared activities can be perceived as an indicator of friendship intimacy and found that compared to adolescents who have friends of their own race, those with interracial friendship reported fewer shared activities with friends of different race (Kao and Joyner 2005). From this perspective, attending a racially diverse school and having high exposure to interracial interaction per se do not guarantee one would form meaningful relationship with peers of different race or change their racial attitudes because of these interactions. Therefore, if the quality of a students' interracial interactions in school can be measured, it would be particularly useful to explore whether the effect of school racial context might vary depending on the quality of one's interracial interactions.

Lastly, from a long-term perspective, findings in this analysis offers important insights regarding the peril of ongoing school segregation. Given the association found between school racial context and students' racial attitudes, it is possible that in the long run, segregated schools might themselves become the soil in which pro-segregation ideologies are reproduced. However, it is crucial to point out that due to the cross-sectional nature of the study, students' racial attitudes prior to attending high school remains unknown. Therefore, the matching procedure in this analysis cannot fully account for the preexisting discrepancy in students' racial attitudes prior to high school. On the one hand, pre-existing racial attitudes might shape students' likelihood of choosing to attend a diverse school. On the other hand, it is also possible that school racial context might in turn reinforces or shifts students' preexisting attitudes. For example, Zucker and Patterson (2018) found that among students who go to diverse schools, parents and children are more likely to have frequent conversations about race. From this perspective, in order to fully understand the development of racial attitudes as a dynamic process, future research in this vein might benefit from a longitudinal design to investigate whether there is a reciprocal relationship between preexisting racial attitudes, school racial context of choice, and the reformation of racial attitudes as racial context changes.

Table 3. 1. Characteristics of White Students Attending High-Diversity vs. Low-Diversity Schools

Variables	White Students	Low-Diversity School	High Diversity School
	Independent/treatment Variable		
School Racial Diversity Index	.37 (.20)	.29 (.15)	.64 (.06)
	Outcome Variable		
Pro-segregation preferences	2.85 (.88)	2.91 (.85)	2.63 (.97)
	Matching Variables		
Parental Education Level:			
Grade school or less	.003 (.06)	.003 (.05)	.003 (.06)
Some High School	.03 (.16)	.02 (.15)	.04 (.19)
High School Graduate	.20 (.40)	.19 (.39)	.21 (.41)
Some College	.20 (.40)	.19 (.39)	.22 (.41)
College Graduate	.36 (.48)	.37 (.48)	.31 (.46)
Grad School	.22 (.41)	.22 (.41)	.23 (.42)
Interracial Friendship:			
All My Race	.19 (.39)	.22 (.42)	0.09 (.28)
Almost All My Race	.34 (.47)	.27 (.48)	.23 (.42)
Mostly My Race	.28 (.45)	.28 (.45)	.28 (.45)
About Half My Race	.13 (.34)	.09 (.28)	.27 (.44)
Mostly Other Races	.04 (.20)	.03 (.17)	.08 (.27)
Almost All Other Races	.02 (.15)	.01 (.11)	.06 (.23)
Exposure to other races in neighborhood:			
All My Race	.27 (.44)	.32 (.47)	.08 (.27)
Almost All My Race	.33 (.47)	.35 (.48)	.25 (.43)
Mostly My Race	.22 (.42)	.21 (.41)	.27 (.44)
About Half My Race	.11 (.31)	.07 (.26)	.21 (.41)
Mostly Other Races	.05 (.23)	.03 (.18)	.12 (.33)
Almost All Other Races	.03 (.16)	.01 (.11)	.07 (.25)
Exposure to other races in elementary School:			
All My Race	.21 (.41)	.24 (.43)	0.10 (.30)
Almost All My Race	.36 (.48)	.40 (.49)	.22 (.41)
Mostly My Race	.21 (.41)	.20 (.40)	.25 (.43)
About Half My Race	.14 (.35)	.11 (.31)	.26 (.44)
Mostly Other Races	.05 (.22)	.03 (.17)	.11 (.31)
Almost All Other Races	.03 (.17)	.02 (.14)	.07 (.25)
Percent of Population of Same Race in Local Area	.66 (.22)	.72 (.19)	.45 (.17)
School Mean SES	14.83 (.96)	14.96 (.98)	14.4 (.75)
Positive Previous Interracial Interaction Experience	3.86 (.85)	3.86 (.85)	3.84 (.84)
Number of Observations	2605	1993	612

Table 3. 2. Characteristics of Non-White Students Attending High-Diversity vs. Low-Diversity Schools

Variables	Non-white Students	Low-Diversity School	High Diversity School
Independent/treatment Variable			
School Racial Diversity Index	.54 (.16)	.48 (.14)	.71 (.03)
Outcome Variable			
Pro-segregation preferences	2.44 (.98)	2.50 (.97)	2.27 (1.00)
Matching Variables			
Race:			
Black	.31 (.46)	.35 (.48)	.28 (.45)
Hispanic	.37 (.48)	.36 (.48)	.37 (.48)
Asian	.10 (.29)	.08 (.27)	.11 (.31)
Other	.23 (.42)	.21 (.41)	.24 (.43)
Parental Education Level:			
Grade school or less	.05 (.22)	.06 (.23)	.04 (.19)
Some High School	.10 (.29)	.10 (.30)	.08 (.28)
High School Graduate	.23 (.42)	.23 (.42)	.24 (.43)
Some College	.22 (.41)	.21 (.41)	.24 (.43)
College Graduate	.26 (.44)	.25 (.43)	.27 (.44)
Grad School	.14 (.35)	.15 (.35)	.13 (.34)
Interracial Friendship:			
All My Race	.10 (.30)	.12 (.32)	.05 (.22)
Almost All My Race	.15 (.35)	.16 (.37)	.11 (.32)
Mostly My Race	.19 (.39)	.20 (.40)	.18 (.38)
About Half My Race	.24 (.43)	.24 (.43)	.25 (.43)
Mostly Other Races	.19 (.40)	.18 (.38)	.24 (.43)
Almost All Other Races	.13 (.33)	.11 (.31)	.17 (.37)
Exposure To Other Races In Neighborhood:			
All My Race	.09 (.28)	.11 (.31)	.02 (.14)
Almost All My Race	.12 (.32)	.14 (.34)	.07 (.25)
Mostly My Race	.14 (.34)	.15 (.35)	.11 (.31)
About Half My Race	.20 (.40)	.18 (.39)	.24 (.43)
Mostly Other Races	.27 (.44)	.25 (.43)	.31 (.46)
Almost All Other Races	.20 (.40)	.18 (.38)	.26 (.44)
Exposure To Other Races In Elementary School:			
All My Race	.12 (.32)	.13 (.34)	.08 (.26)
Almost All My Race	.14 (.34)	.15 (.36)	.10(.29)
Mostly My Race	.14 (.35)	.14 (.35)	.13 (.34)
About Half My Race	.21 (.35)	.21 (.41)	.23 (.42)
Mostly Other Races	.22 (.41)	.20 (.40)	.25 (.43)
Almost All Other Races	.18 (.38)	.17 (.37)	.21 (.41)
Percent of Population Of Same Race In Local Area	.25 (.20)	.26 (.20)	.23 (.19)
School Mean SES	14.00 (1.17)	14.04 (1.19)	13.88 (1.10)
Positive Previous Interracial Interaction Experience	4.08 (.84)	4.08 (.84)	4.08 (.84)
Number of Observations	1776	1314	462

Table 3. 3. Estimated Effect of Attending High-Diversity School after Constrained Full Matching

	White Students		Non-White Students	
	Estimated Effect	95% CI	Estimated Effect	95% CI
Model 1: Using Binary Treatment as Independent Variable				
Fixed-Effect Model	-.09*** (.02)	[-.13, -.04]	-.09*** (.02)	[-.14, -.04]
Model using weights	-.12*** (.03)	[-.17, -.06]	-09*** (.03)	[-.15, -.03]
Model 2: Using Continuous Racial Diversity Index as Independent Variable				
Fixed-Effect Model	-.10** (.03)	[-.15, -.04]	-.11*** (.02)	[-.16, -.06]
Model using weights	-.13** (.05)	[-.23, -.04]	-.08** (.03)	[-.15, -.02]

Table 3. 4. Sensitivity Analysis

White Students			Non-White Students		
Sensitivity Parameter	CI for Estimated Treatment Effect	Upper Bound of p value	Sensitivity Parameter	CI for Estimated Treatment Effect	Upper Bound of p value
1	[-.17, -.05]	**.00**	1	[-.14, -.04]	**.00**
1.1	[-.19, -.03]	**.00**	1.1	[-.16, -.02]	**.00**
1.2	[-.20, -.01]	**.01**	1.2	[-.18, .00]	**.03**
1.3	[-.22, .00]	**.04**	1.3	[-.20, .02]	.10
1.4	[-.24, .02]	.10	1.4	[-.22, .04]	.24
1.5	[-.25, .04]	.21	1.5	[-.23, .05]	.44

Figure 3. 1. Odds Ratio of Attending High-Diversity Schools (White Students)

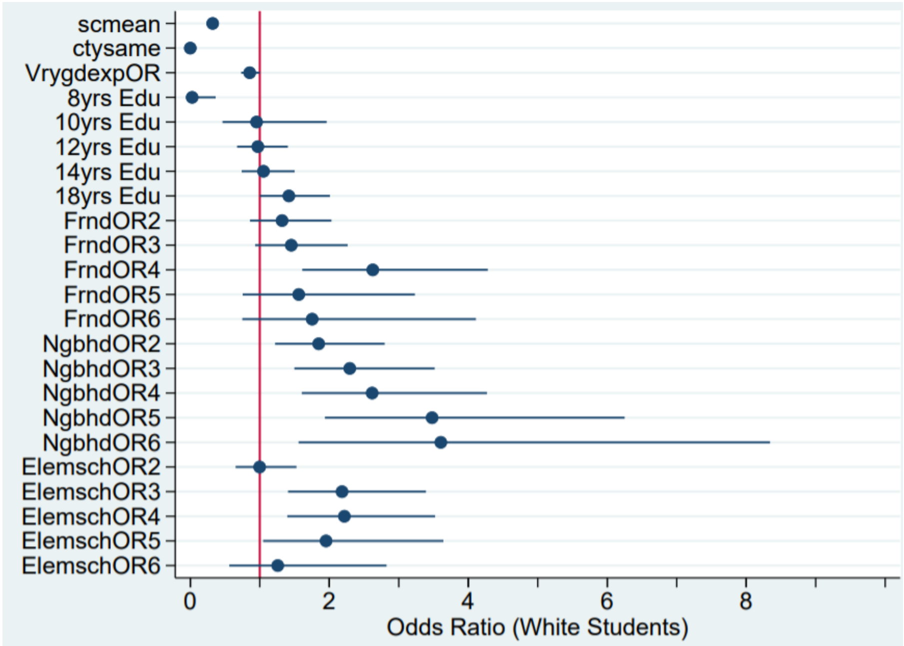


Figure 3. 2. Odds Ratio of Attending High-Diversity Schools (Non-White Students)

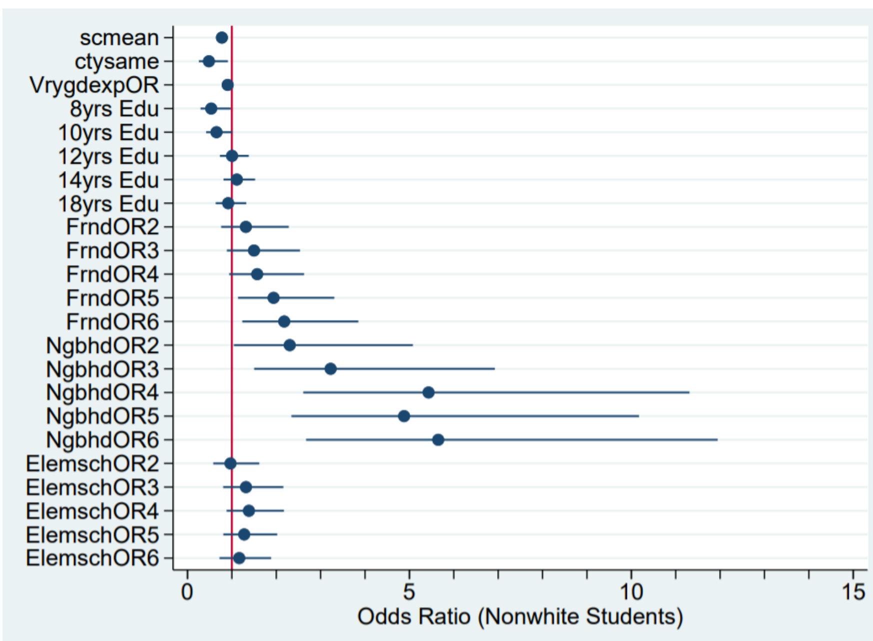


Figure 3. 3. Comparison between Different Matching Methods: Standardized Mean Differences (SMD) of White Students Sample

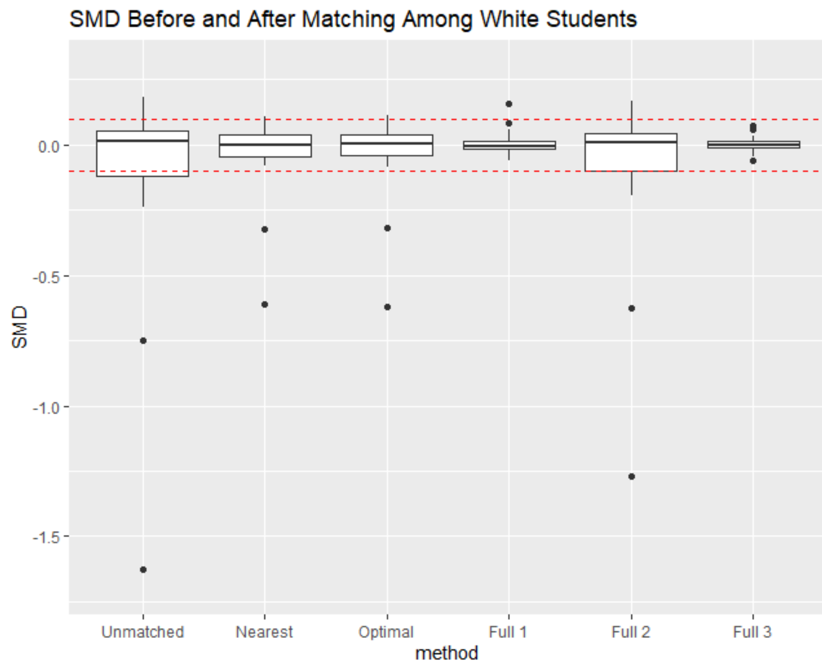


Figure 3. 4. Comparison between Different Matching Methods: Standardized Mean Differences (SMD) of Non-White Students Sample

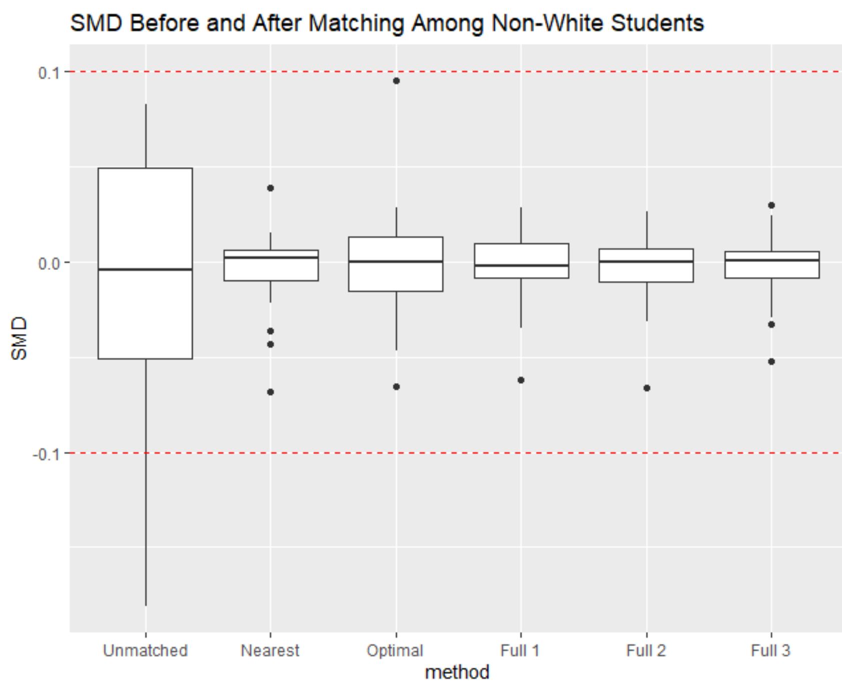


Figure 3. 5. Covariance Balance of Constrained Full Matching (White Students)

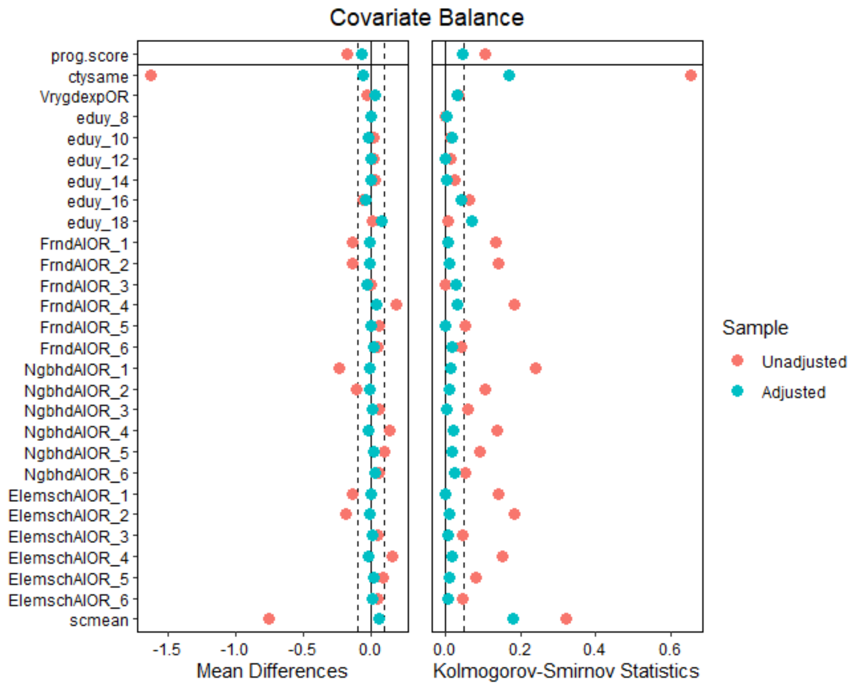


Figure 3. 6. Covariance Balance of Constrained Full Matching (Non-White Students)

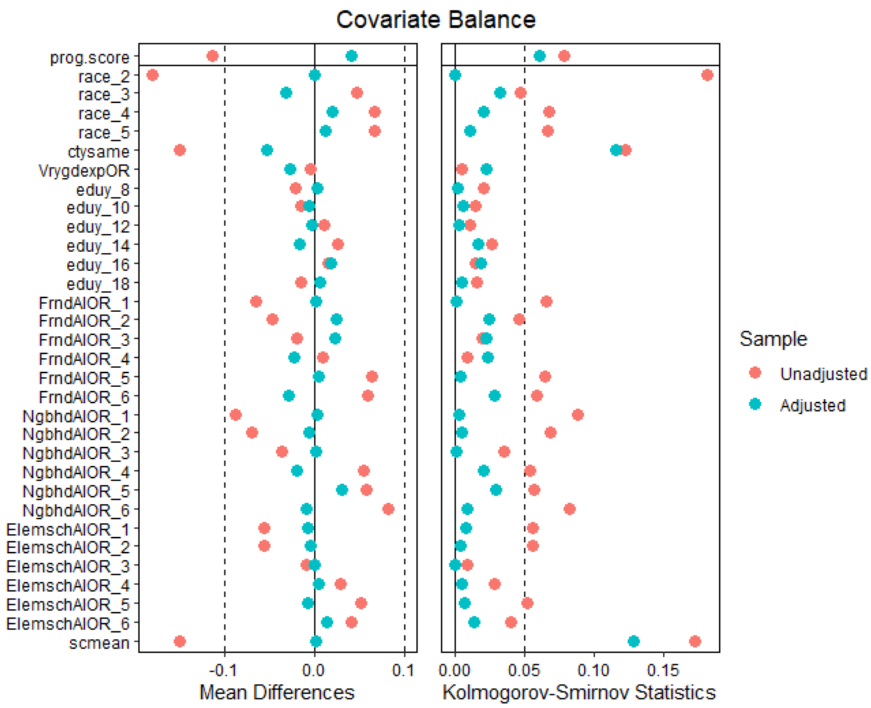


Figure 3. 7. Distribution of Propensity Scores (White Students)

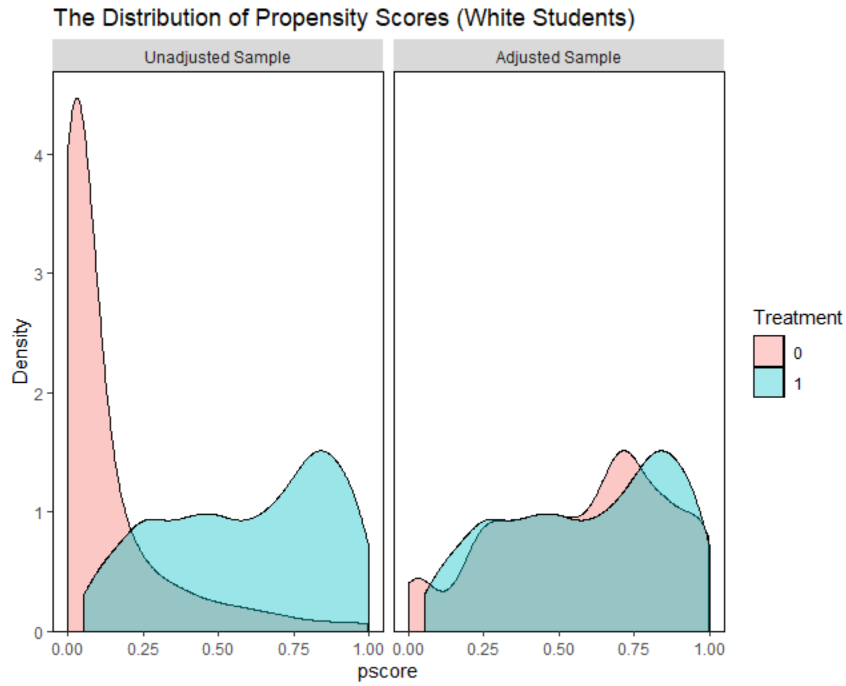
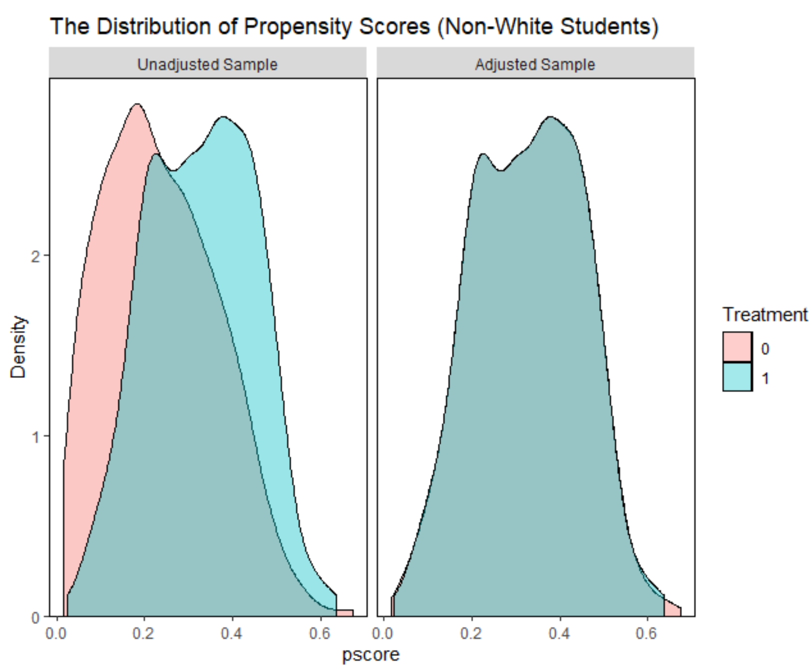


Figure 3. 8. Distribution of Propensity Scores (Non-White Students)



CHAPTER IV:
Diversity Over Time —Trajectories of School-District Diversity and Gaps in Test Scores from 2001 to 2018

Introduction

School districts constitute an essential unit in the American education system. School district quality not only remains a key consideration when people select housing locations or make school choices (Clapp, Nanda, and Ross 2008; Dhar and Ross 2012), but also holds vital implications for how financial and educational resources are allocated across different districts (Monk and Hussain 2000; Unnever, Kerckhoff, and Robinson 2000). In the literature on educational inequality, prior studies have documented significant gaps in expenditures, funding and other financial resources between different school districts (Baird 2008; Boustan, Ferreira, Winkler, and Zolt 2013, Knight 2017). Scholars also have found evidence that between-district inequality in financial and educational resources have a significant association with disparities in students' learning outcomes (Card and Payne 2002; Jackson, Johnson, and Persico 2016).

In addition to these noticeable disparities in educational resources and outcomes across different school districts, education-focused scholars have also highlighted the importance of studying between-district differences in terms of demographic composition

(Owens 2018; Mayer 2002; Reardon and Owens 2014). For instance, scholars argued that despite the increase in diversity in the broader student population, between-district segregation along both racial and economic lines remained high since the 2000s (Corcoran & Evans 2010; Stroub and Richards 2013). Higher levels of between-district segregation in a large area, such as a MSA or a state, have been linked to larger variations in resources across school districts or a wider achievement gap in that area (Sosina and Weathers 2019; Mayer 2002).

However, while these studies focused on metropolitan areas or states as the unit of analysis to compare the level of between-district segregation across different MSAs or states, there is not sufficient attention paid to the dynamic trajectories of diversity changes within each school district. That is to say, though we know that there is increasing variation in the demographic composition across different school districts, little is known about the specific diversity trajectory each district has followed. This chapter thus considers school districts as the unit of analysis and explores whether and how racial diversity has evolved differently over time in different school districts. In doing so, this study hopes to shed light on understanding the diversity of school districts as a dynamic process.

School district diversity could change over time in a variety of ways and be driven by a variety of mechanisms. On the one hand, existing differences in school district quality and performance might drive students' parents to select or avoid a particular school district (Ellen, O'Regan, and Conger 2009; Welton, Diem, and Holme 2015). Additionally, low-performing schools or school districts may also have difficulty retaining high-quality instructors, leading to a vicious cycle that reinforces performance gaps between school districts (Clotfelter, Ladd, Vigdor, and Diaz 2004). On the other hand, changes in the demographic composition of an area may in turn reshape the financial situation or academic outcomes of the school districts in that area (Figlio and Fletcher 2012; Kurban, Gallagher, and Persky. 2015). For instance, Figlio and Fletcher (2012) found that as the share of elderly population in a school district increases, the level of support for public school spending tends to decrease, especially when school-aged population in that district is predominantly non-white. Therefore, understanding school-district-level demographic trends could provide particularly useful insights into potential changes in the landscape of educational inequality and stratification. To that end, this chapter moves from school-level analysis to a more macro district-level comparison and aims to trace the trajectory of demographic change of each school district and examine whether racially diverse (or homogeneous) school districts remain diverse (or homogeneous) over time.

In the next sections, I first provide a brief review of literature on how between-district segregation is linked to gaps in students' educational outcomes. Next, I compare several theories for understanding factors that might lead to changes in racial and socioeconomic composition of school districts. Finally, I discuss potential diversity trajectories different school districts might follow according to these theories before moving on to the data and method section.

Between-District Segregation and Educational Inequality

Although the demographic composition of any area is to some extent structured by how diverse the border population is, scholars have pointed out that students of different racial and socioeconomic backgrounds are not equally represented in public school districts (Bankston and Caldas 2005). On the one hand, the student body in American schools is becoming more diverse. According to data from the Pew Research Center (2017), the rapid growth in Hispanic and Asian population of school age has led to significant increase in the proportion of non-white students. On the other, however, school segregation continues to keep students of different socioeconomic and racial/ethnic backgrounds apart. Despite the growth in non-white student population, the level of school segregation between white and non-white students didn't decrease from 1989 to 2010 (Orfield et al. 2014, Reardon, Yun and Eitle 2000). Noticeably, scholars have pointed out that the level of between-district segregation started to surpass that of within-district segregation (Holme and Finnigan 2013). Put differently, students of different races and ethnicity are increasingly likely to be segregated into different districts, as opposed to different schools within the same school district. After comparing enrollment data for private and public schools from 1999-2000, Clotfelter (2004) concluded that more than 80% of segregation in metropolitan areas was accounted for by the disparity in racial composition across different public school districts. In terms of the socioeconomic composition of different school districts, Owens and colleagues (2014) found that between-district economic segregation increased since 1990 in the majority of metropolitan areas they examined. Particularly, in terms of the school districts students are enrolled in, the isolation between students from high-income families and all other students increased rapidly during the 2000s (Owens, Reardon, and Jencks 2014). These findings combined suggested that as a result of increasing between-district segregation, school districts are becoming more and more distinct from one another both racially and socioeconomically. For this reason, it might be particularly useful to explore and compare the unique diversity trajectory followed by different school districts, in order to better understand the changing landscape of school segregation in the long run.

In terms of the implications of between-district segregation, evidence in general showed that racial and socioeconomic composition at the district level is significantly associated with observed achievement gaps between students of different demographic and socioeconomic backgrounds. For instance, Bankston and Caldas (2005) found that the test scores gap between white and non-white students is largest in school districts where the majority of racial minority students are concentrated in public schools and a high share of white students' parents choose to enroll their kids outside of the public school system. Similarly, Owens (2018) analyzed how cross-district differences in socioeconomic composition may shape academic outcomes of students. She concluded that the achievement gap between high- and low-income students, as well as that between black and white students, widens in metropolitan areas where there is high level of economic segregation between different school districts. In a more recent study, Jang and Reardon (2019) compared socioeconomic achievement gaps across different states and concluded that wider achievement gaps were observed in states with higher levels of between-district income segregation.

Changing Demographic Diversity as a Dynamic Process

In the literature on demographic diversity, scholars have pointed to various factors that may lead to changes in demographic composition of an area, ranging from individual-level choices made to enter or move away from an area, to macro-level structural barriers that shape what choices are available. In general, existing theories provide the following explanations for why demographic composition changes may occur on school district level. First, spatial sorting theory argues that socioeconomic achievement of a certain demographic group can be translated into access to socioeconomically advantaged geographical areas (Couture, Gaubert, Handbury, and Hurst 2019; Clark and Maas 2012). As a result of such sorting processes, students of more disadvantaged socioeconomic characteristics could be geographically left behind as their more affluent peers choose to relocate to more desirable school districts. Eventually, economic and academic (dis)advantages would be accumulated in certain school districts, resulting in larger between-district disparity in financial, educational, and social resources (Clark and Maas 2012). Related to this line of thinking, due to the overlap between social stratification along racial and socioeconomic lines, previous studies have shown that students of color are more likely than their white peers to attend schools or live in neighborhoods with concentrated poverty (Goldsmith 2009; Saporito 2003; Saporito and Sohoni 2007; Reardon and Owens 2014).

Another line of thinking emphasizes how racial prejudices can influence neighborhood or school choice decisions and result in residential or school segregation. From a macro perspective, this theory suggests that as the diversity of an area increases to a tipping point, it tends to start losing its white population due to white flight (Renzulli and Evans 2005). From a micro perspective, studies related to this theory also pointed out that racial preference can shape how the desirability of an area is perceived by individuals (Charles 2000; Krysan 2002; Krysan, Couper, Farley, and Forman 2009). Such perceptions may in turn affect moving decisions or school choices people make. For example, previous studies on neighborhood choice also pointed out that the tendency of residential segregation can be further perpetuated when racial minorities feel uncomfortable moving into predominantly-white areas or get turned away from such areas due to racial steering by real estate agents (Galster and Godfrey 2005). Race-based preferences also play a role in shaping school choices made by families of different racial/ethnic backgrounds (Billingham and Hunt 2016). For instance, studies have shown that when non-whites accounted for a significant proportion of the population in an area, white parents have a tendency to flee and turn to alternative school choice such as charter school (Kleitz, Weiher, Tedin and Matland 2000; Weiher and Tedin 2002). This pattern has resulted in declining white-student enrollment within the public school systems, especially in areas where alternative schooling options are available (Bankston and Caldas 2005; Renzulli and Evans 2005).

While the previous two theories focused mainly on the selection behavior and preferences of individuals, there is a third line of thinking that highlights how changes in school district boundaries can shape the racial diversity of an area. Particularly, some scholars have pointed out that school district gerrymandering can occur especially when school districts undergo rapid growth in racial diversity, and these redrawn attendance boundaries could in some cases exacerbate racial isolation (Richards 2014; Siegel-Hawley 2013; Siegel-Hawley, Bridges, and Shields 2016). For instance, Siegel-Hawley and colleagues (2016) examined a school district in Virginia and found that through the process of school closure and redrawing of attendance zone lines, the segregation between black and white students, as well as that between Hispanic and white students, rose rapidly over only two years. Relatedly, Holme and Finnigan (2013) found that segregation level is higher in areas with high levels of school district fragmentation, which could occur when redrawn boundaries create fragmented districts of smaller and smaller size. With an increasing number of fragmented school districts emerging, evidence showed that racial sorting between different school districts has been on the rise (Taylor, Frankenberg, and Siegel-Hawley 2019). Therefore, district-level demographic composition could be perceived as a dynamic process that is subject to not only school choices made by individuals but also structural changes as school district's boundaries shift and redefine the landscape.

Combining the perspectives mentioned above, due to the interplay between individual-level school choice and district-level boundaries change, although the overall racial diversity in the population has increased, the diversity trajectory of different school districts may still follow various patterns. Therefore, this analysis aims to identify and characterize such variation in racial diversity trajectories. Based on the theories reviewed, I hypothesize that compared to all-white districts, there might be more noticeable changes in racial diversity over time in school districts where there is a fair amount of representation of more than one race/ethnicity group. As the dynamics between the representations of different racial/ethnic groups in more integrated districts start to change over time, it might either trigger white flight if the proportion of nonwhite students continue to grow, or maintain a stable or even upward pattern of increasing diverse demographics. Additionally, as gerrymandering theory would suggest, if these types of integrated school districts go through changes in boundaries or fragmentation, it would likely trigger significant decline in racial diversity. For all-white districts, however, theories mentioned above would suggest that it might not be very likely for a large proportion of non-white students to get enrolled in these districts either due to racial prejudice encountered or due to race-based school preferences. Consequently, I hypothesize that the racial diversity of all-white districts will remain low, while districts with comparable representation of more than one race may be subject to more changes in diversity over time.

Data and Analytical Sample

The data used for this analysis come from Common Core of Data (CCD), which is an annual universe collection of data on characteristics of all public schools and school districts. CCD data from 2001 to 2018 are used to model the trajectory of racial diversity for each school district. Additionally, to examine the difference in educational outcomes between school districts with different diversity trajectories, school-district-level test scores data are drawn from the Stanford Education Data Archive (SEDA). SEDA contains information about standardized average test scores administered in 3rd to 8th grade in math, as well as the average increase in test scores across cohorts (year slope) for each school district over the duration from the 2008-2009 to 2015-2016 school years. Although the year range of SEDA only overlapped with part of the year range of the CCD data used in the analysis, exploring the association between diversity trajectories and academic achievement might still provide useful insights. The analytical sample consists of 6,529 school districts that have existed since or before 2001 and remained operational during 2001 to 2018.

Analytical Strategy

Consistent with previous chapters, racial diversity is measured using the diversity index, which can be interpreted as the probability that two students randomly selected from each school district are from different race/ethnic groups. The diversity index ranges from 0 to 1, with 0 indicating no racial diversity. This study utilizes latent class mixed models (LCMM) to capture various trajectories of diversity change for different school districts. Instead of merely considering the average over-time change in diversity or a universal trajectory of diversity change, a unique advantage of LCMMs is its capacity to identify heterogeneous trajectories (Proust-Lima, Philipps, and Liquet 2015). Particularly, LCMMs assume that there are potential subgroups (or latent classes) each with distinct growth trajectories and then estimates parameter values differently for each latent class. Importantly, since the potential subgroups are unobserved, the number of subgroups/classes (k) needs to be predetermined. Following common strategies utilized in previous studies, Bayes Information Criterion (BIC) will be calculated for models with different numbers of classes specified to determine the optimal value of k that provides the best fit for the data. In addition, in order to ensure that each latent class identified is to some extent representative and interpretable, models that have at least 10% of the school districts in each latent class would be preferred.

Prior to fitting LCMMs to the data, all school districts are first categorized into different types of districts based on the racial composition of each district at the starting point in 2001. I then explore whether there are heterogeneous diversity trajectories within each type of school districts as characterized by starting diversity. This strategy is utilized for two reasons. First, to some extent, the racial composition at the starting point might largely influence what sorting or segregation processes can happen afterwards. For example, the racial diversity of an all-white district can only remain the same or go up but not go down, because the level of diversity is already close to 0 at the starting point. Therefore, categorizing school districts as the first step ensures that school districts within each category are similar at the starting point and have similar potential for trajectory types. Second, depending on which group originally composes the majority of the student body at the starting point, later changes in diversity can have very different meanings and may be interpreted differently. For example, when racial diversity increases, for a predominantly non-white district it would mean that more white students start to enroll in this district, while the same change would mean the opposite for a predominantly white-district.

This analysis follows a similar classification scheme used in Hall and colleagues' studies (2016) on neighborhood racial composition. All school districts in the analytics sample are categorized as one of the five following categories, including 1) All-white districts, where white students accounted for more than 95% of the student body in 2001. 2) Mostly-white districts, where white students accounted for less than 95% but more than 75% of the student body in 2001. 3) White districts with non-white concentration, where more than half but less than 75% of the student body was white, and Black or Hispanic students combined accounted for at least 25% of the student body. 4) Predominantly racial minority districts, where Black students alone or Hispanic students alone composed more than 50% of the student body. 5) Integrated/Diverse districts, where not a single race or ethnic group alone accounted for more than 50% of the student body. This classification scheme focused on the proportion of white, Hispanic, and Black students, instead of the proportion of Asian or other students for several reasons. First, due to the limited representation of Asian or students of other races in the sample, the number of districts with high Asian concentration is limited compared to the number of districts with a high proportion of Black and Hispanic students. Second, in the literature on education stratification, while black-white or Hispanic-white achievement gaps are very commonly used indicators for educational inequality, Asian students are usually considered as academically advantaged. Out of 6,826 school districts that reported demographic information in 2001 and remained operational till 2018, this classification scheme is able to capture 6,529 school districts (96% of the original 2001 sample). School districts that fall outside of the five categories are thus omitted from the analysis.

Next, to better understand the shift in the demographic landscape associated with each diversity trajectory identified by the LCMMs, I also compare the specific changes in the proportion of each race/ethnic group and the proportion of students eligible for free lunch for school districts that followed different diversity trajectories. As the last step of the analysis, in order to explore the implications of different racial diversity trajectories for educational outcomes, for each type of school districts, the association between diversity trajectories and district-level test score outcomes are investigated using regression models. Specifically, district-level average test scores, as well as the increase in test scores across cohorts, are regressed on the racial diversity trajectories, while controlling for other district-level characteristics such as size (the number of students in each school district), location of the district (indicating whether a district is located in an urban area), student-to-teacher ratio, proportion of white students, proportion of students eligible for free lunch, and expenditure per pupil.

Results

Heterogeneity in Diversity Trajectories

First, before diving into detailed diversity trajectories, Figure 4.1 presents a comparison of the distributions of racial diversity across all five types of school districts. It can be seen that mostly-nonwhite districts had the widest range of racial diversity, but the median level of racial diversity in general showed a decline over time. In comparison, the median level of racial diversity of all-white and mostly-white districts both increased over time, although the pace of change was slightly larger for mostly-white districts than all-white districts. Similarly, white districts with nonwhite concentration also saw an increase in racial diversity from 2001 to 2018.

[Figure 4.1 about Here]

Turning to the LCMMs, the results suggested that there is noticeable heterogeneity in the diversity trajectories both across five different types of districts and within each type of districts. The BICs from LCMMs and the distribution of each latent class (trajectory) are shown in Table 4.1. Models with the lowest BICs, as well as at least 10% districts within each latent class are selected. Based on these criterion, the selected models identified 3 distinct diversity trajectories from 2001 to 2018 for all-white school districts, 5 diversity trajectories for mostly-white districts, 4 diversity trajectories for white districts with racial minority concentration, 6 diversity trajectories for mostly-nonwhite districts, and 4 diversity trajectories for integrated districts. Figure 4.2 to Figure 4.6 visualize the changes in racial diversity associated with each trajectory. The width of each trajectory line indicate the proportion of school districts that fell into the particular trajectory class.

[Table 4.1 and Figure 4.2 to Figure 4.6 about Here]

To better compare the pace and direction of diversity changes associated with each trajectory, Table 4.2 presents the linear coefficients for the year variable from the LCMMs, which captures how rapidly racial diversity of a school district increases or decreases. Almost half (47%) of all-white school districts followed a slow-increasing trajectory of diversity change. Despite the slight increase, the racial diversity of these school districts remained the lowest in 2018 compared to all other four types of school districts. Similarly, mostly-white districts and white districts with non-white concentration both followed upward trajectories in racial diversity. However, the coefficients from the LCMMs showed that the slopes of increase among the two types of districts were much faster than that among all-white districts. This finding supports my hypothesis that compared to school districts that were homogeneous at the starting point (such as all-white districts), school districts with representation of students from more than one race are more likely to go through changes in racial diversity.

[Table 4.2 about Here]

Contrary to the patterns seen among all-white or mostly-white districts, the coefficients from the LCMM estimators indicated that mostly-nonwhite districts in general saw declines in racial diversity over the duration from 2001 to 2018. Specifically, 34% of mostly-nonwhite districts saw almost no change in racial diversity, either remaining at relatively high or extremely low levels of racial diversity. Nonetheless, the racial diversity of the majority (66%) of mostly-nonwhite districts dropped significantly from 2001 to 2018. School districts that were racially diverse at the starting point in 2001, on the other hand, followed more mixed trajectories of racial diversity changes. While 19% of these diverse districts had a slight increase in racial diversity, 37% saw little changes in the level of racial diversity. Additionally, 29% of integrated districts experienced a slight decline in racial diversity, while 14% saw rapid drop in racial diversity from 2001 to 2018.

To further explore whether the implications of changing racial diversity vary across different school districts, Table 4.3 shows the specific changes in the proportion of each demographic group from 2001 to 2018 associated with each distinct diversity trajectory. The results showed that changes in the proportion of nonwhite students were in general smaller than 5% in all-white districts. This pattern aligns with my hypothesis that despite the increase in racial diversity in the student population, all-white districts are less likely to go through dramatic changes in demographic composition. According to the theories of racial preferences and school choices, if white parents have a tendency to prefer areas with high white concentration, the choices made by white parents could accumulate and result in the perpetuation of existing school segregation (Roda and Wells 2013; Kimelberg and Billingham 2013; Billingham and Hunt 2016). Among both mostly-white districts and white districts with nonwhite concentration, the increase in racial diversity from 2001-2018 was largely attributed to the increase in the proportion of Hispanic students, as well as the decrease in the proportion of white students. This finding is consistent with the growth in Hispanic student population as pointed out by previous studies.

[Table 4.3 about Here]

Among mostly-nonwhite districts that experienced the most rapid decline in racial diversity, the proportion of white students dropped by more than 12% during 2001 to 2018. A similar pattern is observed among school districts that were diverse in 2001.

Regardless of the specific diversity trajectories, all the diverse districts saw at least a 14% decline in the proportion of white students. This finding aligns with previous studies on white flight which argued that rising proportion of non-white students or racial diversity could trigger white students to begin fleeing to other districts (Bankston and Caldas 2005).

Additionally, all five types of school districts saw significant increases in the proportion of students eligible for free lunch. However, while the average proportion of students eligible for free lunch remained below 35% for all-white districts from 2001 to 2018, some mostly-nonwhite districts had more than 80% of students who were eligible for free lunch in 2018. This is consistent with findings from previous studies (Reardon and Owens 2014) and indicates that compared to white students, racial minority students are more susceptible to the concentration of poverty in their school districts.

Diversity Trajectories and Test Score Outcomes

Turning to the association between racial diversity trajectories and district-level academic achievement outcomes, Figure 4.7 and Figure 4.8 show the disparities in the average test scores, as well as the increase in test scores across cohorts, between the five different types of school districts. The average increases in test scores were similar across different types of school districts, indicating that on average the level of academic achievement remained stable across cohorts. However, there is a noticeable difference in terms of average test scores. Overall, consistent with findings from previous studies (Johnson Jr 2014; Hanushek, Kain and Rivkin 2009), all-white and mostly-white school districts outperformed mostly-nonwhite districts.

[Figure 4.7 and Figure 4.8 about Here]

To further investigate whether districts that followed different diversity trajectories differed in terms of academic performance, I compare the test score outcomes within each type of school districts. Table 4.4 summarized the coefficients from the regression models for both the average test scores and the increase in test scores across cohorts. Among racially diverse school districts, those districts that saw more rapid declines in racial diversity from 2001 to 2018 had lower average levels of test scores than those that remained a relatively high level of racial diversity. According to the results from the regression models, the trajectory-based gap in academic achievement remained significant after other district-level characteristics, such as the proportion of students eligible for free lunch, student-to-teacher ratio, size, and the urbanity of districts, are accounted for. The disadvantages in academic achievement outcomes associated with the declining diversity trajectories could be partly explained by the fact that compared with similar districts that remained a stable level of racial diversity, these districts have undergone sharper decreases in the proportion of white students and increases in the proportion of students eligible for free lunch from 2001 to 2018. The finding is in line with Bankston and Caldas' argument (2005) that white flight is associated with lower level of achievement outcomes, especially when white flight results in the concentration of racial minorities in a district. A previous study (2013) by Mickleson and colleagues also reached a similar conclusion that racial isolation is associated with lower mathematics scores. Given the overall higher achievement outcomes among high-diversity districts, the findings suggest that racial integration might have the potential to create a learning environment that could lead to beneficial academic outcomes (Condron et al. 2016).

[Table 4.4 about Here]

However, an opposite pattern is observed among all-white and predominantly-white school districts. The regression coefficients show that there is a small but negative significant association between racial diversity and district-level academic achievement. Among all-white districts, those that saw the most rapid increase in racial diversity had slightly lower over-cohort test score growth compared to all-white districts that remained low levels of racial diversity, even after the proportion of students eligible for free lunch was accounted for. Similarly, among mostly-white districts, those that followed trajectories with slower increase in racial diversity show higher test scores and a slightly larger over-cohort test score growth, after controlling for other district-level demographic and socioeconomic characteristics. Since all-white or mostly-white districts that went through increase in diversity also saw noticeable decrease in the proportion of white students, the negative association between diversity levels and academic achievement is consistent with the argument that white flight is negatively correlated with district-level academic outcomes.

As for mostly non-white school districts and white districts with non-white concentration, the regression models suggest that after the proportion of students eligible for free lunch and other characteristics are accounted for, there is no significant difference in academic achievement outcomes between districts that followed different diversity trajectories. Nonetheless, the proportion of students eligible for free lunch has a significant negative correlation with both the average level and the slope of test scores.

This finding aligns with Reardon's argument (2016) that different levels of exposure to poverty between white and non-white students remain a key factor that shapes disparities in educational achievement. Given that mostly-nonwhite districts had a higher proportion of students eligible for free lunch, the increasing concentration of racial minority students in these districts hold important implications for the pattern of educational stratification in the long run. According to theories of white flight and school choices, it is possible that the increase in non-white students in these districts may continue to trigger white flight, which may eventually exacerbate the concentration of racial minority students in areas with high levels of poverty and create a negative cycle that lead to the reproduction of existing white-nonwhite achievement gap (Saporito 2003).

Conclusion and Discussion

This chapter offers a longitudinal approach to understand the changes in school districts' student racial/ethnic composition as a dynamic and heterogeneous process. The analysis showed that there are noticeable variations in how diversity evolves over time across different school districts. Although the broad student population has become more diverse from 2001 to 2018, not all school districts experienced an increase in racial diversity. To the contrary, the analysis revealed that school districts followed various trajectories that differ in not only the pace, but also the direction of diversity changes.

Although the longitudinal perspective of this chapter has particular advantages in terms of understanding changes in diversity as a dynamic process, the methodological design of the analysis is not free from limitations. Importantly, since the analysis only included school districts that remained operational from 2001 to 2018, the sample is not able to capture school districts that ceased to exist during 2001 to 2018, or new school districts that emerged after 2001. For this reason, the trajectories identified in the analysis may not be able to fully reflect the influences of school districts fragmentation and the gerrymandering of school districts lines. Therefore, it is worth considering in future research how changes in school district's boundaries in an area may trigger changes in diversity trajectories for districts within and adjacent to that area. Additionally, in order to better understand the association between diversity trajectories and educational outcomes, future research may also consider other more comprehensive measures of academic achievement.

Despite the limitations discussed above, this chapter offers important insights into understanding various trajectories of racial diversity over time, as well as the important implications these changes in racial diversity hold for educational inequality in achievement outcomes. The findings point to diverging diversity trajectories among predominantly-white and predominantly-nonwhite school districts. All-white and mostly-white school districts in general saw slight to modest increase in racial diversity, although all-white districts remained the type of school districts with lowest racial diversity. Similarly, white districts with non-white concentration in general followed an upward trajectory in terms of racial diversity, with a much faster pace of increase than that of all-white school districts. In comparison, mostly-nonwhite school districts in general saw decline in racial diversity, which was particularly driven by the decline in share of white students and increase in the proportion of low-income and Hispanic students. Integrated school districts, on the other hand, followed more mixed racial diversity trajectories during the 2001-2018 time period, with almost half of the districts becoming less racially diverse.

The findings in general support previous studies on white flight, which argued that for school districts where non-white students accounted for a significant proportion of the student body, the concentration of racial minority students may be further reinforced as more and more white students' parents choose not to enroll their kids in these districts. In terms of socioeconomic diversity, minority-concentrated school districts also tend to be the type of school districts with the highest proportion of students eligible for free lunch. Consistent with previous studies (Saporito and Sohoni 2007), this pattern indicates that interplay between school racial and economic segregation may have resulted in differential level of exposure to poverty between white and non-white students.

Additionally, the difference in academic achievement between predominantly-white districts and predominantly non-white districts further suggests that the racial and socioeconomic composition of school districts play an important role in shaping disparities in educational outcomes. The analysis revealed that among school districts that are all-white or mostly-white, there is a small yet negative association between increasing racial diversity and test score outcomes after other district-level characteristics are controlled for. This finding implies that school districts that underwent faster withdrawal of white students are also more likely to see decline in educational outcomes.

Contrary to the pattern found in predominantly-white districts, the findings pointed to a significantly positive association between racial diversity and achievement outcomes among diverse/integrated school districts. This finding implies that racial integration at the school district may have the potential to lead to favorable achievement outcomes. On the other hand, the disadvantaged achievement outcomes among mostly-nonwhite districts are largely associated with the concentration of poverty in these districts. Given the overall downward diversity trajectories among mostly-nonwhite districts, the analysis implies that non-white students may be particularly susceptible to the negative consequences of concentrated poverty if white flight continues to reinforce the current structure of school racial and socioeconomic segregation.

Given the relatively minimal changes in the proportion of non-white students among all-white districts, the results also suggest that even over an almost two-decade duration, the structure of school racial segregation showed a tendency to remain unchanged. Regardless of the racial composition at the starting point in 2001, very few school districts in the sample saw drastic increases in racial diversity. To the contrary, all-white districts largely remained racially homogeneous, while mostly-nonwhite districts showed a tendency to evolve into districts with an even higher concentration of racial minority and socioeconomically disadvantaged students.

Taken together, the results presented in this chapter show both the challenges and opportunities faced by American school districts. On the one hand, the positive association between racial diversity and district-level academic achievement found in integrated school districts points to the potential benefits of racial and socioeconomic integration at the district level. As the student body in the U.S. becomes more and more diverse, the changing dynamics of different demographic groups may create opportunities in the future for school districts to evolve toward racial and socioeconomic integration. On the other hand, given that predominantly-white school districts have largely remained racially homogeneous during the past two decades, if the current structure of school segregation remains unchanged, racial minority and low-income students who are left behind in school districts with high concentration of poverty may continue to face challenges in their educational journey.

Table 4. 1. BICs and the Distribution of Latent Class(s) from LCMMs

All-White School Districts

# of Classes	BIC	% Class 1	% Class 2	% Class 3	% Class 4
1	283091.7	100.0			
2	252787.7	29.2	70.8		
3	238789.4	12.3	40.4	47.4	
4	**230213.0**	**4.3**	**20.0**	**39.6**	**36.1**

Mostly-White School Districts

# of Classes	BIC	% Class 1	% Class 2	% Class 3	% Class 4	% Class 5
1	315707.0	100.0				
2	277540.1	46.8	53.2			
3	259234.4	27.1	37.7	35.2		
4	249204.0	21.2	28.9	28.7	21.1	
5	**243112.7**	**12.6**	**19.8**	**25.0**	**18.2**	**24.37943**

White School Districts with Non-White Concentration

# of Classes	BIC	% Class 1	% Class 2	% Class 3	% Class 4	% Class 5
1	99093.3	100.0				
2	87998.9	41.2	58.8			
3	83715.5	32.3	49.3	18.3		
4	81040.7	20.8	27.2	39.6	12.4	
5	**79458.9**	**14.1**	**23.0**	**28.9**	**28.2**	**5.781058**

Mostly-Nonwhite School Districts

# of Classes	BIC	% Class 1	% Class 2	% Class 3	% Class 4	% Class 5	% Class 6
1	104326.6	100.0					
2	89374.6	65.0	35.0				
3	83012.7	45.3	29.7	25.1			
4	79101.1	34.7	18.2	28.8	18.2		
5	76590.4	27.9	24.3	17.1	14.8	15.9	
6	**75003.7**	**20.8**	**23.9**	**17.5**	**13.2**	**11.72107**	**12.9**

Diverse/Integrated School Districts

# of Classes	BIC	% Class 1	% Class 2	% Class 3	% Class 4
1	38850.8	100.0			
2	34150.2	57.5	42.5		
3	32533.0	47.6	34.2	18.2	
4	**31389.4**	**19.5**	**36.7**	**29.4**	**14.4**

Note: Selected models with the lowest BIC are highlighted in bold.

Table 4. 2. Comparison of the Linear Coefficients (Changes Over Time) from LCMMs across Different Trajectories

All-White School Districts

Trajectory	Linear Coefficient Of Year	SD	P-Value
1	0.51***	0.01	0.00
2	0.24***	0.01	0.00
3	0.10***	0.01	0.00

Mostly-White School Districts

Trajectory	Linear Coefficient Of Year	SD	P-Value
1	0.61***	0.01	0.00
2	0.41***	0.01	0.00
3	0.25***	0.01	0.00
4	0.07***	0.01	0.00
5	0.33***	0.01	0.00

White School Districts with Non-White Concentration

Trajectory	Linear Coefficient Of Year	SD	P-Value
1	0.44***	0.01	0.00
2	0.31***	0.01	0.00
3	0.19***	0.01	0.00
4	-0.02	0.02	0.21

Mostly-Nonwhite School Districts

Trajectory	Linear Coefficient Of Year	SD	P-Value
1	0.08***	0.02	0.00
2	-0.06***	0.01	0.00
3	-0.22***	0.02	0.00
4	-0.13***	0.02	0.00
5	-0.03	0.02	0.18
6	-0.25***	0.02	0.00

Diverse/Integrated School Districts

Trajectory	Linear Coefficient Of Year	SD	P-Value
1	0.14***	0.02	0.00
2	0.07***	0.02	0.00
3	-0.09***	0.02	0.00
4	-0.34***	0.03	0.00

Note: The Quadratic term were included in the models but omitted here.

Table 4. 3. Specific Demographic Changes Associated with Each Diversity Trajectories

All-White Districts

Trajectory	Chg. in% White	Chg. in %Hispanic	Chg. in% Black	Chg. in% Asian	Chg. in % Other Race	% EFL in 2018	Chg. in % EFL
1	-13.8%	7.3%	1.5%	0.7%	4.4%	32.1%	16.5%
2	-6.9%	3.2%	0.3%	0.1%	3.2%	31.7%	13.8%
3	-3.4%	1.3%	0.1%	-0.1%	2.1%	35.1%	13.6%

Mostly-White Districts

Trajectory	Chg. in% White	Chg. in %Hispanic	Chg. in% Black	Chg. in% Asian	Chg. in % Other Race	% EFL in 2018	Chg. in % EFL
1	-26.7%	14.6%	3.9%	2.4%	5.8%	39.7%	19.3%
2	-16.8%	10.3%	0.6%	0.9%	5.0%	38.5%	15.6%
3	-9.7%	5.2%	0.1%	0.4%	4.0%	33.7%	13.6%
4	-4.5%	2.3%	-0.3%	-0.2%	2.7%	34.3%	12.4%
5	-13.5%	8.2%	0.2%	0.5%	4.6%	34.9%	13.6%

White Districts with Non-white Concentration

Trajectory	Chg. in% White	Chg. in %Hispanic	Chg. in% Black	Chg. in% Asian	Chg. in % Other Race	% EFL in 2018	Chg. in % EFL
1	-23.8%	16.5%	0.4%	0.9%	6.0%	53.4%	23.2%
2	-17.9%	13.9%	-1.0%	0.0%	4.9%	53.5%	19.3%
3	-13.9%	12.2%	-1.5%	0.1%	3.1%	52.1%	15.5%
4	-4.0%	4.1%	-3.4%	0.3%	3.0%	49.3%	10.7%

Mostly-Nonwhite Districts

Trajectory	Chg. in% White	Chg. in %Hispanic	Chg. in% Black	Chg. in% Asian	Chg. in % Other Race	% EFL in 2018	Chg. in % EFL
1	-7.4%	9.9%	-7.1%	0.5%	4.1%	72.0%	22.5%
2	-9.4%	9.2%	-1.8%	-0.1%	2.1%	66.1%	16.9%
3	-12.7%	12.7%	-1.1%	-0.4%	1.5%	68.7%	18.8%
4	-4.2%	4.1%	-0.5%	-0.2%	0.8%	81.6%	17.0%
5	-1.2%	1.2%	-0.4%	0.0%	0.5%	81.6%	24.9%
6	-8.8%	9.0%	-0.6%	-0.6%	1.1%	74.8%	15.9%

Diverse/Integrated Districts

Trajectory	Chg. in% White	Chg. in %Hispanic	Chg. in% Black	Chg. in% Asian	Chg. in % Other Race	% EFL in 2018	Chg. in % EFL
1	-14.0%	11.2%	-4.5%	0.7%	6.6%	42.3%	14.9%
2	-15.5%	15.8%	-4.7%	0.2%	4.1%	61.1%	21.3%
3	-14.3%	14.8%	-3.4%	0.0%	2.9%	61.7%	19.7%
4	-19.5%	19.4%	-1.9%	0.0%	2.0%	65.5%	24.4%

Note: EFL represents students who are eligible for free lunch.

Table 4. 4. The Association between Diversity Trajectories and Educational Outcomes Based on the Regression Models

All-White Districts

	Average Test Scores			Increase in Test Scores		
Variable	Coef.	SD	P-Value	Coef.	SD	P-Value
Trajectory #2	0.05	0.05	0.27	0.02*	0.01	0.03
Trajectory #3	-0.02	0.05	0.69	0.01	0.01	0.08
% EFL	-3.18***	0.14	0.00	-0.14***	0.02	0.00

Mostly-Whiet Districts

	Average Test Scores			Increase in Test Scores		
Variable	Coef.	SD	P-Value	Coef.	SD	P-Value
Trajectory #2	0.19***	0.06	0.00	0.02*	0.01	0.02
Trajectory #3	0.34***	0.08	0.00	0.05***	0.01	0.00
Trajectory #4	0.35***	0.09	0.00	0.04***	0.01	0.00
Trajectory #5	0.32***	0.07	0.00	0.04***	0.01	0.00
% EFL	-4.37***	0.15	0.00	-0.17***	0.02	0.00

White Districts with Non-white Concentration

	Average Test Scores			Increase in Test Scores		
Variable	Coef.	SD	P-Value	Coef.	SD	P-Value
Trajectory #2	-0.08	0.07	0.29	0.01	0.01	0.65
Trajectory #3	-0.06	0.08	0.44	0.01	0.01	0.48
Trajectory #4	-0.09	0.10	0.38	0.01	0.02	0.43
% EFL	-2.43***	0.20	0.00	-0.10***	0.03	0.00

Mostly-Nonwhite Districts

	Average Test Scores			Increase in Test Scores		
Variable	Coef.	SD	P-Value	Coef.	SD	P-Value
Trajectory #2	0.15	0.08	0.09	0.00	0.01	0.83
Trajectory #3	-0.11	0.10	0.27	-0.01	0.01	0.63
Trajectory #4	0.00	0.13	0.99	-0.01	0.02	0.61
Trajectory #5	0.20	0.15	0.18	-0.02	0.02	0.25
Trajectory #6	0.07	0.12	0.53	-0.02	0.02	0.18
% EFL	-1.55***	0.18	0.00	-0.07**	0.03	0.01

Diverse/Integrated Districts

	Average Test Scores			Increase in Test Scores		
Variable	Coef.	SD	P-Value	Coef.	SD	P-Value
Trajectory #2	-0.27*	0.14	0.05	-0.02	0.02	0.22
Trajectory #3	-0.33*	0.15	0.02	-0.02	0.02	0.28
Trajectory #4	-0.46**	0.17	0.01	-0.04*	0.02	0.05
% EFL	-2.10***	0.36	0.00	-0.11**	0.04	0.01

Note: Trajectory #1 (high diversity) was used as the reference category in all models. The coefficients for control variables are omitted here. EFL represents students who are eligible for free lunch

Figure 4. 1. Comparison of Racial Diversity across Different Types of School Districts

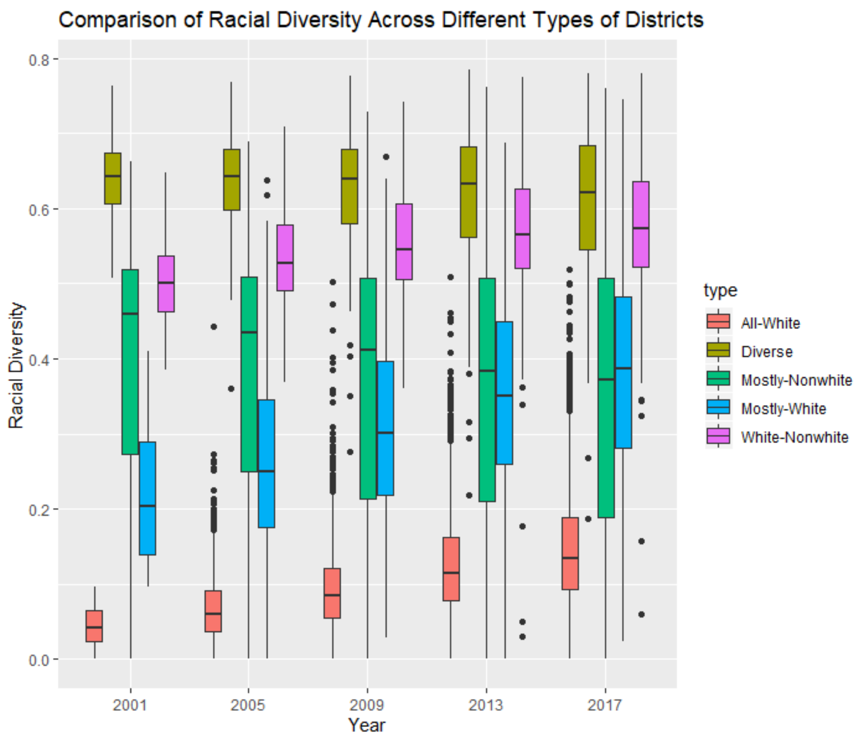


Figure 4. 2. Racial Diversity Trajectories of All-White Districts

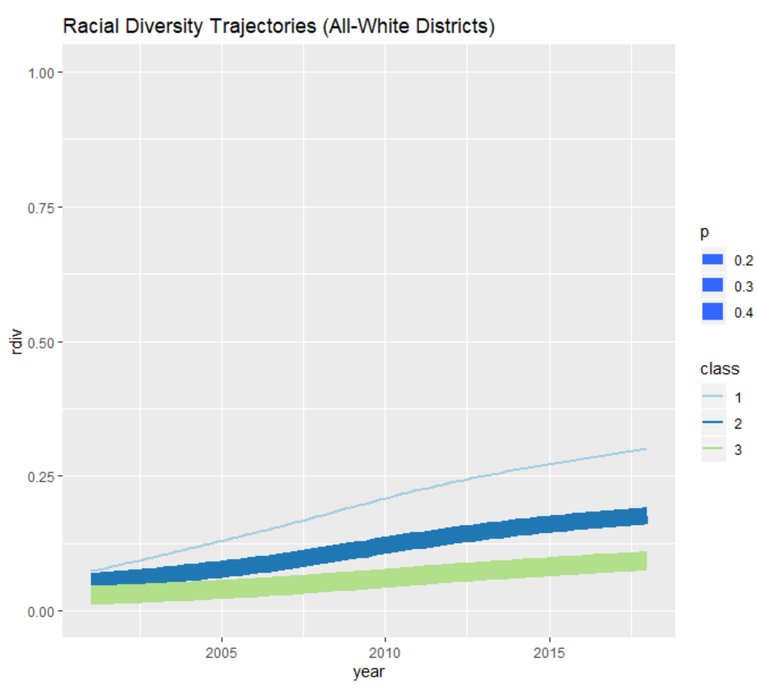


Figure 4. 3. Racial Diversity Trajectories of Mostly-White Districts

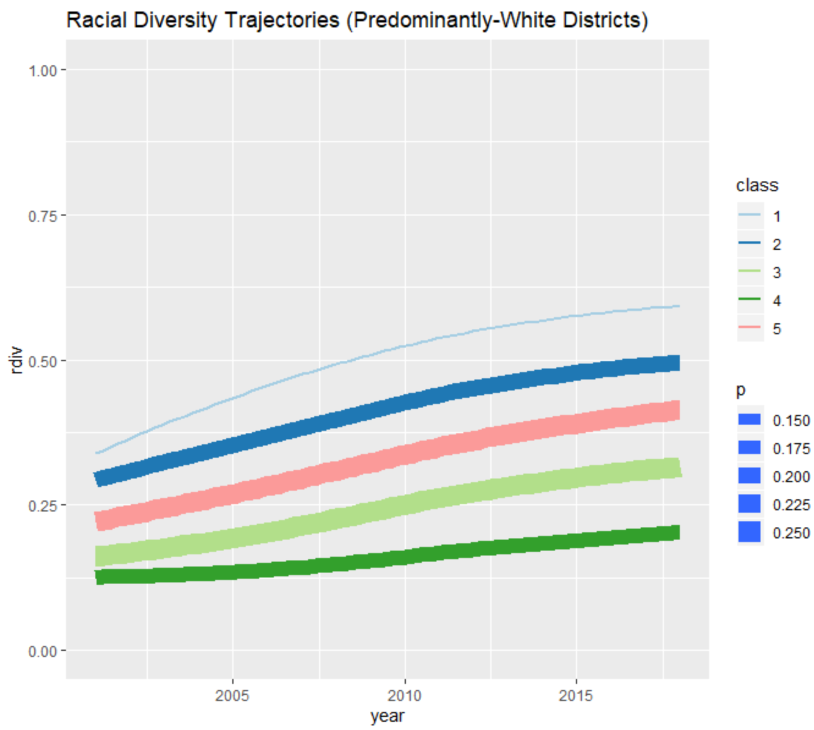


Figure 4. 4. Racial Diversity Trajectories of White Districts with Non-White Concentration

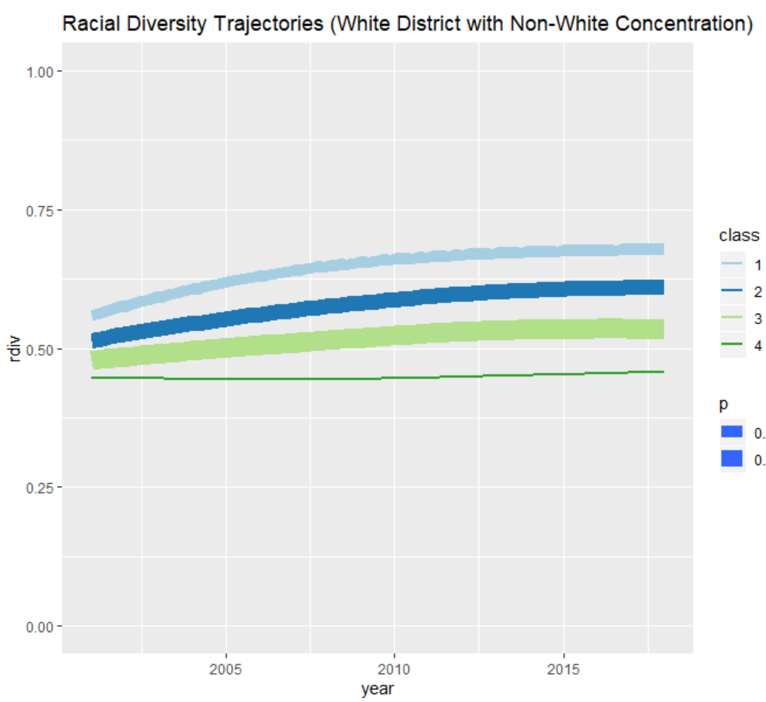


Figure 4. 5. Racial Diversity Trajectories of Mostly-Nonwhite Districts

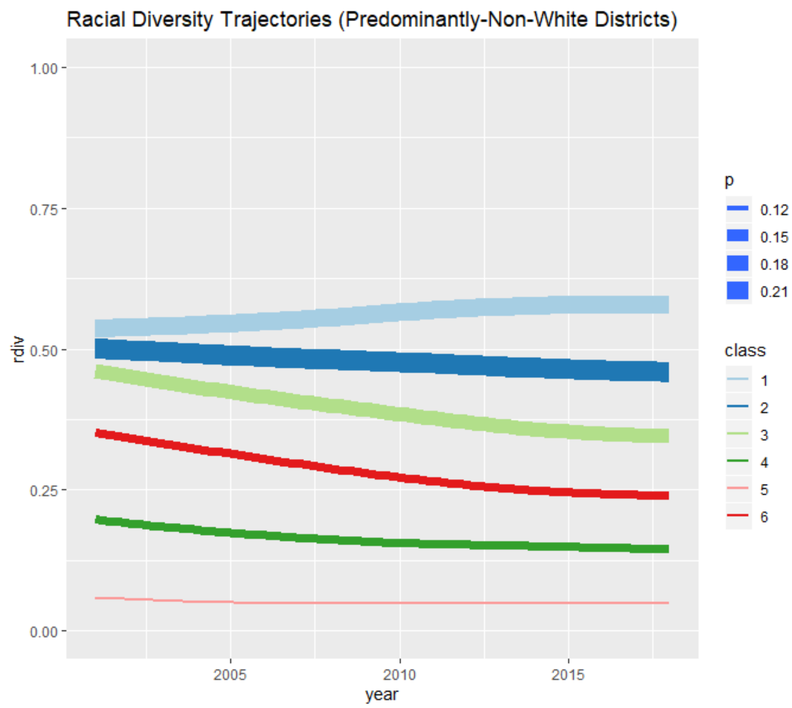


Figure 4. 6. Racial Diversity Trajectories of Integrated/Diverse Districts

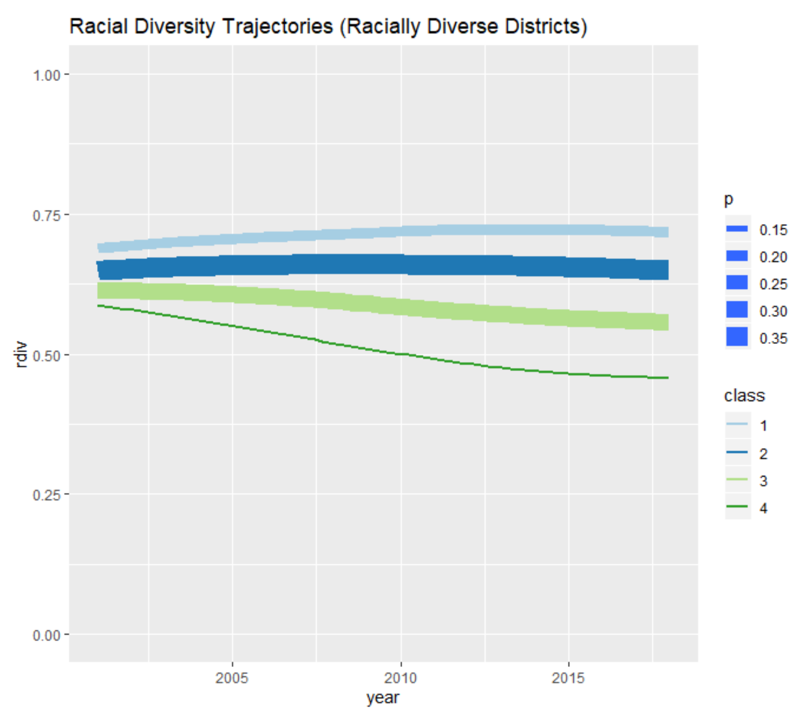


Figure 4. 7. Comparison of Average Test Scores across Different Types of Districts

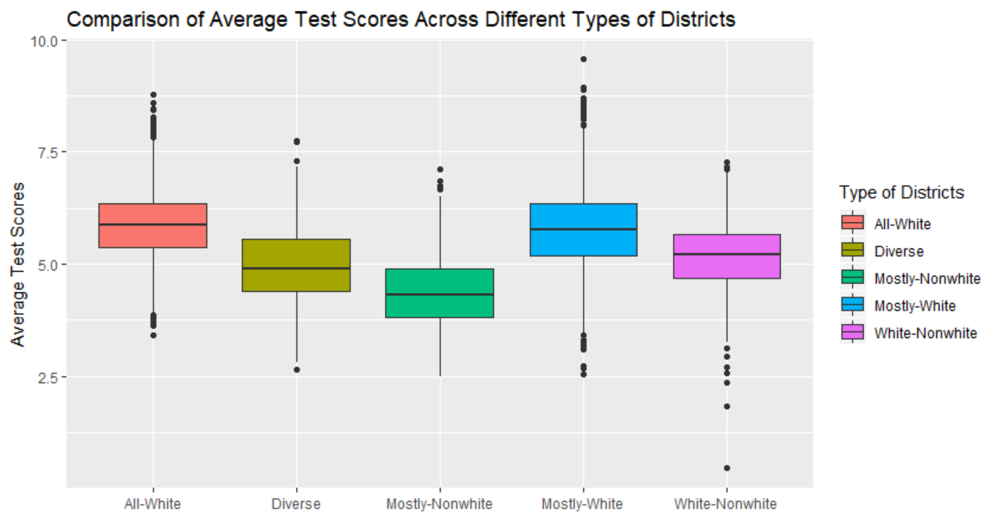
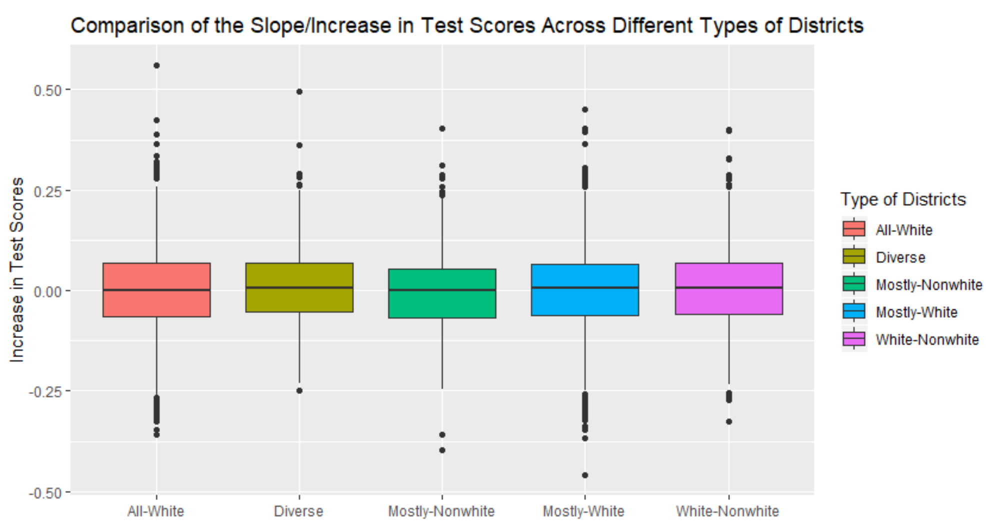


Figure 4. 8. Comparison of the Slope/Increase in Test Scores across Different Types of Districts



CHAPTER V:
Conclusion and Discussion

The goal of this dissertation was to extend current understanding of whether school or school district diversity has an influence on students' attitudes and educational outcomes. To that end, the first empirical chapter addressed the gap in the literature by expanding the focus from school racial diversity to socioeconomic diversity. The analyses in the first empirical chapter also point to differential meanings of socioeconomic diversity in different school context. The second empirical chapter revisited the importance of school racial diversity but addressed the methodological challenges of selection bias by utilizing a full matching strategy. In doing so, the analyses offered new evidence regarding the association between school racial context and students' race-related preferences. The last empirical chapter moved beyond cross-sectional analyses and examined the variation in changes of diversity over time across different school districts. The analyses pointed to heterogeneity in the diversity trajectories, as well as disparities in test score outcomes associated with school districts that followed different diversity trajectories. Collectively, this dissertation brings together the literature on school segregation and educational stratification and provides valuable insights into understanding the empirical relevance of diversity in the school context.

In the first empirical chapter, I highlighted the importance of considering school socioeconomic diversity as a related, yet different dimension of school socioeconomic context than school mean SES. The results showed that there is a significant positive association between school socioeconomic diversity and students' educational expectation, even after relevant individual-level characteristics and other school-level characteristics are adjusted for. However, the coefficients from the random-effect models suggested that the average marginal effect of school socioeconomic diversity differs across different school contexts and varies depending on students' socioeconomic backgrounds. In low-SES schools, the positive association between diversity and educational expectations is stronger among low-SES students than among their more socioeconomically advantaged peers. This pattern aligns with the mechanisms suggested by cultural transmission theory, which argues that low-SES students might benefit from a learning environment where a proportion of the student body is accounted for by middle- or high-SES students. Compared to a homogeneously low-SES school, the presence of middle- and high-SES peers in a more diverse school may bring in more cultural and social capital at the school level and positively affect students' learning practices at school (Lin 2000; Thrupp 1997).

Nevertheless, when it comes to high-SES schools where low-SES students only account for a very small share of the student body, the analyses pointed to a different mechanism suggested by the relative deprivation theory. The results showed that in this type of school context, the positive association between socioeconomic diversity and educational expectation is attenuated among socioeconomically disadvantaged students. Therefore, socioeconomically disadvantaged students who experience high levels of relative deprivation in a high-SES diverse school might not be able to benefit from diversity as much as their more affluent peers. Taken together, these findings pointed to both the potential benefits and drawbacks of school socioeconomic integration plans.

Additionally, the heterogeneous effects of diversity found across students of various background pointed to the importance of recognizing effect heterogeneity while evaluating the effectiveness of education-focused policy (Brand, Pfeffer, and Goldrick-Rab 2012). From a policy perspective, findings from the first empirical chapter suggested it is critical for policymakers to consider how the meaning of diversity might change not only across different students but also in different type of schools. Given the opposing mechanisms found in schools where low-SES students constitute the majority of the student body and schools where they only account for a small proportion, the findings indicated that school socioeconomic composition might play a role in shaping the ways students perceive their own SES compared to their peers. Therefore, policymakers should also take into account how changes in school socioeconomic diversity might differently affect the daily learning experiences of students of distinct socioeconomic backgrounds. Additionally, in situations where disadvantaged students are the minority in the student body, school-level practices to minimize the influences of relative deprivation among low-SES students might go a long way in making the diverse learning environments more inclusive to students of various backgrounds.

While the first empirical chapter offers useful insights regarding how school diversity might shape students' educational expectations, the analysis itself is not free from the concerns of selection bias, given that students are not randomly selected into schools with different levels of diversity. Therefore, the second empirical chapter addressed this particular methodological challenge by applying a quasi-experimental approach. The results illustrated that there is noticeable difference in characteristics between students who attend racially diverse schools and those who attend more homogeneous schools, but the full matching approach is effective in reducing the imbalance in covariance between the two groups. From a methodological perspective, this chapter serves as a starting point for future research to further explore the usefulness of full matching approach in education-focused and sociological studies.

Using the matched sample, this chapter confirms that observed selection bias alone does not fully account for the association observed between school racial context and students' racial attitudes. I found that for both white and non-white students, those who attend racially diverse schools are less likely to develop pro-segregation preferences compared to their peers in more racially homogeneous schools. The findings lend support to the contact hypothesis, which argues that a diverse environment could increase interracial interactions and therefore lead to more positive attitudes and opinions about peers of other races (Boisjoly et al. 2006). The results hold important implications regarding the long-term dynamic of school racial segregation. In particular, if school serves as an important site that shapes the formation of students' racial attitudes, ongoing de facto segregation might show a tendency to perpetuate itself through the reproduction of pro-segregation ideologies. Future research in this line should expand on the findings from this chapter and explore whether attending racial diverse schools may have a long-term influence on students' racial attitudes and preferences later in life.

Findings from the first two empirical chapters both pointed to a significant association between school diversity and student-level outcomes. To further understand the specific mechanisms that the influence of school racial and socioeconomic diversity, future research in this vein may also consider how changes in school racial and socioeconomic composition affects students' daily interactions with their peers. For instance, despite attending a school with high levels of racial or socioeconomic diversity, the diverse environment itself might not guarantee that students would choose to make friends or interact with peers outside of their own race/ethnicity or with different socioeconomic backgrounds. Therefore, going one step further than this dissertation, it might be particularly useful for future studies to understand to what extent changes in school diversity may bring about changes in the dynamics between different races or SES groups within the school context.

Shifting from a cross-sectional perspective to a longitudinal perspective, the third empirical chapter tackled the question of whether diverse school districts remain diverse over time and whether homogeneous ones diversify. The results showed both the stable and the changing aspects of de facto school segregation. On the one hand, despite the slight increase in racial diversity over time, predominantly-white districts remained the type of school districts with the lowest level of racial diversity. On the other hand, the noticeable decline in racial diversity among mostly-nonwhite districts aligned with theories of white flights and school choices, which argued that as students from white and socioeconomically advantaged families choose to flee or avoid districts with high shares of racial minorities, the concentration of non-white students in certain areas could be reinforced over time. It is also noteworthy that mostly-nonwhite school districts are also the types of districts with the highest proportion of students eligible for free lunch. The overlap between race- and class-based school segregation suggested that compared to white students, nonwhite students might have become especially susceptible to the concentration of poverty in school.

Findings from the last empirical chapter highlighted the variation in diversity trajectories not only across different types of school districts, but also within each types of school districts. For instance, among school districts that were racially diverse in 1998, although some went through the process of white flight and saw significant declines in racial diversity over time, about half of diverse school districts remained high level of racial diversity. In terms of the association between diversity trajectories and academic achievement outcomes, diverse school districts that remained high diversity over time also saw higher district-level test scores compared to similar districts that evolved into more homogenous districts over time, even after other district-level characteristics are adjusted for. As for district-level socioeconomic composition, the analysis also showed that the concentration of low-income students is negatively associated with district-level test scores. Collectively, these findings suggested that school racial and socioeconomic integration may have the potential to improve students' learning outcomes. On the other hand, if the current structure of school segregation continues, the concentration of poverty in mostly-nonwhite districts may reproduce existing disparities in educational achievement in the long run.

Returning to the key inquiry of this dissertation, the analyses from the three chapters have shown that diversity in the school contexts indeed matter. On the school level, both school socioeconomic and racial contexts may influence the way students perceive their own socioeconomic status compared to their peers, as well as shaping their race-related attitudes. On a school district level, different patterns of diversity in the student body are also associated with disparities in educational outcomes. Taken together, the conclusions from my analyses revealed that challenges still remain for the efforts toward school integration. First, given that very few districts saw drastic increase in diversity from 2001 to 2018, if the current structure of residential and income segregation stays unchanged, the process of white flight and school district gerrymandering might continue to leave behind racial minority students in districts with a high concentration of poverty. Second, given the association between school-level diversity and students' educational expectations and racial attitudes, segregated schools themselves might become the soils that reproduce the pattern of school segregation and even widen existing gaps in educational outcomes. Creating more diverse, equitable, and inclusive schools requires a deeper understanding of both the macro structures that serve to perpetuate the landscape of school segregation and the micro context-specific meanings of school diversity, as well as policy efforts to ensure that students of different backgrounds can equally benefit from school integration.

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