

Abstract Title Page

Title: How Does Transition from Elementary to Middle School Affect the Racial Achievement Gap?

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Abstract Body

Problem / Background / Context:

Transition from elementary school to middle school has been a frequent research topic in recent years. The findings have highlighted both risks and opportunities that may have an impact on the academic achievement in the following years (Akos & Galassi, 2004). Most research on the middle school transition focuses on developmental and psychological changes around the age of the transition, and investigates or discusses the impact of such changes on academic performance, motivation and behavior in schools. In addition to intrapersonal developmental changes that middle-school students experience, they also experience significant changes in school context and school experiences. In middle schools, students typically have different teachers for different subjects, go to larger schools, make new friends, have to change rooms in between classes, are expected to work more independently, etc.

Research on school transitions consistently notes the importance of a successful transition for later outcomes, both academic and psychological (Anderman, Maehr, & Midgley, 1999; Anderman & Midgley, 1997; Barber & Olsen, 2004; Barton & Rapkin, 1987; Friedel, Cortina, Turner, & Midgley, 2010; Lohaus, Elben, Ball, & Klein-hessling, 2004; Seidman, Allen, Aber, Mitchell, & Feinman, 1994; Vanlede, Little, & Card, 2006; West, Sweeting, & Young, 2008). Consequently, a great deal of research investigates different aspects of the transition and tries to provide practitioners with advice on how to help ease students' middle school transition to prevent or minimize possible negative effects on academic outcomes.

What has been less studied however, is whether and how the transition from elementary to middle school may affect the racial achievement gaps. In other words, it is not known yet whether the change in school contexts affects students from different racial and socioeconomic backgrounds in different ways, possibly affecting the black-white or Hispanic-white achievement gaps. This paper addresses this question.

There are a number of reasons to suspect that there might be differential effects of the middle school transition for different demographic groups, some of which suggest it might narrow achievement gaps; others suggest it may widen them. Middle schools are generally less racially and socioeconomically segregated than elementary schools, because they are typically larger and draw from larger catchment areas. If the segregation of elementary schools is associated with large disparities in school quality, then the move to middle schools may lead to reduced disparities in school quality experienced by white and minority students. On the other hand, the middle school transition may lead to greater tracking, and greater racial disparities in access to challenging academic content and instructions. Tracking in the transition from middle to high school may lead to greater segregation, both within and in between schools (Card & Rothstein, 2007; Irizarry, 2014).

Maybe one of the biggest changes when moving from elementary to middle school is the fact that students have different teachers for each subject, and thus spend only a few hours a week with a teacher; while in elementary education, the teacher spends most of the school hours in the same class, and thus knows all the students very well and builds a more personal relationship with each of them. Research investigating the effects of teacher relationships (e.g., Maulana, Opdenakker, den Brok, & Bosker, 2011) suggests that a good teacher student relationship matters even more for minority students (e.g., den Brok, van Tartwijk, Wubbels, & Veldman, 2010). In that case, the less personal relationship with the teacher in middle school might affect the minority students more. The other way around could also be true: if the minority

students tend to have a less beneficial interpersonal relationship with their elementary school teacher, they might enjoy the fact that their teachers in middle school are less proximate.

Since middle school transition happens at an age when students undergo many other transitions, be it physical, psychological, or social, one can also imagine that these non-academic changes might influence academic outcomes differently by race. For instance, Barton and Olsen (1987) found that peer social support increased only for blacks of high academic competence. Also, blacks reported greater distrust of the environment than they reported negative internal states, whereas whites reported the opposite pattern. West, Sweeting and Young (2008) found that students of lower ability and lower self-esteem experienced poorer school transitions. Thus, if the minority students are the lowest performing students, they are the most vulnerable for negative effects of middle school transition. (den Brok et al., 2010)

On the whole, it is unclear whether the transition to middle school may exacerbate achievement gaps or narrow them. This paper attempts to provide initial evidence on this question.

Purpose / Objective / Research Question / Focus of Research:

This study answers the question: “What is the effect of transition to a middle school after elementary school on:

- black-white achievement gap in mathematics
- black-white achievement gap in reading
- Hispanic-white achievement gap in mathematics
- Hispanic-white achievement gap in reading?”

Improvement Initiative / Intervention / Program / Practice:

Public schools in the United States are organized in different ways across districts. In some districts, all public schools are organized as either elementary or middle school; and thus all students within these districts are obliged to make a school transition in between (we name these districts the *transition districts*). In other districts, all public schools are organized as K-G8 or G1-G8 schools, and thus most students stay in the same school throughout their elementary and middle school (we call these districts the *control districts*). We exploit this variation in districts to investigate the effects of a middle school transition on students’ achievement and the size of the racial achievement gaps.

Population / Participants / Subjects:

There are nearly 14,000 school districts and about four million students attending grade 5 in a public school in the United States. For this study, we compare students’ achievement and racial achievement gaps from districts where all elementary schools are separate from middle schools with these from districts where all schools offer both elementary and middle school education. We use data from school year 2010-2011. The districts that have a mix of both school structures are left out in this study.

We begin by categorizing districts as one of three types: those in which no 5th graders in the district have to change schools after grade 5 (control districts); those in which all 5th graders must change schools after 5th grade (transition districts); and those in which some, but not all, students must change schools after grade 5 (partial transition districts). Table 1 and Figure 1 show the distribution of the districts among these three types. In about 30% of the districts, all students have to change schools after grade 5; in 61% of the districts, no one does. Table 2 and

Figure 2 show the distribution of the students among these district types. About 30% of the students have to change schools after grade 5; about 30% of the students don't. The districts where some, but not all, students must change are disproportionately large districts, representing only 9% of districts, but roughly 40% of students.

We limit the sample to grades 4 in 2008-09, grade 5 in 2009-10 and 6 in 2010-11 in control and full transition districts. This selection results in a sample of roughly 2.2 million students within 13,352 districts. We further limit the sample to districts in which we can compute achievement gaps in each of these three grade-years. In practice, this means we restrict the sample to districts in which there were at least 20 black (or Hispanic) and 20 white students in each of the three grades. Although this is a low threshold, many districts do not enroll sufficient minority students to meet this criteria. For black-white gap analyses, we have 1,040 districts; for the Hispanic-white analyses, we have 1,209 districts; the districts enroll an average of roughly 400 students per grade, making them slightly larger than the average district in the U.S (which enrolls roughly 300 students/grade).

Research Design:

To estimate the effects of school transition, ideally, one would randomly assign students to either an educational path with a middle school transition or one with a K-8 path. This is of course not feasible in real life. In order to estimate the change in achievement gaps after middle school transition, we use a difference-in-difference-in-difference design. To be able to ascribe possible differences in change in gaps to the middle school transition, we estimate the change in achievement gaps between grade 5 and 6 in both transition districts (treated districts) and control districts. Because we want to make sure that the possible found effects are to be described to the middle school transition, and not to other district-specific characteristics, we also estimate the change in achievement gaps between grade 4 and grade 5, to control for possible pre-treatment trends in achievement gaps. We also add district specific fixed effects. Precision weights ($1/SE_{V2}$) are included in the regression models to correct for reliability of the gaps estimates, that is, gaps with more precision receive a heavier weight in the analysis.

We fit the following model to estimate the average black-white and Hispanic-white achievement gap (V) for mathematics and reading respectively.

$$V = \beta_1 Grade + \beta_2(Grade * T) + \beta_3 G6 + \beta_4(G6 * T) + D + \varepsilon,$$

where T indicates whether a district is a transition district ($T = 1$) or a control district ($T = 0$), and where the parameters are interpreted as:

- β_1 : difference in gaps between grades 4 and 5 in control districts (pre-treatment difference).
- β_2 : difference in grade 4 and 5 gap difference between transition and control districts (pre-treatment difference in trends)
- β_3 : difference in gaps between grades 5 and 6 in control districts, controlling for grade 4 to 5 grade trend.
- β_4 : this is the parameter of interest. It tells us how much different the change in gaps is from grade 5 to grade 6 in districts with $T=1$ than in those with $T=0$, after controlling for pre-treatment trend differences.
- D is the district fixed effect.

Further analyses will look into how middle school transition effects persist in later grades, the expanded model looks as follows:

$$Y = \beta_0 + \beta_1 G6 + \beta_2 G7 + \beta_3 G8 + \beta_4 (G6 * T) + \beta_5 (G7 * T) + \beta_7 (G8 * T) + D + \varepsilon$$

Additional sensitivity analyses will examine the whether we see the same patterns in districts where the middle-school transition happens after 6th grade, and whether the patterns are robust to the inclusion of a set of grade-varying control covariates. We will conduct analyses within specific states to ensure that the results are not due to differences between states in state accountability tests. We will also check for differences in grade retention between transition and control districts. Finally, we will investigate the possibility of heterogeneity of effects across district types. For example, if changes in segregation patterns are the cause of any effects we see, we can test to see whether the patterns are larger or smaller across districts in relation to segregation levels in ways that are consistent with this hypothesis.

Data Collection and Analysis:

Data on district grade transition structures are derived from the Common Core of Data (CCD), accessible to the public from www.nces.ed.gov. We also obtain a rich set of demographic covariates from the CCD, including racial composition, segregation, socioeconomic composition, etc.

Achievement gaps are derived from district-by-grade-by-race-by-subject achievement data collected by the U.S. Department of Education provided to the authors. We compute racial achievement gaps using a set of statistical methods that was developed and validated for estimating achievement gaps by Ho and Reardon (2012). These methods and their extensions enable us to compute achievement gaps within each district in a metric that is comparable across states, grades, and years, even when different tests are used.

Findings / Outcomes:

Preliminary results are shown in Table 3. The black-white achievement gap in both math and reading increase significantly more from 5th to 6th grade in transition districts than in control districts, after adjusting for grade 4-5 gap trends. The increase is roughly 0.06 standard deviations, roughly one tenth of the size of the average gap in 4th grade, so these effects are non-trivial in magnitude. The same pattern is evident in the Hispanic-white gap in math, but not in reading.

Conclusions:

Although we have further analyses to conduct, the preliminary findings suggest that the transition to middle school has, on average a significant effect on racial achievement gaps. In further analyses we will seek to rule out alternative explanations for the findings, and explore potential mediators and mechanisms of the findings, and examine the extent to which these negative effects of the middle school transition persist over subsequent years.

Appendices

Appendix A. References

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Appendix B. Tables and Figures

Table 1: Distribution of districts by school structure

	Freq.	Percent
Control districts (all schools are K8)	8,952	61.49%
Mixed districts (left out analyses)	1,207	8.29%
Transition districts (all middle schools are separate)	4,400	30.22%
Total	14,559	100.00%

Table 2: Distribution of students by school structure

	Freq.	Percent
5 th graders in control districts	1,086,457	29.28%
5 th graders in partially transition districts	1,527,323	41.16%
5 th graders in transition districts	1,096,818	29.56%
Total	3,710,598	100.00%

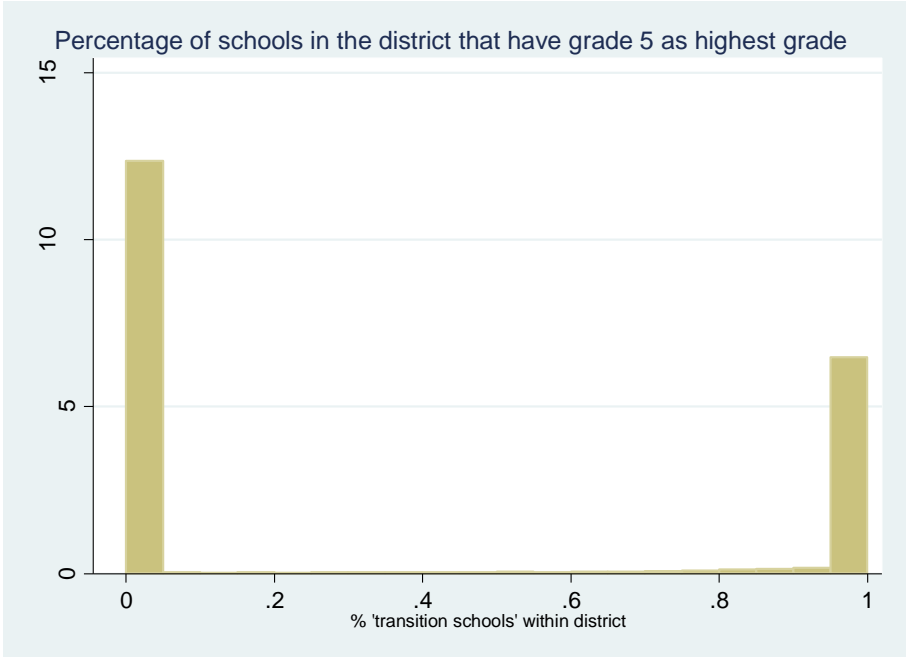


Figure 1

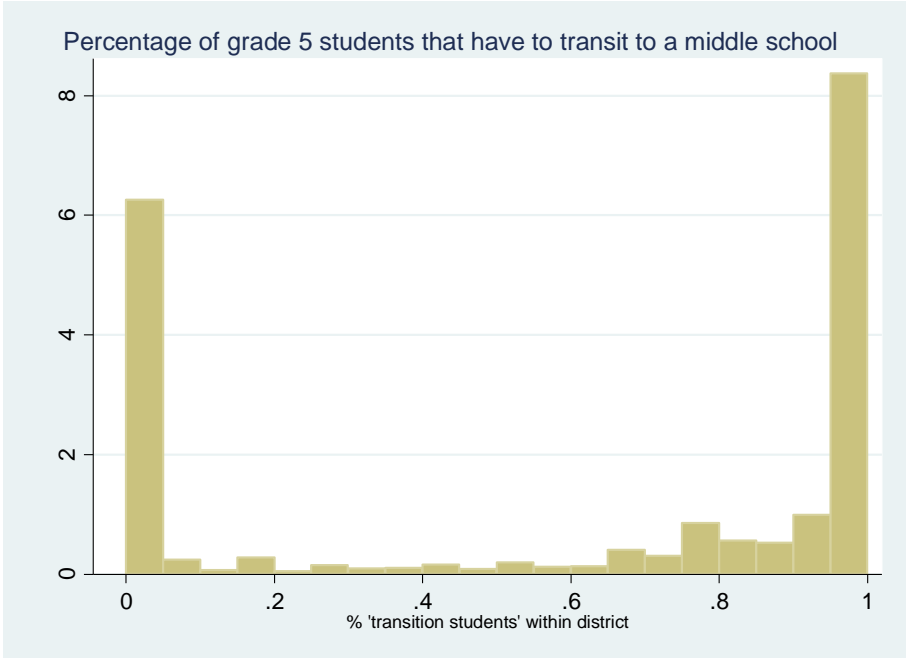


Figure 2

Table 3: Results

	Black-white achievement gaps			
	Mathematics		Reading	
	β	SE	β	SE
average gap	0.675 ***	0.004	0.609 ***	0.004
grade trend in control districts	-0.022 *	0.009	-0.015	0.009
trend difference in transition districts	-0.027 *	0.011	-0.019	0.011
additional grade 5-6 change in control districts	0.021	0.016	-0.007	0.016
transition effect	0.061 **	0.019	0.059 **	0.019
N (districts)	1,040		1,014	
	Hispanic-white achievement gaps			
	Mathematics		Reading	
	β	SE	β	SE
average gap	0.534 ***	0.003	0.587 ***	0.003
grade trend in control districts	-0.037 ***	0.006	-0.015 *	0.006
trend difference in transition districts	-0.004	0.009	-0.014	0.009
additional grade 5-6 change in control districts	0.029 **	0.011	-0.033 **	0.011
transition effect	0.020	0.015	0.050 **	0.015
N (districts)	1,209		1,149	