Student Segregation and Achievement Tracking in Year-Round Schools

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Twenty-five percent of California's elementary schoolchildren attend schools operating on nontraditional, staggered, overlapping attendance calendars collectively referred to as multitrack year-round education (MT-YRE). This case study reveals substantial differences in the characteristics of students and teachers across the four attendance tracks of eight MT-YRE schools in one large California school district. Analyses of Stanford Achievement Test data, controlling for student and teacher characteristics, reveal strong association of achievement with student demographic, programmatic, and teacher segregation within these MT-YRE schools. These findings suggest that MT-YRE readily (re)segregates students within schools and thereby inhibits access to equal educational opportunity relative to traditional and nontraditional single-track school calendars.

Year-round (modified-calendar) schools are an important, but largely unstudied, component of the American public school system.[1] More than 4 percent of the nation's 47 million public schoolchildren attend a year-round school.[2] Over 60 percent of the nation's year-round-school students are enrolled in the California public school system alone. One million schoolchildren (2 percent of the national total and more than 15 percent of the California total) attend a California public school operating on a modified-calendar system known as multitrack year-round education (MT-YRE).[3] To gauge the scale of MT-YRE in California (the most prevalent form of year-round schooling in that state), less than one-third of the remaining 49 states have total public school enrollments as large as that in California's MT-YRE schools.

The prevalence of MT-YRE in California is not the only reason to emphasize its study, though any system of education that affects one million schoolchildren is worthy of attention in its own right. What is more impor-

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tant about California's MT-YRE schools is that they are a striking example of how a state and its local school districts may administratively respond to population growth under fiscal constraint, a response seen or actively contemplated in other states as well (e.g., Florida, Nevada, North Carolina, and Utah);[4] and this response has potentially important, but generally unintended, educational consequences. In particular, MT-YRE is a system that differentiates school attendance groups with the potential for creating both social and academic segregation comparable to other curriculum-tracking practices that have received a great deal of scholarly attention in recent years.[5] Also, enrollment and staffing patterns within MT-YRE schools may be subject to the dynamics of family choice, choice in a context that has no transportation costs and relatively low information and transaction costs.

MT-YRE AS ADMINISTRATIVE RESPONSE

Fiscal and political constraints on school construction in California have encouraged the widespread adoption of MT-YRE calendars because such attendance scheduling allows schools to serve more children with the same physical building space.[6] This is accomplished by creating multiple, staggered attendance calendars ("tracks" with differing vacation schedules) such that at any given time, some fraction of the students (and their teachers) are not is session.[7] The prevalence of MT-YRE in California has essentially two causes: student population growth exceeding school capacity and state policy encouraging MT-YRE implementation.

First, California has experienced an unabated influx of poorer, often immigrant families into older urban and suburban neighborhoods since the 1980s, which has increased the population densities of those neighborhoods.[8] This increased population density has been a major factor in why MT-YRE has been used to accommodate overcrowding and, since 1996, to find classrooms to implement the California class size reduction initiative.[9] These conditions also help to explain why California's MT-YRE schools are more frequently low-performing schools compared to those operating on traditional or other single-track calendars.[10]

Second, throughout the 1990s, California's Year-Round School Grant Program provided an incentive for districts to continue or newly adopt MT-YRE operation in order to qualify for state building funds for new school construction regardless of community demographics.[11] From San Diego in the south to the Sacramento Valley in the north and in roughly half of the coastal and inland counties in between, over 1,000 schools in more than 100 urban, suburban, and rural districts operate on some form of MT-YRE calendar. And of greatest signficance to the present study, at the end of the last decade, about one in every four of the state's elementary school students was attending an MT-YRE school.[12]

HOW MT-YRE SCHOOLS ARE ORGANIZED

The most common multitrack calendar is a rotating, four-track system with roughly one-fourth of the student body not in attendance at any given time. The most prevalent rotation cycle is the "60/20" model, where students are "on track" for three months (60 days) and "off track" for one month (20 days).[13] Thus, one-fourth of the students and their families are on vacation in any given month. The typical process for making track assignments involves setting a sign-up date for parents (often in the spring months of May or June) when new students and their families express their track preferences.

In addition to calendar preference, student assignment is likely to be influenced by several rules and practices governing track enrollment. Returning children are nearly always guaranteed the right to remain on their current track if they wish. Families with siblings on a specific track are typically given preferential access to placement on that track. And special-circumstance appeals are sometimes allowed (e.g., to facilitate parental visitation for children with divorced parents). Quite often schools also designate specific tracks for special programs (such as athletic teams, band or other music programs, and bilingual education programs) in order to avoid duplicating costs or to accommodate community preferences. In order to participate in these programs, students are typically assigned to specific tracks.[14] Once assigned to an attendance track, students typically have little or no exposure to children in other tracks during the instructional portion of their day. As discussed more fully below, the sign-up system contributes to strikingly differentiated enrollment patterns.[15]

ASSIGNMENT MECHANISMS

The MT-YRE calendar adds a layer of complexity to the assignment of students and staff. Three mechanisms for distribution among attendance tracks have been identified in the research literature: attendance boundary division, program differentiation, and preferential choice. First, attendance boundary division subdivides the school's neighborhood catchment area, effectively creating multiple schools within the school. This appears to occur relatively infrequently; only one case was found in the literature.[16]

Second, program differentiation concentrates specific types of students, personnel, and resources on particular attendance tracks. There is no adequate empirical work on exactly how programs are assigned to tracks.

There are, however, anecdotes about this in the literature.[17] As noted in our findings, there is some confirming evidence from this study.

Third, preferential choice separates students in accordance with family preferences for particular attendance tracks and allows teachers to seek their preferred work schedules. These opportunities for choice are structured by district policies. Family and staff choice is unique to MT-YRE schools. There are no choice opportunities in traditional-calendar schools,[18] but schools operating on an MT-YRE calendar are subject to the dynamics of parental choice through sign-up queues employed to allocate children to preferred schedules. Parents exercise their choices *within* the "neighborhood" school, a circumstance with information-gathering and transportation costs much lower than those typically associated with interschool or interdistrict choice options.[19] Additionally, the teacher labor market sometimes provides opportunities for staff to seek assignment to preferred tracks. As shown below, significant consequences follow these choice dynamics, which, in combination with program differentiation, yields significant student and staff segregation.

POTENTIAL CONSEQUENCES

Two points are critical for understanding the potential social and educational consequences of differentially distributing students and teachers among multiple attendance tracks. First, by creating typically four distinct "schools within a school," the MT-YRE calendar offers a particularly powerful mechanism for separating and, as Shields and Oberg assert, potentially "ghettoizing" groups within a school site.[20] Even though students are enrolled at the same school site, the staggered attendance pattern changes their schoolmates every month. As a consequence, they come to see members of their attendance track as their primary classmates. Regardless of the student assignment mechanism, classroom groups generally are separated by attendance track for all instructional activities. Not only do students stay within a particular track for the entire school year, they typically remain in the same track from one year to the next. Moreover, MT-YRE is more commonly an elementary than secondary school phenomenon, and thus cohort separation begins with the first day of kindergarten.

The second point to emphasize is that separating student track groups creates opportunities for the development of significant biases in the distribution of educational resources and opportunities. The MT-YRE calendar separates teachers, as well as students, into groups by attendance track. As a consequence, teachers are not equally available to all students, other teachers, or even their site administrators. When students go "off track," so do their teachers. Frequently as a result of resource limitations, teachers who work with special populations (English-language learners and special education students) or who are curriculum specialists (e.g., music, physical education, and reading) are available only on specific attendance tracks. This leads in turn to redistributing the students according to the available instructional resources. This realignment or redistribution may be the intended consequence of explicit policies or merely the unintended consequence of an effort to use resources efficiently. Regardless, significant track-to-track differences in the distribution of educational resources and opportunities are produced.

These issues of group separation and resource allocation are two major themes in the well-established literature on curriculum tracking. That research helps to inform the data analysis presented in this study by emphasizing a third theme—academic-achievement differences—which is seen as dependent upon group and resource segregation. The curriculum-tracking research literature draws attention to the fact that tracked programs do more to create resource and opportunity differences for students than effectively respond to preexisting student performance differences.[21] Moreover, inaccurately placed students tend to stay in their initial track placements.[22] For example, the lower tracks, where poor and minority students are found in higher concentration, all too often receive the least adequate teaching resources and display stagnated student achievement growth.[23] This research concludes that track assignments do more to *determine* student outcomes than to *respond* to individual differences.[24] Further, since academic-performance advantages tend to be aligned with social-class differences among children, schools' curriculum-tracking policies abet the reproduction of social and cultural advantages for certain groups.[25] Three issues from curriculum-tracking research are attended to in this study of MT-YRE attendance tracking: (a) the biased distribution of teaching talent, (b) the sorting of students by demographic and programmatic characteristics, and (c) the differential outcomes of schooling.[26] As our study finds, MT-YRE schools are characterized by sharp differentiation on each of these three dimensions.

PRIOR RESEARCH ON TRACK-TO-TRACK DIFFERENCES IN MT-YRE SCHOOLS

Prior research on the character and impact of MT-YRE school policies is quite limited. The literature that does exist supports three conclusions:[27]

1. Attendance tracks that most resemble the traditional calendar are the most popular.
2. Student demographics differ markedly from track to track.
3. The track-to-track student achievement gap can be quite large.

Table 1. Summary of differences among attendance tracks in elementary schools using a multitrack year-round calendar

			Demographic differentiation			
YRE track	Summer month off	Enrollment popularity	Family income levels	LEP enrollment	Nonwhite enrollment	Relative achievement
A	June	Lower	Lower	Variable	Variable	Lower
B	September	Lower	Lower	Higher	Higher	Lower
C	August	Higher	Higher	Lower	Lower	Higher
D	July	Higher	Higher	Variable	Variable	Higher

Sources: Norman R. Brekke, *Year-Round Education and Academic Achievement in the Oxnard School District* (Paper presented at the annual meeting of the National Council on Year-Round Education, Anaheim, CA, 1986); Robert Burns, *A Study of Combination Class Achievement* [SA-006] (Riverside: California Education Research Cooperative, School of Education, University of California, Riverside, 1996); Ruth E. Knudson, *Year-Round School: Are There Student Differences?* (Paper presented at the annual meeting of the American Educational Research Association, San Francisco, 1995 [ED385952]); Douglas E. Mitchell, *Assessing the Attainment Risks of Assigning Students to Combination Grade Classes* (Unpublished manuscript, California Education Research Cooperative, School of Education, University of California, Riverside, n.d.); Janet Stimson, *The Effects of Multigrade Classes on Student Achievement in Year-Round Schools* (Unpublished doctoral dissertation, Northern Arizona University, Flagstaff, 1991).

As shown in Table 1, the tracks differ not only in the months during which students are on vacation, but also in family preference, student poverty levels, limited English-language proficiency and nonwhite enrollment, and overall achievement levels. The rows in the table identify the four different tracks of typical MT-YRE calendars. The columns identify intertrack differences. As to the first point, tracks most like the traditional calendar (e.g., those with summer vacation months in July or August) are the most popular and are always the first to fully enroll. Late enrollees are generally assigned to the less popular tracks with more open slots.[28]

Second, the tracks are demographically differentiated.[29] The most popular track has more students, and these students are more often from wealthier, English-speaking, white families than the other tracks. The least popular track has fewer students, relatively more of whom are from poorer, non-English-speaking, and nonwhite families.

In many cases, demographic segmentation reflects de facto segregation resulting from parental choice and the resulting alignment of school programs with the differentiated enrollment groups. Personnel and other resource constraints may accelerate the convergence of preferences with programs, as when shortages of bilingual or special education (and sometimes music) teachers cause school officials to limit some educational programs to one or two of the MT-YRE tracks in order to control costs and allocate limited resources or services.[30] However, two other mechanisms leading to demographic segmentation have been observed. First, school catchment areas have been subdivided into smaller neighborhood zones to fill tracks, reproducing the differences already known to be associated with the de facto segregation in family housing patterns.[31] Second, de jure segregation has been observed in one case from the 1980s. That is, in response to the preference of Mexican agricultural laborers for extended vacations to Mexico in January, the Oxnard School District had a policy calling for school officials to actively encourage the enrollment of migrant workers' children on B-Track, which is off in January, to limit absenteeism for this group.[32]

To restate the third conclusion, mean achievement also differs sharply across attendance tracks. The most popular tracks have the highest mean achievement, while the least popular tracks have the lowest mean achievement.[33] Achievement stratification can occur as multiple strata. That is, each track can have successively higher mean achievement levels regardless of the number of tracks (three, four, or more), or there can be a high track, a low track, and the remaining tracks roughly at the same mean achievement level somewhere between the top and bottom tracks.

While the three conclusions are consistent across the case studies, we note that none of these studies extensively explored the track segregation patterns for systematic covariation among demographic and achievement variables. In particular, there were no attempts to simultaneously consider all or even some of the factors identified in Table 1 when accounting for track-to-track achievement differences. Further, neither the contributions of unequally distributed teaching talent nor the dynamics of choice were identified in previous studies. In what follows, we report on teacher, as well as student, segmentation across MT-YRE tracks, in a context where track assignment preferences are a contributing factor, and more extensively investigate the relationship between student achievement and segregation within MT-YRE schools.

A STUDY OF MT-YRE SCHOOLS IN ONE LARGE CALIFORNIA DISTRICT

Our data allow us to examine MT-YRE academic and social segregation as it has developed in one large California school district. Extensive and detailed demographic and achievement data on 12,174 traditional- and MT-YRE-calendar elementary school students in grades 2 through 6, including professional background information about their teachers, were compiled for statistical analysis (see Appendix A for details). At the time the data were collected (after the close of the 1997–98 school year), eight (30 percent) of the district's elementary schools operated on an MT-YRE calendar, enrolling roughly 37 percent of the district's elementary students.[34] This was, in part, to comply with the requirements of the Year-Round School Grant Program.[35] In a personal communication, one district superintendent noted that the fiscal incentives offered by this state grant program were compelling.[36] By adopting MT-YRE, the district received higher priority for state school building funds (and MT-YRE grant funding), which made MT-YRE a more attractive option for responding to enrollment growth than double sessions, leasing or purchasing relocatable classrooms, or seeking a school construction initiative on the local ballot.

The number of elementary students assigned to MT-YRE schools in this district rose sharply in 1996, from 28 to 37 percent, to accommodate first-year implementation of California's class size reduction (CSR) initiative: Two additional elementary schools adopted MT-YRE calendars. The average total school enrollment across all elementary schools in the district in 1997–98 was 735; across MT-YRE schools, average enrollment was 913.[37] A descriptive statistical profile of the district's 12,000+ elementary school students (grades 2–6), including track-to-track differences for the 4,000+ students in MT-YRE schools, is presented in Appendix Table A1. Information from that table is described in the following sections.

THE STUDENTS

The elementary school student population is ethnically diverse. There is a plurality of white students (43.7 percent), followed closely by Hispanics (41.5 percent). A much smaller proportion of the enrollment is black (9.7 percent), with the remaining 5.1 percent, largely but not exclusively Asian, classified as "other." The poverty (National School Lunch Program [NSLP] or free/reduced price lunch qualification) rate is 50.5 percent. English is the predominant home language (75.3 percent), followed by Spanish (21.8 percent), with the remainder classified as "other." The proportion of the students classified as limited English proficient (LEP) is 17.7 percent. Another 6.8 percent are classified as fluent English proficient (FEP), with the remainder being English only. There are a bit more Hispanic and other, LEP, and Spanish- and other-home-language students in MT-YRE than in traditional-calendar schools, but somewhat fewer poor students.

Gender and grade are fairly evenly distributed. The second- and third-grade samples are slightly larger than those in the higher grades. There are two types of special education identifiers: gifted and talented (GATE) and special education. The GATE-identified proportion of the sample is 9.8

percent. The special-education-identified students are divided into two subgroups: resource specialist program (RSP) for low-achieving students (3.2 percent of the sample) and designated instructional services (DIS) students with other handicapping conditions (2.7 percent). About one student in six (17.1 percent) was new to the district in 1997–98. The proportion of boys is higher in MT-YRE schools, compared to traditional-calendar schools, but mobility and the proportion of GATE students is lower.

The average achievement levels in mathematics and reading on the spring 1998 statewide administration of the Stanford Achievement Test, Ninth Edition (SAT-9), were recorded in the normal-curve-equivalent (NCE) metric.[38] The NCE scale permits the simultaneous comparison of students across grade levels on a common metric, namely, performance relative to a nationally representative sample of students taking the same tests. Additionally, the NCE scale corresponds to national percentile rank scores at 1, 50, and 99, which helps to give some intuitive sense of how well a student or group of students is performing on a given test level.[39] For example, the district-wide average achievement levels for mathematics and reading (45.48 NCE points and 44.07 NCE points, respectively) for this California school district's elementary school students are a little below the normed national mean of 50. Mean achievement in mathematics and reading is about 1 NCE point lower in MT-YRE schools than in traditional-calendar schools.

THEIR TEACHERS

Nearly 20 percent of the students in the district have teachers on probationary contracts, while 67 percent have tenured teachers, with the remainder having the typically underqualified "Other" contracts. About one-sixth of the students have a teacher who holds a bachelor's degree, while about four of six have a teacher with a bachelor's degree plus 30 hours, and the remaining one in six has a teacher who holds a master's or higher degree. More than 90 percent of the students have fully credentialed teachers, but slightly more than 11 percent have teachers who hold some type of "alternative credential." Across all students, teachers average 7.3 years of teaching experience. Because of the presence in this district of a substantial number of very highly experienced teachers, this mean experience value is misleading, however. A better estimate of average teaching experience would be the median experience level, which is 3 years of experience. Teachers in MT-YRE schools, on average, have less experience, are less likely to have full credentials, are more likely to have alternative credentials, and are less likely to have postbaccalaureate degrees, though more likely to have tenure, than those in traditional-calendar schools. With this overview of the district's elementary schools in mind, we turn to the examination of our central research questions.

INVESTIGATING ACADEMIC AND SOCIAL SEGREGATION IN MT-YRE SCHOOLS

Our data analysis documents seven key findings related to intertrack differences in the MT-YRE schools. Rather than separate a description of what was learned from explanations of how the data were analyzed, we describe the basis for each finding along with presentation of the finding itself (see Appendix B for additional details regarding the statistical methods employed).

INTERTRACK ACHIEVEMENT GAPS ARE LARGE

Based on the differences between track-level means for mathematics and reading achievement, MT-YRE attendance tracks are academically segregated to such an extent that children in the lowest-achieving track (B) are academically about 1.5 years behind their peers in the highest-achieving track (C).[40] C-Track's mean reading score is 50.78, fully 15.70 points above that for B-Track. C-Track also outperforms A- and D-Tracks by 7.23 and 6.21 NCEs, respectively.[41] The mathematics story is similar. The A- and D-Track difference of 1.02 NCE points is not significant, but both tracks are significantly above B-Track. C-Track has the very highest math achievement at 52.91 NCEs, 16.30 points above B-Track, 10.68 above A-Track, and 8.17 above D-Track.

Another way to observe these dramatic track-to-track differences is to examine the full distribution of achievement at the track level rather than just the average achievement. This can be done by plotting "shift functions," so named because they reveal how much one achievement distribution is shifted above or below another across the entire measured range.[42] In the present case, the achievement distribution of the traditional-calendar schools is used as the reference function (comparing its NCE scores at each 5th percentile or "vigesile" of the score distribution, with the scores at each 5th percentile of the four MT-YRE track score distributions). The achievement differences (positive or negative) between the traditional-calendar group and the achievement levels of the four MT-YRE tracks determine their respective shift function values—these values are shown in Figure 1 for both mathematics and reading achievement.

As illustrated in Figure 1, track-to-track achievement differences are quite striking, particularly at the center and high-performance end for mathematics achievement and at the low end and entire upper half for reading achievement. Either by examination of the mean achievement levels for each track, as shown in Appendix Table A1, or by the shift functions in Figure 1, it is possible to see that the within-MT-YRE-school academic segregation by track has three strata: (a) C-Track consistently has the highest performance across the entire achievement distribution in both mathematics and reading; (b) in the middle, A- and D-Tracks have nearly identical achievement distributions that are similar to, though slightly lower than, the achievement distribution in the traditional-calendar schools; and (c) B-Track consistently has the lowest performance across the entire achievement distribution.

INTERTRACK STUDENT DEMOGRAPHIC SEGREGATION IS ALSO SUBSTANTIAL

In addition to substantial academic segregation, the MT-YRE tracking system exhibits very substantial demographic segregation. Children in the lowest-achieving (B) track are almost 2.5 times as likely to be poor as those in the highest track (C). They are more than 5.5 times as likely to be from a non-English-speaking home and almost twice as likely to be members of a nonwhite ethnic group (see Table 2). In addition to the three student differences just noted, there is a large gap in the proportion of students identified for GATE between the B- and C-Tracks, as well as a notable difference in the student mobility rate. Program differentiation is almost certainly an important contributor to this segregation.

Though some of the demographic stratification (i.e., white vs. nonwhite and English vs. non-English) singularly distinguishes B-Track from all of the other tracks by about the same amount, more typically the differences reproduce the three strata found in the achievement segregation described above. B-Track is lowest, C-Track is highest, and A- and D-Tracks have similar intermediate values. C-Track is most sharply distinguished from all other tracks when it comes to GATE student enrollment and year-to-year student mobility. On these two variables A-Track is significantly more "disadvantaged" than D-Track . In the case of student mobility, A-Track has a rate even higher than B-Track. We should also note that home-language differences involve more than an English vs. non-English linguistic separation. The proportion of students from homes where "other" languages (predominantly Asian languages) are spoken is highest for A-Track, which also has the highest proportion of students with "other" ethnicity (see Appendix Table A1). Clearly, the demographic segmentation across MT-YRE attendance tracks observed here is more complex than the initially obvious polar separation of B- and C-Tracks with A- and D-Tracks occupying indistinguishable middle positions. Nevertheless, the demographic segregation found among the four MT-YRE tracks is remarkably similar to the academic segmentation discussed above. As documented in "Achievement Differences Are Closely Linked to Demographic Segregation," these demographic differences arising from student enrollment account for a very substantial part of the intertrack achievement differences.

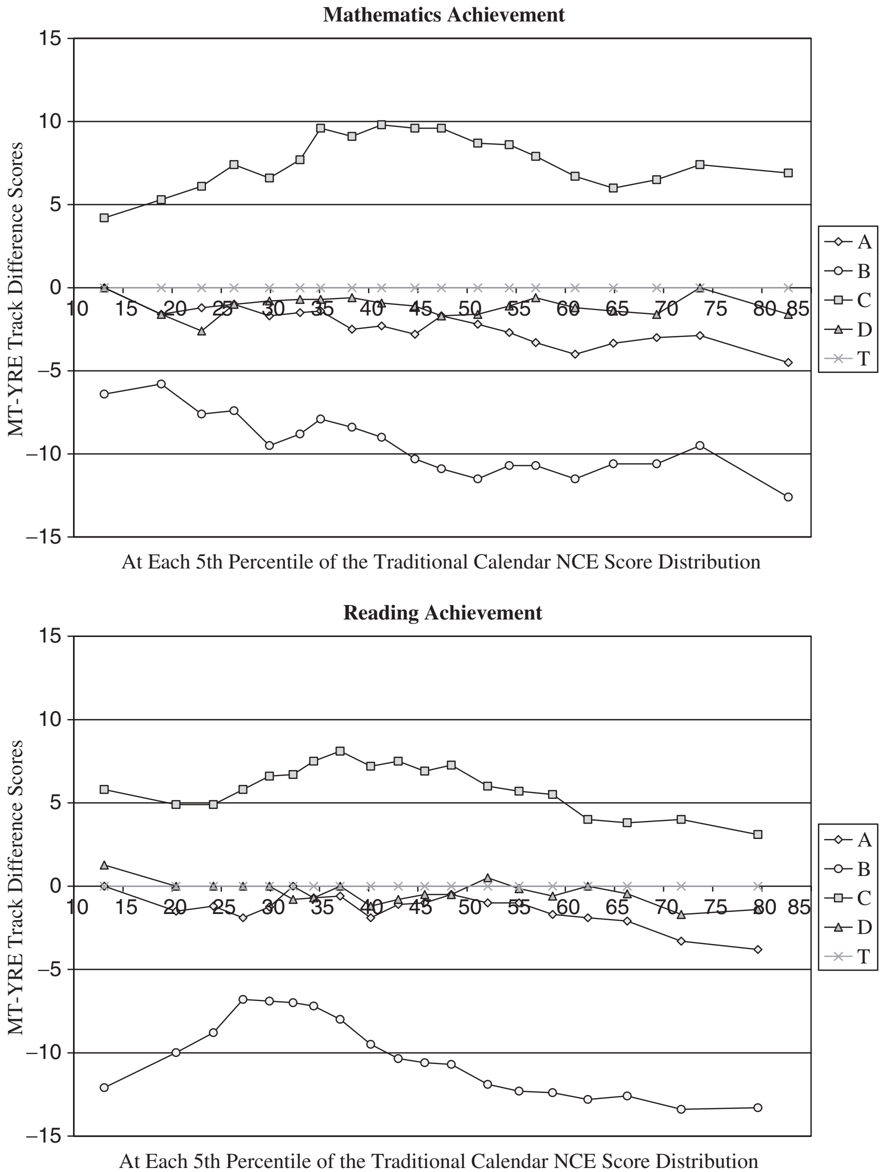

Figure 1. MT-YRE and Traditional Attendance Calendar Student Achievement Differences Shown as Shift Functions Plotted at Each 5th Percentile of the Traditional-Calendar (T) Score Distribution

Table 2. Intertrack student demographic comparisons (percentage composition)

Statistic	MT-YRE attendance calendar			
	A-Track	B-Track	C-Track	D-Track
	Race/ethnicity			
Percentage nonwhite	53.4	81.9	44.7	50.8
Standard error	1.6	1.2	1.4	1.5
Different from track	**B, C**	**All 3**	**A, B, D**	**B, C**
	Poverty (NSLP)			
Percentage NSLP	51.8	73.1	30.8	45.0
Standard error	1.6	1.4	1.3	1.5
Different from track	**B, C, D**	**All 3**	**All 3**	**A, B, C**
	Home language			
Percentage non-English	17.9	62.4	11.2	14.9
Standard error	1.2	1.5	0.9	1.0
Different from track	**B, C**	**All 3**	**A, B, D**	**B, C**
	Identified GATE			
Percentage GATE	5.7	3.8	16.3	7.4
Standard error	0.7	0.6	1.0	0.8
Different from track	**C**	**C, D**	**All 3**	**B, C**
	Mobility (New to district in 1997–98)			
Percent new to district	16.2	14.6	8.2	13.7
Standard error	1.2	1.1	0.8	1.0
Different from track	**C**	**C**	**All 3**	**C**
	Enrollment			
Number of students	979	1,065	1,254	1,177
Percentage	21.88	23.80	28.02	26.30

Note: For statistically significant differences in multiple pairwise comparisons of percentages (Bonferroni adjusted), $p < .05$ is in roman type and $p < .01$ is in boldface type.

TRACKS EXHIBIT A CORRELATED SEGREGATION AMONG TEACHERS

Intertrack segregation is not limited to student achievement and demographics. In MT-YRE schools, students are sharply differentiated in their access to experienced and credentialed teachers. On average, students in the track with the lowest-achieving students (B-Track) have teachers with four fewer years of teaching experience and are almost four times more likely to have teachers with alternative credentials than the far more fully resourced C-Track students (see Table 3). The C-Track also has the highest percentage of students whose teachers have tenure, a full credential, and postbaccalaureate degrees, with the B-Track lowest on these measures of teacher qualification as well (actually, D-Track has a slightly lower percentage of students with teachers holding a full credential). As with demographic segregation, A- and D-Tracks have some similarities (median teacher experience and teacher education level) and some differences

Table 3. Intertrack teacher characteristic comparisons (student-weighted)

	MT-YRE attendance calendar			
Statistic	**A-Track**	**B-Track**	**C-Track**	**D-Track**
	Total years of teaching experience			
Mean	6.35	4.14	8.47	5.72
Standard error	0.09	0.07	0.08	0.08
Different from track	**B, C**	**All 3**	**All 3**	**B, C**
	Teacher has full credential			
Percentage yes	92.5	89.2	96.4	87.3
Standard error	0.8	1.0	0.5	1.0
Different from track	**C, D**	**A, C**	**All 3**	**A, C**
	Teacher has alternative credential			
Percentage yes	8.6	20.7	5.4	16.7
Standard error	0.9	1.2	0.6	1.1
Different from track	**A,** C, **D**	**A, C**	A, **B, D**	**A, C**
	Teacher has tenure			
Percentage yes	67.3	64.4	78.0	73.7
Standard error	1.5	1.5	1.2	1.3
Different from track	**C, D**	**C, D**	**A, B**	**A, B**
	Teacher has postbaccalaureate degree			
Percentage yes	16.3	5.2	19.5	15.0
Standard error	1.2	0.7	1.1	1.0
Different from track	**B**	**All 3**	**B,** D	**B,** C
	Enrollment			
Number of students	979	1,065	1,254	1,177
Percentage	21.88	23.80	28.02	26.30

Note: For statistically significant differences in multiple pairwise comparisons of means and percentages (Bonferroni adjusted), $p < .05$ is in roman type and $p < .01$ is in boldface type.

(teacher credential and contract status), such that the middle two tracks are distinguishable, and not always in the middle relative to the B- and C-Tracks.

ACHIEVEMENT DIFFERENCES ARE CLOSELY LINKED TO DEMOGRAPHIC SEGREGATION

Student demographic segregation accounts for a very substantial amount of the intertrack achievement differences observed in this school district. That is, when a linear regression is used to predict mean student achievement by track using the demographic characteristics of each student, much of the variation across MT-YRE attendance tracks is accounted for. Column I in Table 4 ("Uncontrolled") reports the MT-YRE track means as they are found in the school testing data. Column II ("Student factors") shows how well intertrack differences in student achievement are explained by demographic differences among the student groups enrolled in each track.

As shown in the row of Table 4 labeled "Proportional reduction of variance," using all of the demographic-segregation data reported in Appendix Table A1, the effects of student differences are removed from the estimated track means, thereby reducing the variance in these means by an impressive 89.8 percent in mathematics and an even more potent 93.6 percent in reading. Thus, it is safe to conclude that just about nine-tenths of the intertrack achievement differences in reading and mathematics result from the fact that the tracks are serving demographically distinct groups of students.

ACHIEVEMENT DIFFERENCES ALSO ALIGN WITH TEACHER DIFFERENCES

Teacher segregation also contributes to the emergence of intertrack achievement differences. As seen in Table 4, column III ("Teacher factors"), when the teacher experience, education, contract, and credential variables are substituted for the student demographic variables in a linear-regression model, a more modest, but nevertheless highly reliable, proportion of the intertrack achievement differences is accounted for. This statistical analysis procedure answers the question "How well are the intertrack differences in student achievement predicted by differences among the teachers to which the students are assigned?" Though the relationship is not nearly as strong as for student demographics, 18.4 percent of the variance in track-level mean mathematics achievement is accounted for by the collection of teacher variables, and 12.1 percent of the variance in track-level mean reading achievement is accounted for by the same teacher factors.

IN COMBINATION, TEACHER AND STUDENT SEGREGATION ACCOUNT FOR ABOUT 95 PERCENT OF ALL ACHIEVEMENT DIFFERENCES

To answer the question "How well are the intertrack differences in student achievement explained by a combination of student and teacher differences?" a fourth regression model includes all variables for both groups. The results of this regression model are shown in column IV of Table 4, labeled "Teachers and students." Taken together, the stratification of both students and teachers accounts for 94.2 percent of the intertrack achievement differences in mathematics and 95.9 percent of the intertrack differences in reading achievement.

Another way to see the dramatic impact of student and teacher stratification on intertrack achievement differences is to look at the magnitude of the difference between the highest-achieving track (C-Track) and the lowest-achieving track (B-Track). Without consideration of the potential impact of student and teacher segregation, C-Track has a mean mathematics achievement score that is 16.31 NCE points greater than that of B-Track (this is the equivalent of about 1.5 years of normal achievement growth).

Table 4. Four statistical models estimating MT-YRE track means in student achievement (as predicted by differences in student and teacher characteristics)

	Mathematics achievement				Reading achievement			
		Control variables group				Control variables group		
	I	II	III	IV	I	II	III	IV
YRE track	Uncontrolled[a]	Student factors[b]	Teacher factors[a]	Teachers and students[b]	Uncontrolled[a]	Student factors[c]	Teacher factors[a]	Teachers and students[d]
A-Track	6.99	.88	6.24	.04	8.47	1.80	7.88	1.29
B-Track	.00	.00	.00	.00	.00	.00	.00	.00
C-Track	16.31	4.85	14.72	3.33	15.70	4.01	14.72	3.20
D-Track	8.14	1.21	7.14	.30	9.49	1.86	8.91	1.46
Variance of means	44.65	4.57	36.42	2.60	41.68	2.69	36.65	1.73
Proportional reduction of variance		.898	.184	.942		.936	.121	.959
Model η^2[e]	.077	.348	.098	.362	.081	.367	.096	.375

Note: All uncontrolled (Column I) and controlled (Columns II, III, and IV) track marginal means differences are derived from unstandardized regression coefficients, with B-Track as the reference (zero) level for presentation.

[a]B- and C-Track means are statistically different from each other and all other track means ($p = .000$); A- and D-Track means are *not* different to a statistically significant degree.

[b]Only the C-Track mean is statistically different from the other track means ($p = .000$).

[c]Only the C-Track mean is statistically different from the other track means ($p < .01$).

[d]Only the C-Track mean is statistically different from the other track means ($p < .001$).

[e]Unadjusted proportion of variance in student-level achievement; $p = .000$ for all models.

When both student and teacher factors are included in the linear-regression model, however, the remaining difference between these two tracks is only 3.33 NCE points (the equivalent of only about three months of ordinary achievement growth). For reading, the C-Track mean begins at 15.70 NCE points above the B-Track mean. This difference is reduced to 3.20 NCE points after differences among students and teachers assigned to the four different MT-YRE attendance tracks are accounted for.

ACHIEVEMENT DIFFERENCES BECOME LARGER WITH EXTENDED EXPOSURE TO MT-YRE

Our last finding is the result of exploring how the patterns of student, teacher, and achievement segregation might have been reinforced by MT-YRE school attendance tracking. To conduct this exploration, we turn to one additional variable: the number of years each student has been enrolled in an MT-YRE school. Though its interpretation is fairly subtle, the hypothesis to be tested is straightforward. Put simply, by testing whether students with longer MT-YRE exposure have achievement test scores that contribute more than those of their less exposed peers to intertrack segregation (after controlling for student and teacher demographics, of course), it is possible to determine whether the intertrack segregation is a dynamic and cumulative process, rather than a one-time effect created by initial student and teacher track assignments. Though it would have been more convincing to use multiyear learning trajectory data and track-to-track migration patterns for this analysis, we have data from a single year and thus can make only a post hoc inference regarding the dynamics of MT-YRE participation effects.[43]

The test of interest is performed by conducting a Track by Exposure analysis of covariance (using the student and teacher demographic variables as covariates). If students with longer exposure to MT-YRE play a dominant role in creating intertrack achievement differences, their contributions will show up as a significant Track by Exposure interaction effect, indicating that continued exposure changes the nature of intertrack differences. Once we find this significant interaction effect, examination of the mean scores for each Track by Exposure group will reveal that continued exposure reinforces rather than ameliorates track differences.

Before looking at the statistical output, we should note that any differences found in this way could be the result of either or both of two quite different causes: (a) track-to-track enrollment mobility might exacerbate student body segmentation by having higher-achieving students congregate in the high-achieving track (and low-achieving students move to congregate in the low-achieving track) or (b) educational programs on the different tracks might be differentially effective, raising (or lowering) the relative achievement of students with continued exposure. If track by exposure achievement differences are the result of mobility, family choices would be responsible for segregating students; if they are the result of educational-program differences, then unequal opportunities to learn are producing segregated achievement groups. Without longitudinal achievement data we cannot distinguish these two explanations. The results reported here establish only that existing track-to-track differences in student achievement are linked to student longevity in MT-YRE schools for a particular track. That is, this statistical test for a significant interaction between years in an MT-YRE school and the attendance track on which the student is presently enrolled establishes that achievement differences across MT-YRE tracks are compounded over time.

Table 5 reports the results of the Track by Exposure analysis of covariance. The table shows the relationship between intertrack achievement differences and the number of years a student has participated in an MT-YRE school. Track-to-track differences can be read down the columns, year-to-year differences across the rows. The first thing to note about this analysis is that there is no systematic relationship between achievement and the number of years a student has attended an MT-YRE school. The initially significant intertrack achievement differences not only remain, they generally grow larger as students have more exposure.

The important finding here is that the Exposure by Track interaction is significant. The magnitude of intertrack achievement differences changes as students attend MT-YRE schools for longer periods, with the result that in general, longevity produces increasing differentiation among the track scores. Thus, it is appropriate to conclude that achievement changes over

Table 5. MT-YRE track means in student achievement (1998) as a function of the number of years in MT-YRE (1996–1998): An interaction model

	Mathematics achievement			Reading achievement		
	Years in YRE			Years in YRE		
YRE track	1	2	3	1	2	3
A-Track	0.61	0.54	0.80	1.97	1.24	4.51
B-Track	0.00	1.70	0.09	0.00	3.48	0.85
C-Track	1.60	2.51	7.46	4.61	3.59	5.55
D-Track	0.89	1.78	0.23	2.16	3.71	2.30
Model η^2		.366			.377	

Note: Track marginal means differences are derived from unstandardized regression coefficients, with B-Track and 1 year in YRE as the reference (zero) levels for presentation. Significance levels for mathematics are $p = .000$ for YRE track, $p > .4$ for years in YRE, and $p = .000$ for interaction of track with years in YRE. Significance levels for reading are $p < .001$ for YRE track, $p < .5$ for years in YRE, and $p < .02$ for interaction of track with years in YRE.

time, as children continue for longer periods in MT-YRE schools, and that the magnitude and direction of the changes depend significantly on which of the four YRE tracks they are enrolled in. The overall character of this significant interaction effect can be seen most easily in the bar graph plot of the marginal means presented in Figure 2. Note that the initially higher means for A-, C- and D-Track students can be seen along the left side of the graph. Among students in their second MT-YRE year, A-Track drops below B-Track in both mathematics and reading, though the other tracks continue to outperform the B-Track students. By the third year, B-Track has again become the lowest-performing group, while C-Track greatly extends its margin of superiority in mathematics.

Two key points are underscored by these bar graphs. First, the C-Track has a noteworthy advantage. First-year C-Track students are somewhat ahead of their peers, while students with three years of MT-YRE experience on the C-Track have a substantially larger lead over their peers in other tracks in both mathematics and reading achievement. Additionally, across all four tracks, the longer students are in enrolled in MT-YRE schools, the greater the divergence among their current MT-YRE track means. Thus, we can safely conclude that the dynamics of MT-YRE tracking are such that initial differences created largely by teacher allocation and student demographic segmentation become exacerbated as children remain in these settings.

It is not clear whether these profound intertrack differences should be attributed to instructional-program differences or to migration of students and teachers in ways that concentrate resources and opportunities in the C-Track. While this issue needs to be studied with better data than we now have, we suspect that initial track differences become exacerbated primarily by the dynamics of student and teacher intertrack mobility.[44] Nonetheless, since extended exposure to the MT-YRE tracking system is associated with greater intertrack achievement and demographic differences, it must be the case that either (a) families and teachers recognize track-to-track differences and work to relocate themselves in ways that increasingly segregate track membership or (b) the unbalanced resources available to the different tracks significantly affect children's learning opportunities. As the curriculum-tracking literature has amply demonstrated, the kind of demographic and academic segregation found in these multitrack schools is almost certain to have a cumulative and continuing negative effect on the long-term educational success of some of the schools' most vulnerable students.

SUMMARY OF THE FINDINGS

Multitrack YRE is associated with substantial social and academic segregation of both students and teachers.[45] First, we note that taken as a whole,

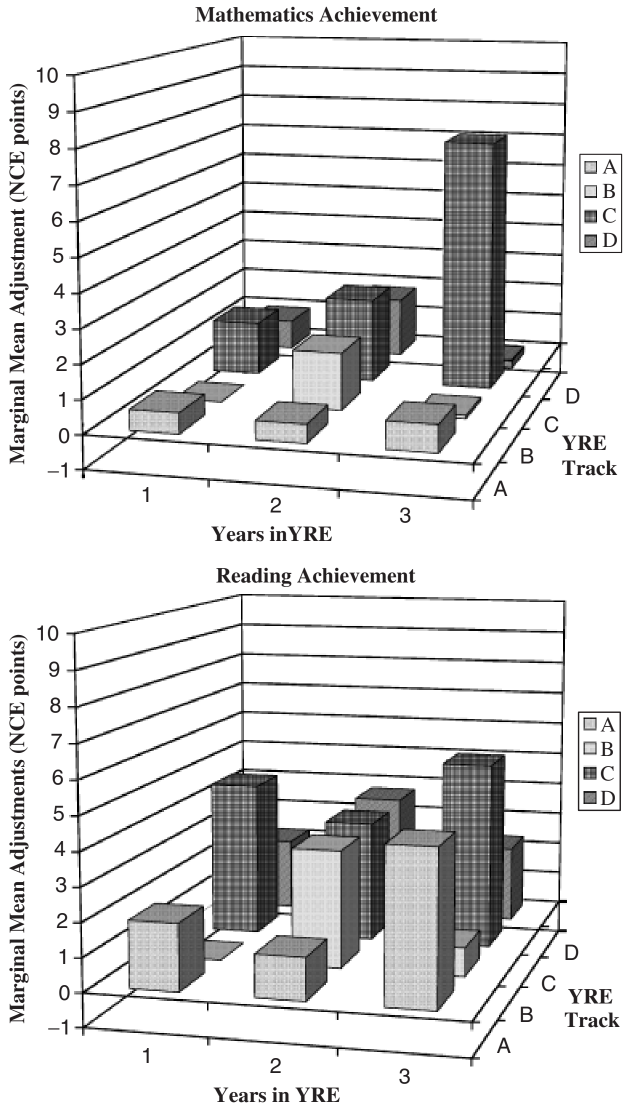

Figure 2. MT-YRE Track Achievement Differences over Three Years—An Interaction Model: Marginal Mean Adjustments to Track Group Mean Scores in 1998 as a Function of the Number of Years in MT-YRE from 1996 to 1998

MT-YRE schools differ from traditional-calendar schools. MT-YRE schools have somewhat lower achievement, a bit more challenging student populations, and slightly less adequate teaching resources than traditional-calendar schools.[46] These differences, though not profound, were observed to be statistically significant in the present case.

Second, and more importantly, there is a very substantial segregation of students and teachers among the four attendance tracks *within* MT-YRE schools—differences not well studied in previous research. Data reviewed here show that MT-YRE school attendance tracks differ sharply in student composition and academic achievement. Segmentation in this year-round school population is initially substantial and, over the three years, appears to expand intertrack achievement differences. The C-Track, with its vacation schedule most like that of the traditional calendar and most popular with parents and students who actively choose tracks, is the highest-achieving track and solidifies its advantage for students with extended enrollment. Over time, the D-Track, with academic performance in the midrange among the attendance tracks, loses some of its initial advantage. The B-Track, which is least like the traditional school in both population and attendance schedule (and typically houses bilingual-education programs) starts out behind and gets further behind as student enrollment continues. Ninety-five percent of the intertrack differences in 1997–98 are accounted for by demographic and programmatic segregation of students in combination with unequal access to highly qualified teachers.[47]

HOW DOES SUCH ACADEMIC DISPARITY ARISE?

Data from this study demonstrate that MT-YRE calendar tracking tends to take on the very features of curriculum tracking that have been the focus of so much recent analysis and criticism. When students attend classrooms tracked by calendar, they wind up in groups also characterized by segmented demographics and program services, with lower-performing students more likely to be in classrooms with less fully qualified or less experienced teachers. Children are not typically assigned to tracks in response to their *performance*, but through the exercise of preferences (or constraints thereon), leading to differentiated *learning opportunities* as a consequence of MT-YRE track selection.

The demographic segmentation of student and teacher groups appears to be sufficiently powerful that we do not need to look to differences in instructional practice in order to account for intertrack achievement differences. Track groups are as differentiated by social status as by school services.[48] This is not to say that instructional practices may not differ radically across tracks, but that student and teacher segregation accounts for track-to-track differences in achievement about as well as any other explanation that might be offered. An active and powerful sorting system is operating within the MT-YRE schools of this California district.

One important consequence to highlight is this: In cases like the one studied here, where districts have desegregation policies (or are under court order to desegregate), we are likely to see significant social resegregation at the site level. To use Bourdieu's language, the most "culturally privileged" groups appear to be finding their way into tracks "capable of reinforcing their advantage." In all likelihood, they do so by pyramiding their collective "social capital" to join preferred tracks and facilitate the accumulation of educational advantage.[49]

Additional research is needed, however. It is not clear whether intertrack achievement differences should be viewed as entirely the consequence of the sociopolitical process of student and teacher assignment or as involving significant educational factors as well. It is possible that initial assignment differences create inequalities in educational effectiveness that "snowball" into substantial achievement differences.[50] It is equally likely, however, that initial differences are compounded by parent and teacher awareness of track differentials that lead them to exercise their choice options in ways that further exacerbate the initial segmentation. While the data available for this study cannot distinguish between these possibilities, data monitoring intertrack movement among students and teachers would show whether the large achievement differences found here are created by student migration rather than instructional effectiveness differences. We plan just such a study in the near future.

DIFFERENT BY DESIGN

In sum, our study is consistent with earlier case studies finding that the modest differences in educational opportunity initially created by the establishment of multitrack year-round calendars work to produce very substantial differences in the distribution of students, teachers, and programs among the different attendance tracks. Selection of tracks by families and teachers and the accompanying alignment of programs and services in response to these choices account for nearly all of the large academic-achievement disparities observed among the four MT-YRE attendance tracks. Beginning with the earliest elementary school years, enrollment in particular attendance tracks becomes the gateway for access to high-achieving classmates, experienced and qualified teachers, and enriched curricular opportunities. Before children in kindergarten have a chance to blossom, before the schools provide the opportunity for children to learn to read, write, or calculate, they are segregated and tracked within their neighborhood MT-YRE schools. Enrollment opportunities are distinct administrative designs that structure both choice opportunities and resource allocations—and the consequences are substantial.

Family and staff choice play the dominant role in this process. These choices, when exercised in the MT-YRE environment, appear to have roughly the same effect that they have in the housing market: segregating advantaged and disadvantaged groups and creating a system that separates strong, high-performance schools (or attendance tracks) from weak and low-performing ones. If one primary purpose for establishing a free, mass, compulsory public education system—supported by the taxing authority of the state to provide resources and the police power of the state to compel participation—is the creation of more equitable life chances for all children,[51] MT-YRE programs like those found in our sample have to be viewed as a threat to that goal. In recent years, education policy has been expanding choice on the grounds that it will induce competition for excellence among the public schools; we see nothing in the data reviewed here to support this proposition. Instead we see the competitive process being used to differentiate and concentrate educational quality without raising overall achievement in any measurable way.

APPENDIX A

DETAILED DESCRIPTION OF DATA

Student achievement data for this study are drawn from California's state-mandated achievement test administered in the spring of 1998 to students in grades 2 through 6 (Stanford Achievement Test, Ninth Edition, Form T). The reading comprehension and mathematics total battery NCE scores are used throughout this analysis.[52] For each student, the data set also includes gender, ethnicity, home language, grade, NSLP participation, English-language proficiency, identification for special education or gifted education services, and interdistrict mobility between annual test administrations. These variables are well known to be associated with differences in student academic achievement.[53] The NSLP variable serves as a poverty indicator.[54] The interdistrict-mobility variable identifies new or transient students. Student English-language proficiency is coded as limited English proficient, fluent English proficient, or English only. Special education services are coded as "not identified" for special education services, "identified for the resource specialist program (RSP)", or "identified for designated instruction services (DIS)."[55] For the purpose of analysis, and reflecting the student population in the district, home language is coded as English, Spanish, or "Other." Similarly, student ethnicity is coded as white, Hispanic, black, or "Other."

The students' school and classroom assignment data make it possible to identify attendance track and teacher. The four MT-YRE tracks are labeled "A" through "D." The year-round schools cycle on a fiscal calendar (July through June). The tracks are off in reverse alphabetical order when the school year begins in July. D-Track has the first summer vacation month in July, C-Track in August, B-Track in September, and A-Track in October (A-Track's third vacation month comes in June each year). Thus, C-Track is closest to the traditional schedule, and B-Track is least like the traditional schedule, with many families perceiving D-Track, which has the traditional summer vacation month of July, as more like the traditional schedule than A-Track.

Student and teacher track assignments in MT-YRE schools were obtained for three consecutive schools years: 1995–96 through 1997–98. Unfortunately, fully comparable student achievement data across all three years were not available. As such, the MT-YRE attendance trajectories of students could be determined, but not their achievement trajectories in both mathematics and reading. However, for the purpose of comparing the relative achievement ranking of each MT-YRE attendance track, mean mathematics and reading achievement levels were calculated (statistics not reported here).

Teacher data from the California Basic Education Data System (CBEDS) Professional Assignment Information File (PAIF) were linked to the student-level data file through the school, grade, and teacher name fields reported in both files. The variables taken from the CBEDS PAIF are (a) total years of teaching experience, (b) number of years of teaching experience within the district, (c) education level, (d) credential status, and (e) contract status. Education level is coded here as a bachelor's degree (BA), bachelor's degree with 30 or more semester hours of advanced postsecondary education (+30), or at least a master's degree (MA or higher). Two dichotomous credential status variables are used: the teacher has a full credential or not, and the teacher holds an alternative credential or not.[56] In addition, the teachers' contractual status in the district is coded in three categories: "Tenured" (beginning with the third full contract year using a Preliminary or Clear credential), "Probationary" (two years or less experience or when using a temporary credential while eligible for regular contract status), and "Other" (a very small group with typically little or no experience and not qualified for a probationary or tenured contract).

About 10 percent of the sample is excluded as a result of unavailability of either data from the student records or CBEDS teacher data. After eliminating cases with missing data, the total sample size dropped to 12,174 students. Teaching experience in the district is highly correlated with total years of teaching experience. Thus, the years-of-teaching-in-the-district variable was redundant and dropped from further analyses.[57] As previously noted, a track-by-track breakdown, along with totals for the MT-YRE schools, traditional-calendar schools, and the sample as a whole, for all of the variables in this study are shown in Appendix Table A1.[58]

Table A1. Total sample, attendance calendar, and MT-YRE track descriptive statistics for district's elementary school (grades 2–6) students in academic year 1997–98

Variable	Category	Attendance calendars						Total for sample
		A-Track	B- Track	C- Track	D- Track	MT-YRE	Traditional	
		Student characteristics						
Achievement on SAT-9 (mean NCE score)	Mathematics	43.59	36.61	52.91	44.74	44.87	45.83	45.48
		(19.97)	(19.30)	(21.24)	(21.06)	(21.30)	(21.51)	(21.44)
	Reading	43.00	34.53	50.23	44.02	43.35	44.48	44.07
		(19.14)	(18.22)	(19.18)	(19.38)	(19.81)	(20.04)	(19.97)
Race/ethnicity (percentage)	White	46.6	18.1	55.3	49.2	42.95	44.15	43.71
	Black	10.6	4.4	8.0	9.4	8.09	10.65	9.71
	Hispanic	33.8	74.6	30.0	36.6	43.17	40.47	41.47
	Other	9.0	2.9	6.7	4.8	5.79	4.73	5.12
Poverty (percentage NSLP)	NSLP	51.8	73.1	30.8	45.0	49.21	51.32	50.54
Home language (percentage)	English	82.1	37.6	88.8	85.1	74.17	75.98	75.32
	Spanish	11.1	60.8	7.9	12.4	22.39	21.39	21.76
	Other	6.7	1.6	3.3	2.5	3.44	2.62	2.92
English language proficiency (percentage)	English Only	82.1	37.7	88.8	85.1	74.19	76.30	75.52
	LEP	12.3	52.0	4.5	9.6	18.86	16.98	17.67
	FEP	5.6	10.3	6.7	5.3	6.95	6.73	6.81
Gender (percentage)	Female	46.2	46.7	47.6	48.3	47.24	49.81	48.87
	Male	53.8	53.3	52.4	51.7	52.76	50.19	51.13
Grade (percentage)	2nd	19.5	25.6	21.6	22.7	22.39	20.33	21.09
	3rd	21.6	19.6	17.7	18.6	19.24	21.68	20.78
	4th	22.3	20.4	19.4	19.7	20.34	19.64	19.89
	5th	19.3	16.9	19.5	20.2	19.02	17.86	18.28
	6th	17.4	17.5	21.9	18.8	19.02	20.50	19.95

Table A1. (Continued)

Variable	Category	Attendance calendars						Total for sample
		A-Track	B- Track	C- Track	D- Track	MT-YRE	Traditional	
Identified GATE (percentage)	GATE	5.7	3.8	16.3	7.4	8.67	10.44	9.79
Identified for special education (percentage)	RSP	3.2	2.3	2.6	3.8	2.97	3.38	3.23
	DIS	2.1	3.1	3.3	2.5	2.77	2.62	2.68
Mobility (percentage)	New to District	16.2	14.6	8.2	13.7	12.92	19.52	17.09
Enrollment	Number	979	1,065	1,254	1,177	4,475	7,699	12,174
	Percentage	8.04	8.75	10.30	9.67	36.76	63.24	100.00
		Teacher characteristics						
Total years' teaching experience	Mean	6.35	4.14	8.47	5.72	6.25	7.84	7.26
		(7.36)	(5.39)	(8.68)	(6.84)	(7.40)	(8.59)	(8.20)
	Median	3	1	5	3	3	4	3
Full credential (percentage)	Yes	92.5	89.2	96.4	87.3	91.46	92.86	92.34
Alternative credential (percentage)	Yes	8.6	20.7	5.4	16.7	12.69	10.12	11.06
Contract status (percentage)	Tenured	67.3	64.4	78.0	73.7	71.28	68.88	69.76
	Probationary	19.9	29.5	15.9	10.5	18.61	20.73	19.95
	Other	12.8	6.1	6.1	15.8	10.10	10.39	10.28
Education level (percentage)	Master's or higher	16.3	5.2	19.5	15.0	14.21	16.07	15.39
	Bachelor's + 30	65.1	80.4	73.1	66.3	71.28	66.22	68.08
	Bachelor's	18.6	14.5	7.4	18.7	14.50	17.72	16.54

Note: Standard deviations of tabulated means are given in parentheses. Teacher factors are student weighted. That is, calculations are performed under the assumption that each student will have a teacher "treatment" effect on his/her individual achievement.

APPENDIX B

DETAILED DISCUSSION OF STATISTICAL METHODS

The test used for whether or not any particular factor significantly accounts for the variance (η^2) in student mathematics or reading achievement is the analysis of variance (ANOVA) *F*-test. Multiple pairwise comparisons of MT-YRE attendance track group means (or proportions for categorical variables, e.g., race/ethnicity, home language, special education services, teacher education level) are tested using Bonferroni-adjusted significance levels.

As shown in Wilcox (see note 42), shift functions are calculated by first establishing the score distribution for a reference group (here, all students attending traditional-calendar schools). The score at each decile (the value at each tenth percentile of the achievement distribution) of the reference distribution is then subtracted from the score at each decile of the "treatment" groups (here, the four groups are the students attending each of the four MT-YRE attendance tracks), leaving the residuals differences for each MT-YRE track to be plotted relative to the reference group (the values at the endpoints of the distributions, i.e., 0 and 100 percent, are not included in the plots); the reference group decile scores are also subtracted from the reference group deciles, thus setting the values for the reference group to zero across the full range of the distribution. However, rather than using deciles to construct our shift functions, we use vigesiles (the value at each fifth percentile of the achievement distribution, i.e., at the 5th, 10th, 15th, . . . , 95th percentiles). By doing so, we obtain greater continuity and resolution, which is justified since our large sample sizes for each track permit reliable estimates for each 5th percentile.

Multivariate estimates of marginal mean differences among the MT-YRE tracks are computed using linear-regression coefficients. The mean achievement for students assigned to each of the four tracks is estimated using the unstandardized regression coefficients estimated for dummy-coded variables for tracks A, B, and C, with D as the reference group. However, because B-Track has the lowest mean achievement level, which makes it the best reference group for discussion purposes, the value of its regression coefficient is subtracted from the value of each of the other three (A, C, and D). This procedure sets the value of the B-Track coefficient at zero and causes the D-Track coefficient to have a nonzero value.

Statistical controls are used to adjust achievement scores for differences in student demographics, program assignments, and teacher qualifications across tracks. Models are run separately for total mathematics and for reading comprehension achievement subtest NCE scores. Prior to controlling for the effects of both student and teacher characteristics, analyses are undertaken to determine how well track mean achievement can be predicted by student characteristics and by teacher qualifications separately.

To ascertain whether MT-YRE tracking has a dynamic and continuing impact on family choices and student assignments, we test for a significant interaction between MT-YRE track assignment and the number of years a child attended MT-YRE classes. In other words, in addition to all of the student and teacher variables included above, a variable for the number of years a child attended MT-YRE classes and the interaction terms between this variable and the track to which the student was assigned are included in the linear-regression models previously specified.

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Notes

1 For detailed reviews of year-round schooling in general, see Harris Cooper, Jeffrey C. Valentine, Kelly Charlton, and April Melson, "The Effects of Modified School Calendars on Student Achievement and on School and Community Attitudes," *Review of Research in Education*, 73 (2003): 1–52; Carolyn M. Shields and Linda J. LaRocque, *Literature Review on Year-Round Schooling (with Annotated Bibliography)* (Report prepared for the British Columbia Ministry of Education, Vancouver, British Columbia, Canada, 1996 [ED399661]); Jane L. Zykowski, Douglas E. Mitchell, David Hough, and Sandra E. Gavin, *A Review of Year-Round Education Research* (Riverside: California Education Research Cooperative, School of Education, University of California, Riverside, 1991). For a simpler and less detached review, see Carolyn M. Shields and Steven Lynn Oberg, *Year-Round Schooling: Promises & Pitfalls* (Lanham, MD: Scarecrow Press, 2000). For a history of school calendar change since the inception of mass public schooling in the nineteenth century, see Kenneth M. Gold, *School's In: The History of Summer Education in American Public Schools* (New York: Peter Lang, 2002).

2 See National Association for Year-Round Education, *YRE Statistics: Growth of Public Year-Round Education in the United States over a 15-Year Period* (San Diego, CA: Author, 2002; retrieved June 13, 2002, from http://www.nayre.org/statistics.html); Thomas D. Snyder (Proj. Dir.) and Charlene M. Hoffman (Prod. Mgr.), *Digest of Education Statistics, 2001* [NCES 2002-130] (Washington, DC: U.S. Department of Education, National Center for Education Statistics, 2002); also Ross E. Mitchell, *Segregation in California's K–12 Public Schools: Biases in Implementation, Assignment, and Achievement with the Multi-track Year-Round Calendar* (Expert report prepared for plaintiffs' counsel, *Eliezer Williams, et al. v. State of California, et al.,* Case No. 312236, Superior Court of the State of California, County of San Francisco, San Francisco, CA, October 10, 2002; retrieved from http://www.mofo.com/decentschools/expert_reports/mitchell_report.pdf).

3 Also see California Department of Education, *California Year-Round Education Directory 2000–2001* (Sacramento: California Department of Education, School Facilities Planning Division, 2001; retrieved December 20, 2001, from http://www.cde.ca.gov/facilities/yearround/direct00.htm).

4 Billee A. Bussard, *The Politics and Marketing of Year-Round School* (Paper presented at the annual meeting of the Florida Political Science Association, Gainesville, FL, March 21, 2003); Bethany Prohm and Nancy Baenen, *Are WCPSS Multi-track Elementary Schools Effective?* [E&R Report No. 96E.03] (Raleigh, NC: Wake County Public School System, Department of Evaluation and Research, January 1996 [ED395983]); Shields and LaRocque, *Literature Review on Year-Round Schooling*.

5 See, for example, R. Scott Baker, "The Paradoxes of Desegregation: Race, Class, and Education, 1935–1975," *American Journal of Education*, 109 (2001): 320–343; Tom Loveless, *The Tracking Wars: State Reform Meets School Policy* (Washington, DC: Brookings Institution Press, 1999); Samuel R. Lucas, *Tracking Inequality: Stratification and Mobility in American High Schools* (New York: Teachers College Press, 1999); Jeannie Oakes, "Two Cities' Tracking and Within School Segregation," *Teachers College Record*, 96 (1995): 681–690; Jeannie Oakes, Amy Stuart Wells, Makeba Jones, and Amanda Datnow, "Detracking: The Social Construction of Ability, Cultural Politics, and Resistance to Reform," *Teachers College Record,* 98 (1997): 482–510; Amy Stuart Wells and Irene Serna, "The Politics of Culture: Understanding Local Political Resistance to Detracking in Racially Mixed Schools," *Harvard Education Review,* 66 (1996): 93–118; Susan Yonezawa, Amy Stuart Wells, and Irene Serna, "Choosing Tracks: 'Freedom of Choice' in Detracking Schools," *American Educational Research Journal*, 39 (2002): 37–67; for a comprehensive review chapter, see Jeannie Oakes, Adam Gamoran, and Reba N. Page, "Curriculum Differentiation: Opportunities, Outcomes, and Meanings," in P. W. Jackson, ed., *Handbook of Research on Curriculum* (New York: Macmillan, 1992), 570–608.

6 Robert Corley, *The Condition of California School Facilities and Policies Related to Those Conditions* (Expert report prepared for plaintiffs' counsel, *Eliezer Williams, et al. v. State of California, et al.,* Case No. 312236, Superior Court of the State of California, County of San Francisco, San Francisco, CA, October 10, 2002; retrieved from http://www.mofo.com/decentschools/expert_reports/corley_report.pdf); Thomas G. Duffy, *Educational Facilities Issues in California: Williams v. State of California* (Expert report prepared for defendants' counsel, *Eliezer Williams, et al. v. State of California, et al.,* Case No. 312236, Superior Court of the State of California, County of San Francisco, San Francisco, CA, April 18, 2003; retrieved from http://www.mofo.com/decentschools/expert_reports/duffy_report.pdf); Legislative Analyst's Office, *Year-Round School Incentive Programs: An Evaluation* (Sacramento, CA: Author, April 1990).

7 Multitrack schools are quite different in design (and in their effects) from the much smaller group of single-track year-round education (ST-YRE) schools that also reorganize the school attendance and vacation calendar. In ST-YRE schools, students are all on the same schedule, typically attending classes three out of every four months of the calendar year. In California, one-third of schools using a year-round calendar are ST-YRE schools. Since, by design, these ST-YRE schools have lower enrollments, only one-quarter of the students attending year-round calendar schools are enrolled in ST-YRE schools. (See notes 2 and 3 for data references.) Simply put, single-track year-round schools merely redistribute the traditional "summer vacation" period into shorter break periods spread across the year. This does not increase school enrollment capacity.

8 Joan L. Herman, "Novel Approaches to Relieve Overcrowding: The Effects of Concept 6 Year-Round Schools," *Urban Education*, 26 (1991): 195–213; Judi McClellan, "K–12 Enrollment Projections," *California Demographics* (Sacramento, CA: California Department of Finance, Demographic Research Unit, Winter 1997): 10; D. B. Smith, "Finding Room for California's Children," *Thrust for Educational Leadership*, 21 (1992): 8–11. Also, as noted by Shields and Oberg in *Year-Round Schooling* and Zykowski et al. in *A Review of Year-Round Ed-*

ucation Research, some California school districts sought temporary relief from overcrowding through MT-YRE in the late 1970s because state requirements for school construction created a long, drawn-out process from initial application for to final occupation of a new building.

9 Steve Hymon, "A Lesson in Classroom Size Reduction," *School Planning and Management*, 36 (1997): 18–23; David C. Illig, *Early Implementation of the Class Size Reduction Initiative* [CRB-97-008] (Sacramento: California Research Bureau, California State Library, April 1997); Joan McRobbie, Jeremy D. Finn, and Patrick Harman, "Class Size Reduction: Lessons Learned from Experience," *WestEd Policy Brief*, Number 23 (August 1998).

10 See, for example, Mitchell, *Segregation in California's K–12 Public Schools;* Claire Quinlan, Cathy George, and Terry Emmett, *Year-Round Education: Year-Round Opportunities—A Study of Year-Round Education in California* (Sacramento: California State Department of Education, 1987 [ED285272]); Jeffrey A. White and Steven M. Cantrell, *Comparison of Student Outcomes in Multi-track Year-Round and Single-Track Traditional School Calendars* (Los Angeles: Los Angeles Unified School District, Program Evaluation and Research Branch, Policy Analysis Unit, March 21, 2001).

11 A key requirement for receiving state financial assistance is that "a number of pupils, equal to or greater than 30 percent of the school district's total enrollment in kindergarten and grades 1 to 6, inclusive, are on the multitrack year-round program" (California Education Code §42263.5.b.2); also see Duffy, *Educational Facilities Issues in California;* Legislative Analyst's Office, *Year-Round School Incentive Programs*.

12 California Department of Education, *California Year-Round Education Directory 1997–98* (Sacramento: California Department of Education, School Facilities Planning Division, 1998). However, relaxation of the voter approval rate for local school bond initiatives from the two-thirds level established by the infamous Proposition 13 California ballot measure of 1978 down to 55 percent with the passage of Proposition 39 on California's November 2000 ballot has made it possible for some districts to gain voter approval and thereby completely abandon the MT-YRE schedule. Nonetheless, it remains to be seen exactly how many students and schools will continue on or be added to the MT-YRE list.

13 California Department of Education, *California Year-Round Education Directory 2000–2001*.

14 Robert B. Burns and Dewayne A. Mason, "Organizational Constraints on the Formation of Elementary School Classes," *American Journal of Education*, 103 (1995): 185–212; Marjorie F. Orellana and Barrie Thorne, "Year-Round Schools and the Politics of Time," *Anthropology & Education Quarterly*, 29 (1998): 446–472.

15 Also see Shields and Oberg, *Year-Round Schooling*.

16 Orellana and Thorne, "Year-Round Schools and the Politics of Time."

17 Burns and Mason, "Organizational Constraints on the Formation of Elementary School Classes"; Shields and Oberg, *Year-Round Schooling*.

18 Single-track-year-round-calendar schools, like traditional-calendar schools, have a common start date and single-track attendance schedule for all students. In ST-YRE schools, there are no opportunities either for parental choice or for student body segmentation among attendance tracks.

19 For a recent review of issues associated with school choice policies, see Jennifer Hochschild and Nathan Scovronick, *The American Dream and the Public Schools* (New York: Oxford University Press, 2003).

20 See Shields and Oberg, *Year-Round Schooling*, esp. 67, 146–149, 165. However, if we were to adopt the definition of "ghettoization" offered by Douglas S. Massey and Nancy A. Denton in *American Apartheid: Segregation and the Making of the Underclass* (Cambridge, MA: Harvard University Press, 1993), 18–19, then a certain set of circumstances would be required to allow only members of one identifiable group to be enrolled on a particular attendance track without any noteworthy representation of another group on the same attendance track. Namely, there

would have to be enough students from one particular group enrolled so that the total enrollment of an attendance track could be filled without other groups' being represented to any significant extent. Circumstances that would permit "ghettoization" do exist and have been noted in the literature, but profound isolation of any particular group on one or more attendance tracks is not observed across all school sites in the current study.

21 For example, Maureen T. Hallinan, "Tracking: From Theory to Practice," *Sociology of Education*, 67 (1994): 79–84.

22 Hallinan, "Tracking"; Oakes, Gamoran, and Page, "Curriculum Differentiation."

23 See review by Oakes, Gamoran, and Page in "Curriculum Differentiation."

24 Also see *Hobson v. Hansen*, 1967, 1971, cited in Mark G. Yudof, David L. Kirp, Tyll van Geel, and Betsy Levin, *Kirp & Yudof's Educational Policy and the Law: Cases and Materials*, 2nd ed. (Berkeley, CA: McCutchan, 1982).

25 Pierre Bourdieu, "Cultural Reproduction and Social Reproduction," in R. Brown, ed., *Knowledge, Education, and Cultural Change: Papers in the Sociology of Education* (London: Tavistock for British Sociological Association, 1973), 71–112; Elizabeth G. Cohen, "Expectation States and Interracial Interaction in School Settings," *Annual Review of Sociology*, 8 (1982): 209–235.

26 See Oakes, Gamoran, and Page, "Curriculum Differentiation."

27 Norman R. Brekke, *Year-Round Education and Academic Achievement in the Oxnard School District* (Paper presented at the annual meeting of the National Council on Year-Round Education, Anaheim, CA, 1986); Robert Burns, *A Study of Combination Class Achievement* [SA-006] (Riverside: California Education Research Cooperative, School of Education, University of California, Riverside, 1996); Burns and Mason, "Organizational Constraints on the Formation of Elementary School Classes"; Ruth E. Knudson, *Year-Round School: Are There Student Differences?* (Paper presented at the annual meeting of the American Educational Research Association, San Francisco, 1995 [ED385952]); Douglas E. Mitchell, *Assessing the Attainment Risks of Assigning Students to Combination Grade Classes* (Unpublished manuscript, California Education Research Cooperative, School of Education, University of California, Riverside, n.d.); Orellana and Thorne, "Year-Round Schools and the Politics of Time"; Janet Stimson, *The Effects of Multigrade Classes on Student Achievement in Year-Round Schools* (Unpublished doctoral dissertation, Northern Arizona University, Flagstaff, AZ, 1991).

28 Burns, *A Study of Combination Class Achievement;* Knudson, *Year-Round School;* and Stimson, *The Effects of Multigrade Classes on Student Achievement in Year-Round Schools.*

29 Brekke, *Year-Round Education and Academic Achievement in the Oxnard School District;* Burns, *A Study of Combination Class Achievement;* Stimson, *The Effects of Multigrade Classes on Student Achievement in Year-Round Schools.*

30 Burns and Mason, "Organizational Constraints on the Formation of Elementary School Classes."

31 See Sandra E. Black, "Do Better Schools Matter? Parental Valuation of Elementary Education," *Quarterly Journal of Economics*, 114 (1999): 577–599; Orellana and Thorne, "Year-Round Schools and the Politics of Time"; Joseph G. Weeres and Bruce Cooper, "Public Choice Perspectives on Urban Schools," in James G. Cibulka, Rodney J. Reed, and Kenneth K. Wong, eds., *The Politics of Urban Education in the United States: The 1991 Yearbook of the Politics of Education Association* (Washington, DC: Falmer Press, 1992), 57–69.

32 Brekke, *Year-Round Education and Academic Achievement in the Oxnard School District.*

33 Burns, *A Study of Combination Class Achievement*; Knudson, *Year-Round School*; Mitchell, *Assessing the Attainment Risks of Assigning Students to Combination Grade Classes.*

34 A highly detailed description of the district's schools is not provided here in order to preserve the district's anonymity.

35 See note 11 for details.

36 The identity of the superintendent is kept confidential in order to protect the identity of the district.

37 These statistics were calculated from data in the CBEDS School Information File (SIF) for years 1995–96 through 1997–98. All of the district's middle and high schools, as well as the remaining elementary schools, operated on a traditional school calendar.

38 The Stanford Achievement Test, Ninth Edition, Form T, referred to as the California STAR, was the state-mandated achievement test for all schools beginning with the 1997–98 school year. When referring to mathematics and reading achievement on the STAR, we mean the total mathematics battery score and the reading comprehension score, respectively. This choice was made because the prior years' testing data available (1996 and 1997) did not include the full reading battery or any of the language battery. Thus, any references to prior years' scores are consistent with current ones.

39 The NCE score is the normal-curve-equivalent score with a national sample mean adjusted to 50 points (not exactly the median, but very close) and a standard deviation of 21.06 points for all grades. Achievement scores reported on the NCE scale serve as interval-level, normally distributed outcome variables, which meet all assumptions of the statistical methods employed in this study. For extreme scores, floor and ceiling effects may occur, since the minimum score is 1 point and the maximum score is 99 points, corresponding to the 1st and 99th percentile rankings, respectively. This and other test score scales are briefly discussed in Robert L. Linn, "Assessments and Accountability," *Educational Researcher*, 29 (2000): 4–16. In the sample reported here, there are few extreme scores, and efforts to account for such truncated observations do not change the results.

40 Though it depends a little on the exact level of the test taken, one grade equivalent of achievement is about one-half of a standard deviation, and the largest differences in achievement are about 16 NCE points, which is more than three-quarters of a standard deviation.

41 All MT-YRE attendance calendar pairwise comparisons of track means have $p = .000$, except that between A- and D-Tracks, where $p > .05$ for both reading ($F_{3,\ 4471} = 128.71$) and mathematics ($F_{3,\ 4471} = 122.52$) achievement.

42 Rand R. Wilcox, *Introduction to Robust Estimation and Hypothesis Testing* (San Diego, CA: Academic Press, 1997).

43 As noted in Appendix A, prior years' data were from a qualitatively different standardized achievement test. Particularly for mathematics, using previous test results in combination with scores on the Stanford Achievement Test in the estimation of learning trajectories would be inappropriate.

44 This is most strongly suggested by examination of one of the two schools that changed from traditional to MT-YRE to accommodate class size reduction. This high-performing school (high enough to influence the year 2 bars in Figure 2) had relatively evenly distributed achievement across tracks in its first MT-YRE year, but by the second MT-YRE year, the differentiated achievement pattern had been established there as well.

45 A third type of opportunity segregation, the classroom teacher to which a student is assigned, would be expected to operate relatively independently of any particular attendance calendar—remembering that there are significant differences in teacher placements across tracks. That is, in addition to parental influence in choice of residence and attendance track, a family may attempt to influence determination of the particular classroom and teacher to which its child is assigned.

46 See, for example, Mitchell, *Segregation in California's K–12 Public Schools*; Quinlan, George, and Emmett, *Year-Round Education*; White and Cantrell, *Comparison of Student Outcomes in Multi-track Year-Round and Single-Track Traditional School Calendars*.

47 A two-level hierarchical linear model (students within classrooms, using MT-YRE track as a dummy-coded classroom-level covariate) confirms that classroom differences in teacher experience and proportions of students identified as LEP, GATE, and in poverty (NSLP-eligible) account for the intertrack achievement differences. That is, program, teacher, and socioeconomic-class differences create and reinforce track differences.

48 Orellana and Thorne, "Year-Round Schools and the Politics of Time."

49 Bourdieu, "Cultural Reproduction and Social Reproduction," 85.

50 Brian Rowan and Andrew W. Miracle, Jr., "Systems of Ability Grouping and the Stratification of Achievement in Elementary Schools," *Sociology of Education*, 56 (1983): 133–144.

51 Hochschild and Scovronick, *The American Dream and the Public Schools.*

52 Also see note 42.

53 See, for example, Doris R. Entwisle, Karl L. Alexander, and Linda Steffel Olson, *Children, Schools, and Inequality* (Boulder, CO: Westview Press, 1997); Douglas E. Mitchell, Tom Destino, and Rita Karam, *Evaluation of English Language Development Programs in the Santa Ana Unified School District: A Report on Data System Reliability and Statistical Modeling of Program Impacts* [SA-008] (Riverside: University of California, Riverside, School of Education, California Educational Research Cooperative, 1997); Ross E. Mitchell, "Class Size Reduction Policy: Evaluating the Impact on Student Achievement in California," *Dissertation Abstracts International*, 62(07): 2305A (September 2001 [UMI No. 3021397]); Alvin S. Rosenthal, Keith Baker, and Alan Ginsburg, "The Effect of Language Background on Achievement Level and Learning among Elementary School Students," *Sociology of Education*, 56 (1983): 157–169; Russell W. Rumberger, Katherine A. Larson, Robert K. Ream, and Gregory A. Palardy, *The Educational Consequences of Mobility for California Students and Schools* [Research Series 99-2] (Berkeley, CA: Policy Analysis for California Education, 1999).

54 As reported in John F. Witte, "The Milwaukee Voucher Experiment," *Educational Evaluation and Policy Analysis*, 20 (1998): 229–252, eligibility for free lunch comes at or below 1.35 times the poverty level; eligibility for reduced price lunch is at or below 1.85 times the poverty level.

55 Students with handicapping conditions severe enough to be assigned to a special day class (SDC) typically take out-of-level tests and thus are eliminated from the study sample.

56 It would be possible to have both a full and an alternative credential if, for example, the holder of a secondary-level credential is teaching at the elementary level on a waiver. It would also be possible if an elementary teacher has an emergency credential to fill a bilingual or ESL teaching position requiring additional authorizations.

57 The Pearson product-moment correlation coefficient is close to one ($r = .95$) for this pair of teacher experience variables. This and all other analyses were performed using software developed by SPSS, Inc., *SPSS for Windows, Version 9.0* (Chicago: Author, 1999).

58 Additional technical details and statistical breakdowns were reported in Ross E. Mitchell and Douglas E. Mitchell, *Student Segregation and Achievement Tracking in Year-Round Schools* [Originally submitted as *Organizational Segregation of Student Achievement in Elementary Schools: The Influence of Multi-track Year-Round Schools*] (Paper presented at the annual meeting of the American Sociological Association, Chicago, IL 1999 [ED462756]).

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