Abstract Title Page

Title:

The Unintended Consequences of an Algebra-for-All policy on High-skill Students: the Effects on Instructional Organization and Students' Academic Outcomes

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Background/context:

There is a national movement to universalize the high-school curriculum so that all students graduate with college-preparatory coursework. The National Governor's Association (2005), for example, recommended toughening high school graduation requirements to insist on college-preparatory coursework for all students. Policy reports from ACT (2004) and the American Diploma Project (2004) advocated raising science and mathematics standards to improve alignment between secondary and post-secondary curricula. Currently, thirteen states require a college-prep curriculum, and 16 more states plan to adopt such requirements in the near future (Achieve, Inc., 2007).

The policy of universalizing a college-prep curriculum intended to improve students' academic outcomes by providing opportunities to take rigorous coursework for students who would not otherwise take such coursework. This policy was supported by a large body of research, which showed that students who enrolled in college-prep coursework had better academic outcomes than students who did not do so. This includes research on Catholic versus public schools (Bryk, Lee, & Holland, 1993), tracking (Oakes, 2005; Gamoran & Mare, 1989; Lucas, 1999; Powell, Farrar, & Cohen, 1985), and college preparation (Adelman, 1995; Horn & Kojaku, 2001).

However, the existing research is limited in its applicability to the case of *a universal mandate* where schools are required to change their curricular offerings. In particular, prior studies have not considered potential difficulties of implementing such a policy due to problems of student diversity. For example, schools may have difficulties in organizing instruction to meet the instructional need of all students who enter high schools with diverse academic skills, while providing a common college-prep curriculum for all students (McPartland & Schneider, 1996).

The current policy discussions have precluded discussions about how a policy of universalizing a college-prep curriculum may affect the way in which schools organize instruction to accommodate curricular changes: schools may create more mixed-ability classrooms when they eliminate remedial classes. This would affect all students, even among high-skill students who are not targeted by the policy—those who would enroll in college-prep coursework regardless of the policy.

If schools incorporate low-skill students, who would otherwise take remedial classes, in the same college-prep classes with high-skill students, peer ability levels would decline for high-skill students, compared to peer ability levels of college-prep classes they would attend in the absence of the policy. Declines in peer ability levels may lead to lower instructional levels and slower pacing(See Barr and Dreeben, 1983), and consequently, high-skill students may become bored and disaffected in classes with lower ability peers (see Loveless, 1999; Rosenbaum, 1999). Thus, even though an algebra-for-all policy did not intend to affect course enrollment of high-skill students, the policy may have unintended effects on their achievement.

Purpose/objective/research question/focus of study:

The purpose of this study is to understand how a policy that provided college-prep coursework for low-skill students may affect instructional organization within schools, and how such effects on instructional organization may have unintended consequences on academic outcomes of high-skill students who were not targeted by the policy. We focus on a ninth-grade algebra-for-all policy implemented in Chicago public schools (CPS) and address two research questions; 1) to what extent did a policy that required algebra for all students in ninth grade affect classroom academic composition?; and 2) for high-skill students who were not targeted by the policy, how did the policy affect their academic outcomes?

Setting:

Chicago has the third-largest school system in the United States. The student population is about 50% African-American, 38% Latino, 9% White, and 3% Asian. Approximately 85% of students are eligible for free/reduced priced lunches. In our analyses, we include all CPS high schools in existence before and after the policy was implemented (n=58 schools).

Population/Participants/Subjects:

We use six cohorts of high-skill ninth-grade students—three pre- and three post-policy cohorts from 1994 and 1999—in schools that existed in both pre- and post-policy periods (18,005 students in 58 schools). We define high-skill students as those whose incoming math abilities were above .5 SD (see Table 1 for variable descriptions). The policy would not have affected their course enrollment because almost all of them took algebra pre-policy (see Figure 1). This eliminates student-level selection bias related to algebra course enrollment.

Intervention/Program/Practice:

The intervention under the current study is the curriculum policy mandating Algebra I for all ninth-grade students. In 1997 the Chicago Public Schools (CPS) raised graduation requirements, eliminating the large array of remedial courses. In mathematics, students were required to take Algebra I in the ninth grade, followed by Geometry and Algebra II in the subsequent years. Prior to the policy, students were required to complete two to three years of mathematics in any subject and many students began high school with remedial coursework (pre-algebra or general mathematics).

Research Design:

Quasi-experiment, interrupted time series, combined with within-cohort comparisons.

Data Collection and Analysis:

This study draws from multiple data sources provided by CPS. Data on course transcripts and semester grade files are used to identify students' algebra enrollment and their teachers and classmates. Administrative records contain student demographic information, including gender, age, race/ethnicity, special-education status, and residential mobility. Student socio-economic variables were constructed using the 2000 U.S. census block-level data linked to students' home addresses. Data on the Iowa Tests of Basic Skills in mathematics are used to measure students' incoming abilities and academic composition of students' algebra classes. High school achievement test scores come from the Tests of Academic Proficiency administered in the inth-grade spring semester (see Table 1 for details).

Our analyses use an interrupted time series design, combined with within-cohort comparisons to isolate the policy effects from the effects of other cohort changes on classroom academic composition and students' academic outcomes. An interrupted time series design takes an advantage of the fact that there was a clear shift in algebra enrollment when the policy was implemented in 1997 (see Figure 1). Thus, if the policy had an effect, we should observe a shift in the outcome trends during the same periods.

One disadvantage of this design is that it could lead to false conclusions about the policy effects if other policy or programmatic changes affected the outcomes during the same periods. Fortunately, the way that schools structured their course offerings pre-policy provided a natural comparison group of CPS schools that were not affected by the curriculum policy. Our analysis of ninth-grade course enrollment showed considerable variability across all types of schools in pre-policy remedial math enrollment among students with the same ability levels (see Figure2).[*] Only schools that enrolled their students in remedial courses pre-policy were affected by the policy to end remedial coursework, while all schools would be affected by other CPS policies. Thus, to estimate the effects of an algebra-for-all policy, we used a difference-in-difference approach; we compared post-policy *changes* in the outcomes between schools that were affected by the curriculum policy and schools not affected by this policy—the comparison schools serve as a control for other reforms occurring simultaneously. See Appendix B for statistical models.

We hypothesize that peer ability levels would decline for high-skill students post-policy in schools that increased algebra enrollment (i.e., these schools would create mixed-ability classrooms when they eliminated remedial math), while peer ability levels would change little in schools that had full algebra enrollment pre-policy.[†] Math test scores of high-skill students would also decline post-policy in schools that increased algebra enrollment due to declines in the ability levels of their classmates, relative to the changes made by high-skill students attending schools unaffected by the policy.

We attempt to address possible school-level selection bias problems—schools that offered remedial math may be different from schools that had full algebra enrollment pre-policy in a way that affects the outcome trends—in the following ways. First, we examine whether schools affected by the policy (those increased algebra enrollment) and schools unaffected by the policy have similar trends in the incoming abilities of ninth-grade students over time. Even though the two types of schools may differ in the average incoming ability of their students in a given time point (e.g., the base year), similarity in their *trends* would increase our confidence that the post-policy shift in the outcome trends is not caused by the changes in the type of students they serve. Second, we examine whether the trends in the outcomes were similar during pre-policy years between schools offering remedial math and schools with full algebra enrollment. We are more

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[*] For example, even though pre-policy algebra enrollment rates were lower in schools serving many low ability students, school academic composition was not related to pre-policy algebra enrollment rates once students' incoming ability levels were controlled for. Also, pre-policy school algebra enrollment rates were unrelated to other measured school characteristics, including type of school (magnet, vocational, neighborhood), size, and demographic composition, after controlling for students' incoming ability levels.

[†] To analyze the policy effects on classroom academic composition, it is important to take into account changes in the incoming ability levels of 9th-grade students over time. Incoming ability levels of 9th-grade cohorts improved during the same periods due to improvements in elementary schools in CPS. Thus, peer ability levels are expected to improve in all schools in the absence of the policy.

confident about the policy effects if the outcome trends diverged only at the time of policy implementation.

Findings/Results:

RQ1. To what extent did an algebra-for-all policy affect classroom academic composition? The policy of mandating algebra for all students led schools to detrack math classrooms: schools created more mixed-ability classrooms when they eliminated remedial math. For high-skill students the ability levels of their peers declined in schools that increased algebra enrollment post-policy after controlling for changes in the incoming ability of 9th-grade cohorts, while peer ability levels changed little in schools that already had full algebra enrollment pre-policy, thus did not increase algebra enrollment post-policy (see Figure 3 and 4).

Figure 5 also highlights the importance of school curricular structure in shaping how schools organize instruction based on students' incoming abilities in the absence of the policy. Schools offering remedial math were more likely to sort math classrooms by students' abilities than schools that did not offer remedial math. In schools with remedial math classes, the lowest ability students were more likely to attend classes with lower ability peers, and higher ability students were more likely to have higher ability peers, than their counterparts in schools with full algebra enrollment.

We also used statistical models to estimate the average ability levels of algebra classes attended by high-skill students for each year, controlling for their background characteristics, school academic composition, and changes in school academic composition over time (Table 2). The average peer ability levels of the base-line cohort (1994) were higher by .18 SD in schools that offered remedial math (schools affected by the policy) than schools with full algebra enrollment (unaffected schools) after controlling for differences in students' characteristics and school academic composition ($p<0.001$). This difference remained the same during pre-policy years. However, the trends shifted in 1998, one year after the algebra-for-all policy was implemented. Peer ability levels declined post-policy for schools that increased algebra enrollment by -.17 SD in 1998 and -.14 SD in 1999, relative to the changes made by unaffected schools, suggesting that schools created more mixed-ability classrooms when they increased algebra enrollment.

RQ2. For high-skill students who were not targeted by the policy, how did the policy affect their academic outcomes? The policy of universalizing algebra coursework had negative effects on math achievement of high-skill students. Figure 6 shows that during pre-policy years math scores of high-skill students were higher in schools offering remedial math (schools affected by the policy) than their counterparts in schools with full algebra enrollment (unaffected schools), controlling for school academic composition and students' background characteristics. The magnitude of the difference in the base-line year (1994) was about one fifth of a standard deviation. Although the two types of schools had similar pre-policy outcome trends, the pattern shifted in 1998, one year after the policy was implemented. Although math scores improved in 1998 and 1999 among high-skill students in schools that were not affected by the policy, test score improvements were smaller in schools that increased algebra enrollment during these years, and the pre-policy test score differences between the two schools were eliminated by 1998. The policy had little effects on math scores in the first year of policy implementation, and this corresponds with the policy effects on classroom academic composition; the decline in peer ability levels did not occur until two years after the policy was implemented.

Additional analyses showed that differences in classroom academic composition explained differences in math scores for the base-year cohort (1994 cohort) between schools that offered remedial math and schools with full algebra enrollment. Also, classroom compositional differences explained differences in the post-policy trends in math scores between the two schools (see Model 2 in Table 3).

Figure 7 through 10 describes differences in the relationship between students' incoming abilities and test scores that pre-policy between affected and unaffected schools over time, showing that pre-policy differences in test scores disappeared by the second year of policy implementation.

Addressing similarities/differences in the trends in the incoming ability levels of ninth-grade cohorts (a possible source of selection bias). Although schools that offered remedial math pre-policy were more likely to serve lower-ability students than schools that enrolled all students in algebra pre-policy, the trends in the academic composition of ninth-grade cohorts were similar between the two types of schools from pre- to post-policy periods (Figure 11). There were no discernable shifts occurred at the time of policy implementation that were unique to the schools increased algebra enrolment.

Conclusions:

The policy of universalizing a college-preparatory curriculum is increasingly a popular strategy to improve academic outcomes in high school. This policy is often supported by studies suggesting that students who enrolled in core academic coursework have better outcomes than students in remedial/general coursework, controlling for their initial skills and other background characteristics. However, few such studies, indeed, examined the effects of *the policy mandating a college-prep curriculum.*[‡] Moreover, little is known about how a curricular policy may unintentionally affect instructional organization, which may affect not only low-skill students who were given an opportunity to enroll in college-prep coursework, but also other high-skill students who were not targeted by the policy because they would enroll in college-prep coursework regardless of the policy. This study addressed these limitations by examining how an algebra-for-all policy implemented in Chicago Public Schools affected classroom academic composition and academic outcomes of high-skill students. Our results showed potential challenges of a curricular policy of expanding a college-prep curriculum to all students: schools are likely to detrack math classrooms when the policy merely required them to eliminate remedial coursework, and this resulted in lower peer ability levels for high-skill students. Consequently, their test scores suffered from this policy. [§] This study suggests that simply mandating a college-prep curriculum for all students is not sufficient enough to improve academic outcomes of all students.

[‡] As many states and districts have begun implementing such a reform, this is a critical limitation in prior research.
[§] Author (year) evaluated the overall policy effects on various students' outcomes on low-skill and average-skill students and showed that even though the policy led more students to receiving credits in college-prep courses, their test scores did not improve and course grades declined.

Appendix A

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Appendix B

Statistical Models to estimate the effect of an algebra-for-all policy on students' academic outcomes among high-skill students

To examine policy effects among high-skill students—those who would take algebra regardless of the policy, we use three-level hierarchical models, with students nested within cohorts within schools. The student-level model to estimate the outcome Y for student *i* in cohort *j* in school *k* is written as:

$$Y_{ijk} = \pi_{0jk} + \pi_{1jk}(\text{Math Ability})_{ijk} + \pi_{2jk}(\text{Math Ability\_Square})_{ijk} + \sum_{p=1}^{P} \pi_{(2+p)jk}(X)_{ijk} + e_{ijk},$$

where X is a vector of student-level control variables (race, SES, age, etc).

Student-level covariates are grand-mean centered so that the intercept, $\pi_{0jk,}$ represents the mean outcome for the typical high-skill students in the system across the entire cohorts. At the cohort-level, the mean outcome is specified as a function of cohort year and the cohort average ability in each school:

$$\pi_{0jk} = \beta_{00k} + \sum_{m=1}^{M} \beta_{0mk}(\text{CohortYear}_m)_{jk} + \beta_{0(m+1)k}(\text{Cohort Ability})_{jk} + r_{jk},$$

where CohortYear is a set of dichotomous variables with m=1, 2….M, distinguishing cohorts where the omitted category is the base-year cohort (1994 cohort)[**], and Cohort Ability is the average ability in each school in each year. The Cohort Ability variable is centered on the average ability in the base year in each school and captures fluctuations in the outcome due to year-to-year changes in the average abilities of the incoming cohorts in each school. The intercept β_{00k} ,thus, represents the average outcome in the base-year (1994) in school *k,* and the

[**] We capture outcome trends by using a set of dichotomous variables representing cohort year because there are only three pre-policy cohorts and a linear trend is difficult to specify with a short interrupted time-series design.

coefficient, $\beta_{0mk,}$ represents the average change in the outcome from the baseline year to the respective cohort year, m, controlling for changes in the school average ability levels of incoming students and other student characteristics.

The slopes for Math ability (π_{1jk}) are allowed to vary randomly across cohorts. All other π's are fixed at the cohort-level.

At the school level, we specify the average baseline year outcome and the subsequent outcome changes (β_{00k} and β_{0mk}) as a function of school type—whether schools are affected by the policy—and the base-year school average ability. This is written as;

$$\beta_{00k} = \gamma_{000} + \gamma_{001}(\text{Affected})_k + \gamma_{002}(\text{School Average Ability})_k + u_{00k,}$$

and for each cohort, m,

$$\beta_{0mk} = \gamma_{0m0} + \gamma_{0m1}(\text{Affected})_{k,}$$

where the variable, Affected, is a dichotomous variable indicating whether schools were affected by the policy (i.e., schools that increased algebra enrollment post-policy by more than 5%) and the omitted category is unaffected schools (i.e., schools that offered algebra over 95% of students pre-policy, thus, increased algebra enrollment by less than 5 % post-policy). The variable, School Average Ability, indicates the average ability of the baseline cohort centered on the average of unaffected schools, which controls for between-school differences in the average ability levels in the baseline year.

The intercept γ_{000} for the level-two intercept (β_{00k}) represents the average baseline year outcome for schools that were not affected by the policy. The coefficient, $\gamma_{001,}$ represents the difference in the base-year outcome between unaffected and affected schools, controlling for the base-year school average ability and other student characteristics

Similarly, the intercept γ_{0m0} for each β_{0mk} where m=1, 2…M, represents the average changes from the baseline year to the subsequent cohort year, m, in schools that were not affected by the policy, and the coefficients γ_{0m1} represents the difference in these outcome changes between unaffected and affected schools, controlling for the base-year school average abilities, cohort changes in the average incoming abilities in each school, and other student characteristics.

All other β's are fixed at the school-level without predictors.

We expect that high-skill students in schools that offered remedial math (schools affected by the policy) would have higher test scores in the baseline year than high-skill students in schools with full algebra enrollment pre-policy(unaffected schools), after controlling for differences in the school average ability ($\gamma_{001} > 0$). This is because schools that offered remedial math pre-policy were likely to sort students into remedial math and algebra on the basis of their incoming skills. Thus, high-skill students in these schools would have higher peer ability levels than similar students in schools that enrolled everyone in algebra pre-policy (schools that did not track students by curriculum), controlling for differences in school academic composition. However, we do not expect differences in pre-policy outcome trends between schools that offered remedial math and schools with full algebra enrollment (γ_{0m1}= 0 for the pre-policy cohort m).

We expect differential outcome trends if the policy induced changes in classroom academic composition in schools that increased algebra enrollment. High-skill students in schools offering remedial math pre-policy would experience declines in peer-ability levels post-policy because they began enrolling in algebra with lower ability students as schools detracked algebra classrooms. Thus, we expect that high-skill students in these schools would make smaller changes post-policy than similar students in schools that already had full algebra enrollment pre-policy ($\gamma_{0m1} < 0$ for post-policy cohort m).

Although the above analyses constrained the relationships between students' incoming abilities and their academic outcomes to be the same across cohorts and school type, the subsequent analyses estimated these relationships separately for schools affected and unaffected by the policy in each year. In other words, we specified the slopes on Math Ability and its square term as a function of cohort year and school type. (their coefficients are used to make Figure 7 through Figure 10).

Appendix C. Tables and Figures

Table 1. Variable descriptions

9th grade outcomes	
Test scores	Math test scores measured in 9th grade spring semester. The test was last administered in spring 2000.
Student-level control variables	
Student incoming math ability	Students' incoming math ability was created using a vector of students' test scores on the Iowa Tests of Basic Skills from third through eighth grade. This "latent" math ability measure was then used to construct two sets of achievement variables, after being standardized across all cohorts with a mean of 0 and SD of 1.
ITBS percentile	Percentile scores on the ITBS 8th grade math tests. This was used to create Figure 3 & 4
Special education	A dummy variable with 1= special education students and 0=otherwise
Gender	A dummy variable with 1=male and 0=female
Race/Ethnicity	A set of dummy variables indicating African-American (ref. group), Asian, Hispanic, and White.
SES	Two variables constructed from the U.S. census data on students' residential block groups: 1) Concentration of poverty (a composite of male unemployment rate and % families under the poverty line. 2) Social status (a composite of the median family income and the average educational attainment. Both were standardized to have a mean of 0 and SD of 1.
Mobility	A set of dummy variables: no moves, one move, two or more moves in the 3 yrs before high school
Age at HS entry	1) Number of months old for high school (0 if a student is not older than the appropriate age), 2) a dummy variable indicating if students are slightly old, 3) a dummy variable indicating if students are young for starting high school
Cohort-level variables	
Cohort year	A set of dummy variables distinguishing cohorts with the 1994 cohort as a reference group
Cohort average incoming ability	Average incoming latent ability of the entering ninth-grade cohort in a school, which was centered on the value of the 1994 cohort in each school (i.e., within-school centered across cohorts).
School-level variables	
Post-policy changes in algebra enrollment	A set of dummy variables distinguishing schools that were affected by the policy—schools that increased algebra enrollment by less than 5% post-policy among low-skill students (ref group)—and schools affected by the policy—schools that increased algebra enrollment among low-skill students by more than 5% post-policy[i ii]

Note:

[i] We initially classified schools in three different categories: school unaffected by the policy (schools that increased algebra enrollment among low-skill students by less than 5% post-policy), affected schools (schools that increased algebra enrollment among low-skill students by 5% to 40% post-policy), and greatly affected schools (schools that increased algebra enrollment among low-skill students by over 40% post-policy). However, the pattern of the results were similar; thus, we combined affected and greatly affected schools into a single category to increase the statistical power.

[ii] To define the policy effects on school algebra enrollment, we used post-policy increases in algebra enrollment among low-skill students only (low-skill students were defined as those with incoming math skills below -0.5 SD). Because the school overall algebra enrollment is highly correlated with the proportion of low ability students in a school pre-policy (i.e., the overall pre-policy algebra enrollment was lower for schools with more low-ability students), defining the policy effects based on the overall changes in algebra enrollment would confound the policy effects with the percent of low skill students.

Table2. Changes in peer ability levels for high-skill students in schools unaffected by the policy and schools affected by the policy (schools that increased algebra enrollment)

	Est.	SE
Intercept (yr94)	0.04	0.04
Affected	0.18	0.05 ***
Yr95(pre)	0.01	0.05
Affected	-0.04	0.06
Yr96(pre)	0.03	0.05
Affected	-0.02	0.06
yr97(post)	-0.01	0.05
Affected	-0.04	0.06
yr98(post)	0.11	0.06 ~
Affected	-0.17	0.06 **
yr99(post)	0.07	0.06
Affected	-0.14	0.06 *

Note: ***P<.001, **P<.01, *P<.05, ~P<.1

The models control for school academic composition, changes in school academic composition, and students' background characteristics

Table 3. Changes in 9th-grade test scores for high-skill students in unaffected by the policy and schools affected by the policy (schools that increased algebra enrollment)

	Model 1		Model 2[i]	
	Est.	SE	Est.	SE
Intercept (yr94)	53.15	0.75 ***	52.95	0.78 ***
Affected	1.80	0.87 *	0.32	0.90
Yr95(pre)	-0.25	0.70	-0.06	0.67
Affected	-0.05	0.93	-0.67	1.09
Yr96(pre)	2.01	1.07 *	1.09	1.20
Affected	-0.15	0.86	1.20	0.57
yr97(post)	1.00	0.90	0.66	0.93
Affected	-0.40	1.02	0.71	1.03
yr98(post)	4.74	1.05 ***	3.86	1.06 **
Affected	-1.85	1.10 ~	-0.76	1.09
yr99(post)	5.29	1.00 ***	4.53	1.00 ***
Affected	-2.53	1.07 *	-1.00	1.05
Class composition				
Intercept(Yr94)			5.65	0.54 ***
Yr95			-1.60	0.71 *
Yr96			0.08	0.67
Yr97			-2.11	0.66 **
Yr98			-0.63	0.65
Yr99			-1.31	0.64 *

Note: ***P<.001, **P<.01, *P<.05, ~P<.1

[i] Model 2 introduces classroom composition variables for each cohort.

The models control for school academic composition, changes in school academic composition, and students' background characteristics

Figure 1.
Percent of students enrolled in algebra by incoming ability and cohorts

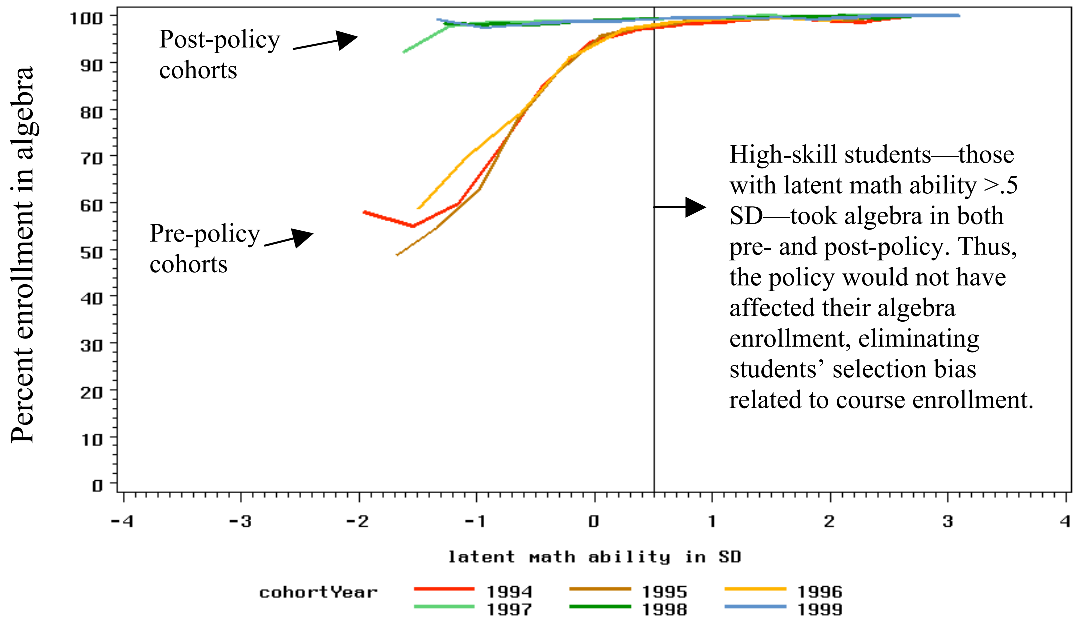
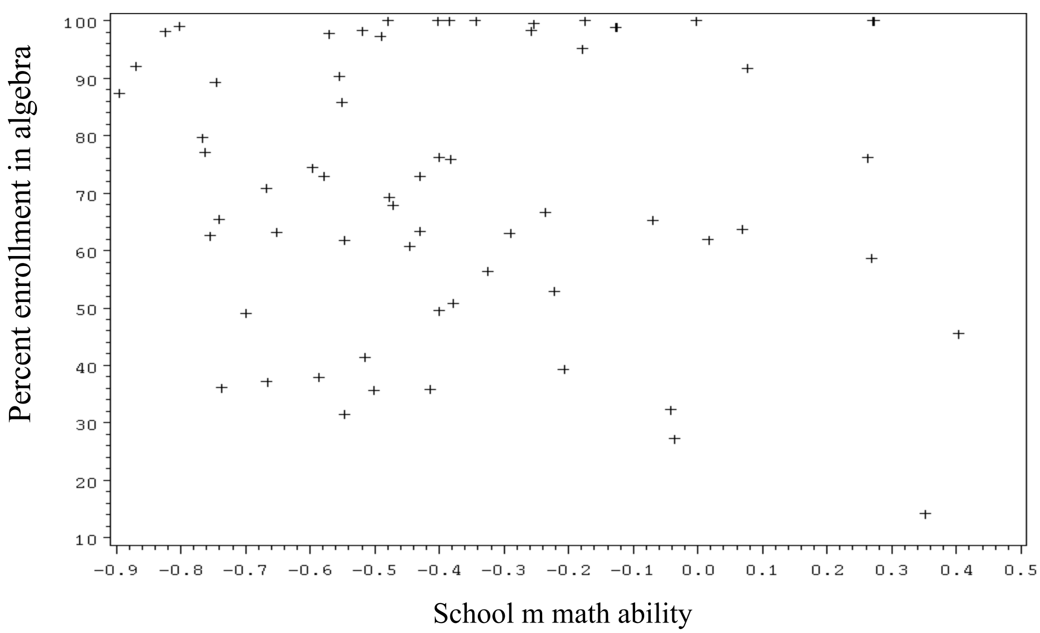


Figure 2.
Schools' pre-policy algebra enrollment of low-ability regular education students by school mean ability (Each dot represents school)



Note: Low-ability students are defined as students with incoing math ability below -0.5 SD. This figure shows that there are considerable variations in algebra enrollment across schools for students with similar incoming ability. Some schools enrolled all of their low-ability students in algebra pre-policy, thus, did not have to increase algebra enrollment post-policy.

Figure 3.
Pre- and post-policy changes in peer ability levels, adjusting for cohort changes in incoming abilities: Schools unaffected by the policy (schools offering algebra for all pre-policy)

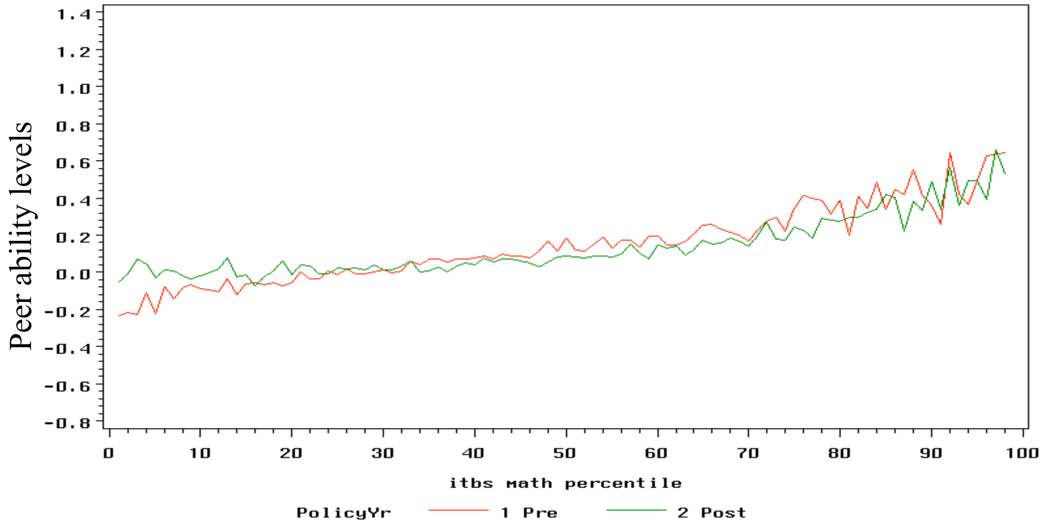
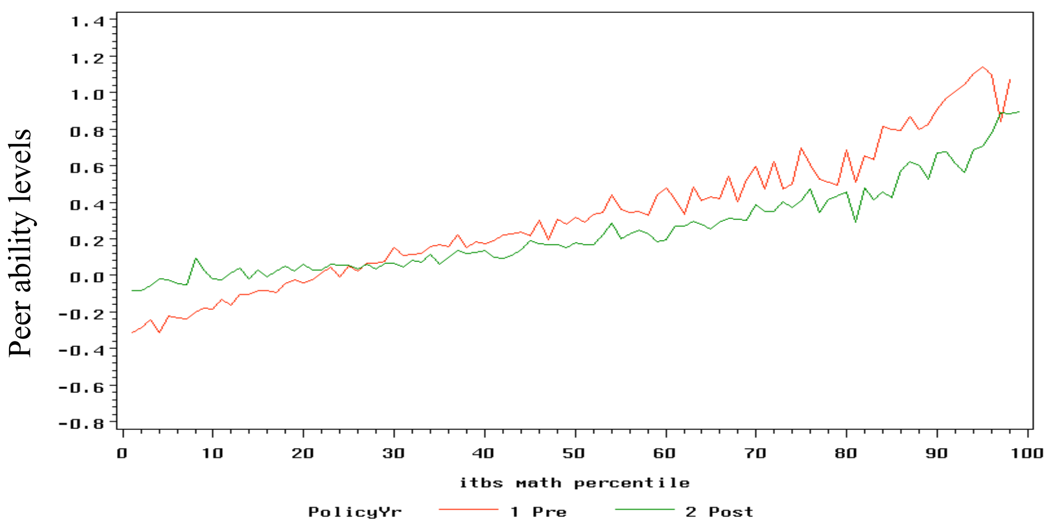


Figure 4.
Pre- and post-policy changes in peer ability levels, adjusting for cohort changes in incoming abilities: Schools that increased algebra post-policy (schools offering remedial math pre-policy)



Note: The above figures describe overall relationships between students' incoming skills and peer ability levels among regular education students. We used the ITBS math percentile scores to measure students' incoming abilities (the X-axis). We then computed the local mean of peer-ability levels for each percentile score. Peer ability levels were adjusted for changes in the incoming ability levels of 9^{th}-grade cohorts over time: we first subtracted students' own incoming abilities from the school average abilities for each cohort. We then took the average of these adjusted scores for each classroom so that peer-ability levels are independent of cohort incoming ability levels.

The above figures show that among higher ability students, peer ability levels changed little post-policy in schools that were not affected by the policy (Figure3), while they declined in schools that increased algebra post-policy (Figure 4).

Figure 5.
Pre- policy relationships between peer ability levels and students' incoming ability levels adjusting for school academic composition for schools unaffected by the policy and schools that increased algebra enrollment

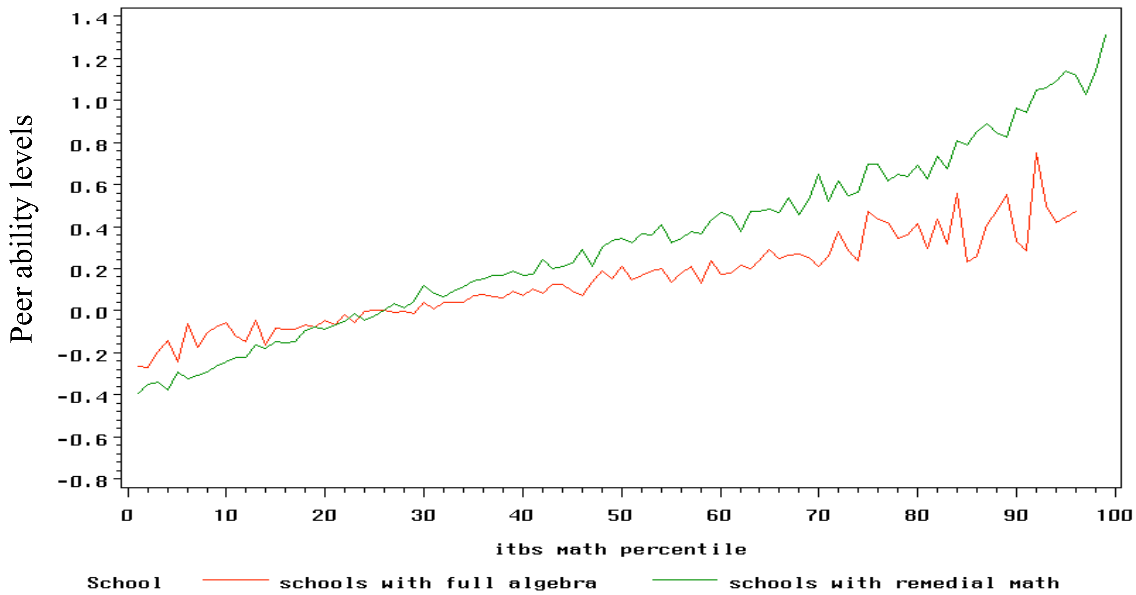


Figure 6.
Trends in the average ninth-grade math test scores for schools unaffected by the policy (schools with full algebra enrollment pre-policy) and schools that increased algebra enrollment (that offered remedial math pre-policy)

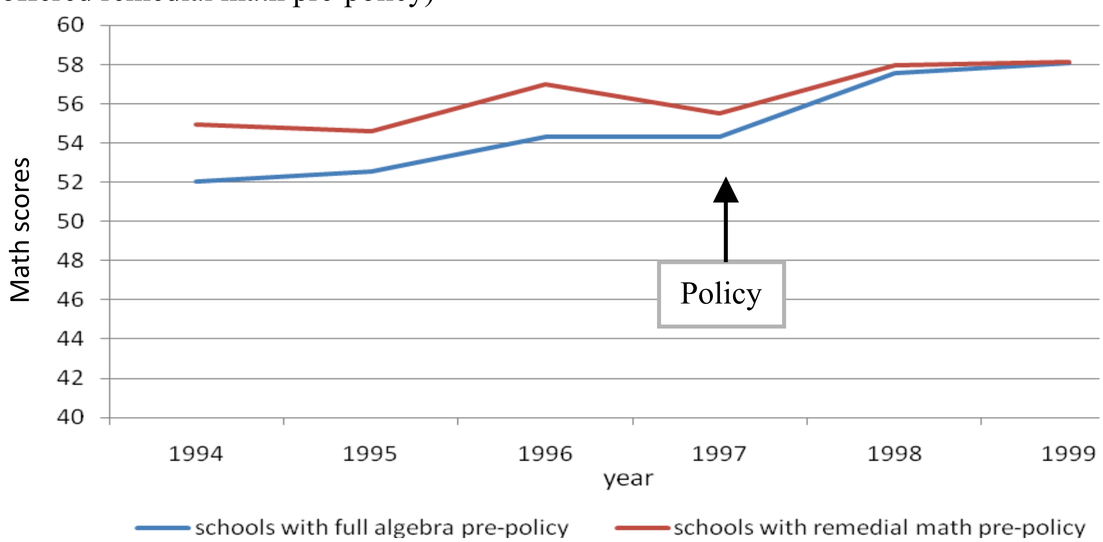
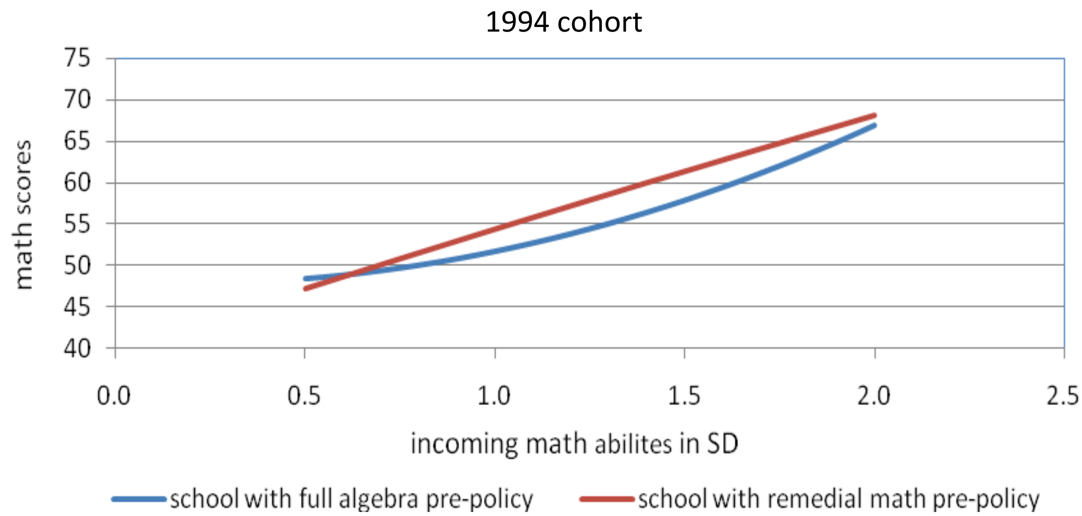


Figure 7.
Ninth-grade math test scores by incoming abilities by school type for the baseline cohort (1994)



Note: other pre-policy cohorts (1995 and 1996 cohorts) show a similar pattern, thus, graphs are not shown

Figure 8.
Ninth-grade math test scores by incoming math abilities by school type in the first year of policy implementation (1997)

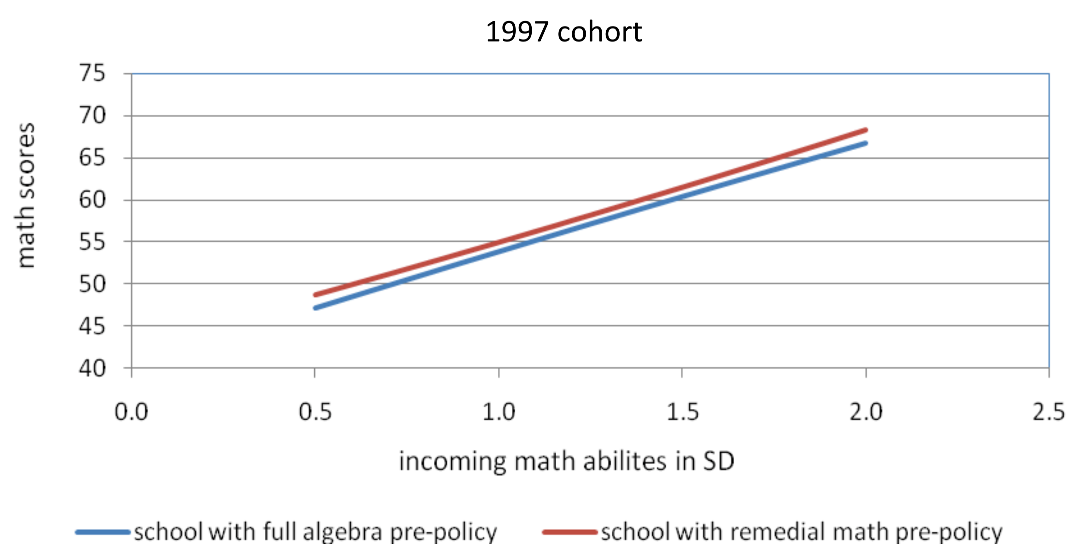


Figure 9.
Ninth-grade math test scores by incoming math abilities by school type in the 2nd year of policy implementation (1998)

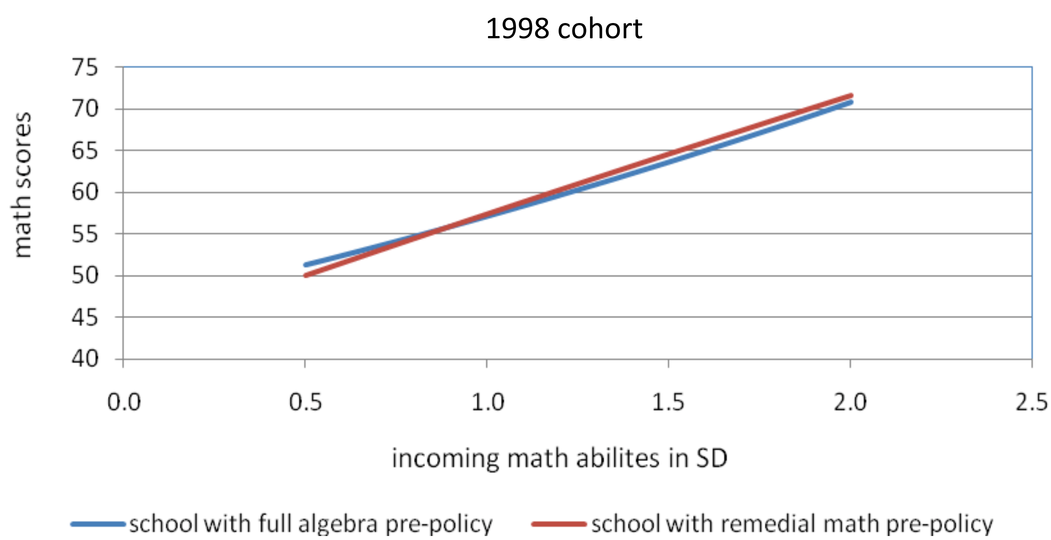


Figure 10.
Ninth-grade math test scores by incoming math abilities by school type in the 3nd year of policy implementation (1999)

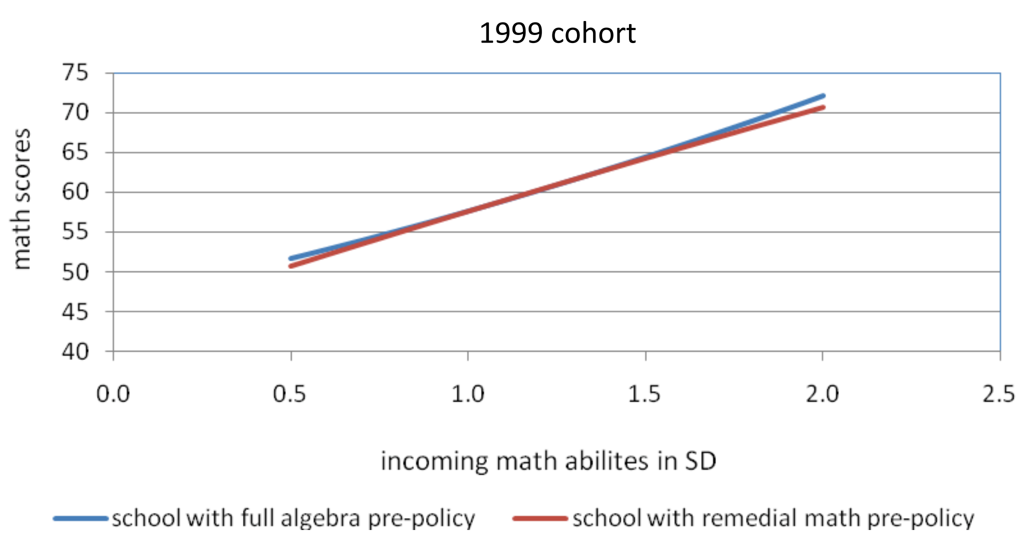


Figure 11.
Trends in the incoming math ability of ninth-grade cohorts from 1994 to 1999 for schools unaffected by the policy (schools with full algebra enrollment pre-policy) and schools that increased algebra enrollment (schools offering remedial math pre-policy)