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Raising the Bar and Equity? Effects of State High School Graduation Requirements and Accountability Policies on Students' Mathematics Course Taking

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In response to the national push to raise academic performance of all students, most states have adopted policies designed to raise academic standards, monitor progress toward those standards, and hold schools and students responsible for attaining them. Given the complex nature of the educational process, these policies are likely to have mixed effects on both general levels of attainment and stratification based on race or ethnicity and social class. Using nationally representative longitudinal data and hierarchical linear modeling, this article explored the association between students' mathematics course work and states' high school graduation requirements and assessment or accountability policies. We found that students in states with more graduation requirements tended to enroll in higher level mathematics courses as freshmen and persist to take more advanced level courses. Similar trends were also found for students in states that link test performance to consequences for schools. Extensive testing, however, had little effect on course taking except to increase differences based on socioeconomic status. In contrast, differences between racial or ethnic groups tended to be smaller in states where test performance was linked to consequences for students.

Keywords: *accountability, educational stratification, equity, graduation requirements, mathematics achievement, opportunities to learn, race and ethnicity, social class, sociology of education*

THE *No Child Left Behind Act of 2001* brought sweeping changes in the role of the federal government in elementary and secondary schooling through, among other reforms, increased mandated testing and school accountability. The law requires states to almost immediately start administering mathematics and reading examinations based on established state curriculum standards to all students in grades 3–12. In addition to overall progress toward meeting state standards, the law also calls for monitoring the progress within each school of students who are economically disadvantaged, from racial or ethnic minority groups, have disabilities, or have limited English proficiency. Schools that fail to make state-defined adequate progress toward meeting the state standards will be subjected to increasingly severe sanctions over five years culminating with restructuring,

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such as state takeover or conversion to a charter school. The goal of this legislation is to not only raise academic standards and, thus, performance for American school children, but also to decrease gaps in achievement between socially advantaged and disadvantaged groups.

The provisions in *No Child Left Behind* were a continuation of efforts over the past 40 years by educational policymakers and practitioners to raise standards in mathematics and science. These reforms have included not only raising expectations for students' mastery of these subjects, but also requiring that all students have exposure to a core curriculum incorporating these standards. Approximately 20 years ago, state policy makers also began implementing examination systems to hold schools accountable for students' academic progress (McDonnell, 1994). Both reform efforts—raising expectations and increasing external accountability—redefine what a high school graduate should know and provide incentives for all students to acquire a minimum level of achievement in order to earn a diploma.

In response to these reforms, schools have raised graduation requirements and restructured their academic programs. Between 1980 and 1993, the average number of credits in core academic subjects that schools required for earning a high school diploma increased by over 1.6 years (Stevenson & Schiller, 1999). Over two thirds of this change was in requirements for additional courses in mathematics and science. Another dramatic change was the softening, if not official elimination, of formal academic tracking systems in favor of a standards-based core curriculum in which tracks are more subject specific and based on timing of course enrollments (Lucas, 1999). During the 1980s, public high schools increased the size of their academic tracks by 14% to enroll an average of 46% of their sophomore cohorts while vocational track enrollments dropped by 12% to an average of less than 19% of their sophomore cohorts (Stevenson & Schiller, 1999). This shifting of students into the academic track was most dramatic in states requiring test score results to be widely disseminated to policy makers, the media, and parents.

Complexity of the educational process, however, means that these efforts to improve students' educational experiences and academic achievement have had mixed results. High-stakes examinations for students, for example, have been related to higher rates of dropping out for at-risk students but do not appear to affect levels of achievement (Jacob, 2001). Greater school accountability appears to increase the number of advanced mathematics credits high school students earn, but does not affect their probability of earning a diploma (Muller & Schiller, 2000). In addition, these state accountability policies also seem to exacerbate the attainment gap between students of low- and high-socioeconomic backgrounds, suggesting that poor students may be negatively impacted by holding schools responsible for their academic progress (Muller & Schiller, 2000). Thus, neither high-stakes examinations for students nor school accountability are a panacea for helping all students reach higher academic standards.

Developing effective policies requires understanding how proposed reforms may influence student achievement at different stages of the educational process, with thoughtful consideration of potential negative effects. This study explores whether students' mathematics course enrollments as freshmen and in high school overall varied as a function of states' high school graduation requirements and assessment or accountability policies. Drawing from a nationally representative longitudinal sample of U.S. high school students in the early 1990s, we used hierarchical linear modeling (HLM) to examine variation across states in both the level of mathematics courses students tended to take and differences in course enrollments related to race or ethnicity and social class. We focused on mathematics because students placements in this highly structured and sequential subject creates key turning points in their opportunities to learn (Schneider, Swanson, & Riegle-Crumb, 1998; Stevenson, Schiller, & Schneider, 1994). The mathematics courses students take in high school affect their academic achievement and their admission to competitive postsecondary schools and preprofessional programs.

Opportunities for Learning and State Policies

A core goal of schooling has always been to promote students' development of skills and knowledge important for success as adults through courses of study providing them with basic opportunities for learning. Since the Cold War and *A Nation at Risk* (National Commission on Ex-

cellence in Education, 1983), U.S. high schools have been criticized for failing to produce graduates prepared for the demands of higher education and the workforce. Of particular concern is that U.S. high school students continually lag behind their counterparts in other industrialized nations in mathematics and science (Stedman, 1997). The former is considered especially problematic because understanding basic mathematical principals taught in algebra and geometry are important for students' success in science (Schmidt et al., 2002). Graduates who are weak in these two subjects are considered unprepared for entry into medicine, engineering, and other technology fields. These concerns have focused policy makers' attention on what courses students take in high school and whether they master the material to which those courses are supposed to expose them.

In response to policymakers' mounting concerns about both academic quality and educational inequity, educational reform efforts since the mid-1980s have encouraged "de-tracking" by requiring all students to complete a common core curriculum (Wells & Oakes, 1996). These efforts were fueled by sociological research revealing great variation in the academic experiences of adolescents, with some exposed to challenging curriculum in the college preparatory track while others received only basic instruction in the general track (Gamoran, 1987; Oakes, 1985). While intended to allow matching of students' talents and interests to course content, high school track assignments were often based on non-academic criteria such as social class and ethnicity (Oakes & Guiton, 1995). Even in schools without formal tracking, students' opportunities for learning are often constrained by systems of prerequisites, especially in highly structured subjects like mathematics, that create sequences of opportunities for learning that can span both grade levels and schools (Stevenson et al., 1994). Where students are placed as freshmen creates a positional advantage for gaining access to advanced level courses, which are related to greater gains in academic achievement and entry into postsecondary schooling (Schneider et al., 1998). Thus, curricular structures create defacto tracking in that freshmen course enrollments determine to a great extent students' academic trajectories in high school. In this article we explored whether states' efforts to raise standards and increase accountability were related to the level of mathematics courses freshmen take and how far students progressed in the subject during high school.

To what extent policymakers can change students' course enrollments, and thus achievement, is questionable because many individual factors influence the types and number of courses they take. Children of college educated parents are more likely to enroll in algebra in 8th grade, allowing them to move on to geometry as high school freshmen, compared to their classmates whose parents only attended high school (Stevenson et al., 1994; Useem, 1991). Children of more educated parents not only receive a head start in the high school mathematics curriculum, but also tend to persist in taking courses including exposure to advanced algebra and calculus. While this situation appears to be changing, girls and minority students have been traditionally under-represented in advanced level mathematics courses (Oakes, 1985). One of the central concerns of our analyses was to determine whether state policies were related to differences based on social class and ethnicity in freshman mathematics course enrollments as well as accumulation of advanced course credits in these subjects.

During the early 1980s, regulatory changes focused on raising academic standards by increasing the number of credits required in academic subjects compared to earlier diploma holders, in effect altering the definition of a high school graduate (Chaney, Burgdorf, & Atash, 1997; Clune & White, 1992; Stevenson & Schiller, 1999). The logic behind such changes was that requiring students to take more courses in core academic subjects increases their opportunities for learning key skills and results in higher levels of academic achievement. Basic assumptions behind these policies were that many high school students are motivated to take only the minimum number of required courses, that the additional courses they take will be academically rigorous, and that they are able to do the work required to pass these courses. Research finds at least partial support for arguments linking high school graduation requirements to increased mathematics course taking and academic achievement of students, especially for those who are marginal in their motivation and skills (Chaney et al., 1997; Clune & White, 1992). This study was designed to compare differences in mathematics trajectories of similarly able students in states with differing course requirements for high school graduation.

Although increased graduation requirements appeared to raise enrollment in academic courses, many policy makers questioned whether course titles accurately reflect their content or that students may be given passing grades without learning the material (McDonnell, 1994). These concerns fueled efforts since the late 1980s to establish performance standards and increase external monitoring of students' progress toward those standards. Initially, mandating external examinations was a mostly "persuasive" reform strategy intended to provide information indicating which students need remediation, to establish common academic goals for students and teachers, and to promote community grassroots movements supporting academic excellence (McDonnell, 1994). The assumption underlying these policies was that regular monitoring of students' academic progress would improve their preparation for advanced level work and increase the demand for rigorous course offerings. Critics of these policies, however, raise concerns that standardized testing creates self-fulling prophecies that limit the opportunities for learning of academically and socially disadvantaged students (Wells & Oakes, 1996). In our study we examined whether more extensive testing of high school students in academic subjects was associated with enrollment in higher level mathematics courses throughout high school for all students.

Many states also have established formal systems of rewards and sanctions linked to performance on mandated examinations that are designed to hold students and schools accountable for attaining at least minimal academic standards. Although controversial, initial reform efforts established high stakes examinations linking test performance to consequences for individual students such as track placement, grade promotion, and high school graduation (Heubert & Hauser, 1999). Critics expressed concern that such policies structurally limit socially and academically disadvantaged students' access to opportunities for learning by allocating them to remedial courses and encouraging them to dropout of school (Catterall, 1989; Jacob, 2001). Some research, however, suggests that motivated low-achieving students may benefit from an increased emphasis on academic achievement and support from teachers (Muller, 1998; Roderick & Engel, 2001; Schiller & Muller, 2000). Because these examinations are usually held early in high school, the policy is more likely to impact the courses taken by freshmen and sophomores to prepare for the tests and might potentially discourage students from taking more advanced level courses as juniors and seniors. We explored in these analyses whether states' high stakes accountability policies affected students' tendencies to enroll in or avoid higher level mathematics courses at two key points in their high school careers.

State policies promoting institutional accountability by linking tangible consequences for schools to aggregate measures of student performance started becoming common in the 1990s. Rather than directly regulating instructional activities, these state policies set academic excellence as the goal while giving schools the freedom to determine the best way to help their students reach the state standards (Elmore, Abelman, & Fuhrman, 1996). One way schools might choose to raise student performance is to increase the numbers enrolled in courses that prepare them for higher level work in key academic subjects like mathematics. However, some schools might also marginalize poor-performing, particularly minority and poor, students to avoid accountability for their expected failure on the state assessments (Schiller & Muller, 2000). We explored whether greater school accountability was related to equity in opportunities to learn mathematics across social classes or racial and ethnic groups.

The decentralized nature of the nation's school systems means that states vary greatly in the strategies and policies they have adopted at a given time. Although most states raised academic course requirements for a high school diploma during the 1980s, by 1990 only three states had adopted the National Commission on Excellence in Education's recommendation that all students take at least three years of mathematics (Chaney et al., 1997). In 1993, states on average required 2.4 years of mathematics (Stevenson & Schiller, 1999). By this time, most states had also implemented some sort of mandated testing program, although how often and in how many subjects students were tested as well as the consequences for test performance varied greatly across states (Schiller & Muller, 2000).

In the analyses for this article we examined the impact of greater course requirements for high school graduation, more frequent mandated testing, and implementation of sanctions and rewards for either students or schools linked to test per-

formance on high school students' course taking in mathematics. Using longitudinal data from a nationally representative cohort of 8th graders, we focused on two key stages of students' academic careers: (a) where they entered the high school mathematics curriculum and (b) how far they progressed through the curriculum. We used HLM to test the extent to which these policies aimed at raising levels of attainment and increasing equity were related to differences based on social class and race or ethnicity in opportunities for learning mathematics in high school. Controlling for other aspects of students' social backgrounds and middle school mathematics classes and grades, we also examined how the relationship between freshman mathematics course placements and students' persistence in the subject varied among states with different policies.

Data and Method

The sample

The analyses in this article required the use of two data sets, one to provide longitudinal information on students' social backgrounds and academic experiences, and the other to provide information on states' assessment and accountability policies. Both of the studies we used were conducted in the early 1990s.

The National Education Longitudinal Study of 1988–92 (NELS:88–92) followed a nationally representative sample of 8th graders in 1988 through their high school careers and beyond (Ingles, Scott, Lindmark, Frankel, & Myers, 1992). The panel used for these analyses consisted of 10,046 public school students who participated in the first three waves of data collection (1988, 1990, and 1992) and for whom high school transcripts were collected. All 50 states and the District of Columbia are represented in NELS:88–92, with an average of 196 students and 22 high schools per state.[1] For these analyses, the sample was weighted to take into account the complex sample design and nonresponse rates so that the results would be representative of those for the 1988 8th-grade cohort.

Information on states' assessment and accountability policies was obtained from the National Longitudinal Study of Schools (NLSS). One purpose of NLSS was to examine the impact of state policies on changes in school practices (Levine & Stevenson, 1997; Stevenson & Schiller, 1999). In 1993, state departments of education were asked through the National Cooperative Education Statistics System to answer a lengthy questionnaire concerning their testing and accountability policies. Responses were received from all 50 states and the District of Columbia.

Mathematics course enrollments

The measures of students' mathematics course taking were constructed from the NELS:88–92 course-level transcript file, which includes indicators of the topic and when it was taken for every course a student took during high school. Based on the standard sequences of mathematics courses most students take, courses were classified into one of the following groups, in hierarchical order: (0) no math, (1) remedial math, (2) general math, (3) pre-algebra, (4) Algebra I, (5) geometry, (6) Algebra II, (7) advanced math, (8) pre-calculus, (9) calculus (Schiller & Hunt, 2001). The first analysis in this article predicted the highest level mathematics course students took as freshmen, indicating where they entered the high school mathematics curriculum. The second analysis predicted the number of Carnegie units earned in higher level mathematics courses (geometry and above), which are commonly required for admission to a competitive college or postsecondary academic program. Due to a highly structured sequence of prerequisites, how many Carnegie units students accumulated in advanced level mathematics courses is a good indicator of how far they progressed toward calculus. Because where students started in the sequence was likely to affect how far they progressed, freshman course placement was also used as a predictor of the second dependent variable.

Student-level variables

This study focused on differences across states not only in students' freshman mathematics courses and number of advanced credits, but also in the variation in these outcomes related to socioeconomic status and race or ethnicity. In these analyses, family socioeconomic status (SES) was a measure of students' financial and social resources from outside the school based on a composite of parents' education, income, and occupation created by NCES. Using HLM, we evaluated whether the relationship between SES and mathematics course taking varied across states with differing graduation requirements or assessment policies.

Instead of the usual four-group classification of students' race or ethnicity, our HLM models only included indicators for African American and Latino/a with the comparison group being white or Asian American. We chose not to distinguish between white and Asian American students because of the latter group's small sample size and sparse distribution in many states that resulted in unreliable HLM coefficients. Our results concerning the effects of race or ethnicity on mathematics course taking and their variation across states were not significantly affected by this decision.

To control for other individual characteristics that might have influenced mathematics course enrollments, we included other indicators of students' background characteristics (gender and family structure) and prior academic achievement (middle school mathematics grades and 8th-grade mathematics course enrollments). We used grades, rather than test scores, because they measure how well students met the expectations of their middle school teachers in their classes and are frequently used by high schools to place students in freshman courses.[2] We also included indicators for whether students attended an urban or rural public high school, with suburban as the contrast category. For a description of these variables, see Appendix A.

State policy measures

Our approach to analyzing the effects of state policies was to develop indicators of strategies, or policy levers, that states adopted to raise expectations and increase accountability for students' academic progress. Efforts to characterize state policies have ranged from broad general characterizations of the policy environment (Lee, 1998) to analyses of specific policies such as requiring students to pass an examination to graduate (Catterall, 1989; Jacob, 2001).[3] Analyses using the former are difficult to interpret because distinctions in the purposes of various policies are lost. The latter often fail to find significant effects of policies unless the analyses focus on the subpopulations most likely subject to the policies. Our goal was to develop "mid-level" indicators of state policies that reflect the various strategies states used to raise expectations and accountability as well as the extent to which a type of policy lever was employed. The measures used in our analyses were based on state policies reported in 1993, the year during which most NELS students graduated from high school.

In this study we included an indicator of states' academic course requirements for high school graduation, the oldest strategy for raising academic standards by requiring students to take more courses. In the NLSS questionnaire, states were asked to report the number of Carnegie units in various subjects that students were required to complete to be eligible for a high school diploma. The variable used in this analysis was the total number of credits required in the four core academic subjects of English, social studies, mathematics and science. (See Appendix B for a full description of the state variables.) Only three states (Colorado, Massachusetts, and Wyoming) reported setting no course requirements for high school graduation, while the remaining states required an average of 9.96 credits in these subjects to earn a diploma.

Our measure of the extensiveness of states' testing programs in 1993 was based on their reports of the grade levels and major academic subjects in which mandated tests were administered to students during high school. Only seven states reported no mandated testing of high school students in the major subjects of English, social studies/history, mathematics, and science. The remaining states gave on average four tests to high school students, although two states (Minnesota and Virginia) reported testing students in all four subjects every year. The extensiveness of a state's testing program is an indicator of whether external examinations were used on a regular basis to monitor students' progress through the established curriculum, usually with the intention of raising overall levels of achievement.

Although most states tested high school students, they varied in the extent to which performance on those tests carried meaningful consequences for students or schools. Our measure of consequences for students based on test performance was the sum of states' reports of whether test scores were recommended or required for purposes such as placement in remedial or advanced placement programs, promotion to the next grade, or award of a high school diploma. Almost two thirds of the states had guidelines or mandatory policies specifying how test scores should be used to determine some aspect of students' academic program or success. Those states with such policies linked test scores to an average of three or four consequences for students. Fewer states linked students' performance on mandated tests

to rewards and sanctions for schools in 1993. The survey asked about eight types of consequences, such as financial rewards for meeting standards or sanctions like loss of accreditation for failure to do so. Over two thirds of the states reported that they either did not set performance standards or did not provide incentives for meeting those standards. The remaining third of the states linked aggregate test scores to an average of three or four consequences for schools.

In preliminary analyses, the four measures of states' policies appeared to reflect distinct strategies for increasing standards and accountability. The four measures of state policies were only moderately related to each other with correlations all less than .36. The strongest correlation reflected that the number of consequences for schools and for students linked to test performance was related to states having a testing program. However, the extensiveness of testing and how results were used to determine sanctions or rewards tended to be unrelated.

Analysis technique

The questions of whether state testing policies were related to students' mathematics courses in high school required a multilevel analytic strategy. We were concerned not only with variation in students' mathematics course taking across states with differing policies (direct effects), but also with whether the associations of students' outcomes with their social backgrounds varied across states (interaction effects). A common technique for analyzing hierarchical data (in this case, students nested within states) and cross-level effects is HLM, which allows simultaneous consideration of factors from two levels of analysis (Bryk & Raudenbush, 1992; Raudenbush & Bryk, 1986).[4]

The same student and state policy variables were used for analyses of students' freshman mathematics course level and the number of advanced mathematics credits earned, except freshman course level was also used to predict the later outcome. The student-level model is shown in Equation 1, where *ij* was the value for a given student in a given state and B_{kj} was the coefficient for students' SES, race and ethnicity, or the control variables in each state. The effects for some of the student-level factors, such as race or ethnicity, were expressed by several coefficients, for example B_{2j} for Latino/a and B_{3j} for African-American. The term e_{ij} was a measure of the random error, which included unmeasured sources of variation in a particular student's outcome. In our analyses, all the student-level variables were centered around their grand means for the sample, which allowed the intercept (B_{0j}) to be interpreted as the mean outcome for each state adjusted for the characteristics of students in that state (Bryk, Raudenbush, & Congdon, 1996; Willms & Raudenbush, 1989).

$$Y_{ij} = \beta_{0j} + B_{1j}(SES_{ij}) + B_{2j-3j}(Race/Ethnicity_{ij}) + B_{4j-10j}(Controls) + e_{ij} \quad (1)$$

Preliminary analyses indicated that, in our sample, the associations between the student-level control variables and mathematics courses either did not vary significantly across states or those variations were not related to state testing policies. Either situation meant that assuming the associations were constant across states did not substantially affect the results for SES and race or ethnicity. Thus, for the analyses presented here, the coefficients for the student-level control variables were set to be "fixed effects" and our statistical model assumed that the relationships between these student characteristics and mathematics course enrollments were the same for all states (Bryk & Raudenbush, 1992).

The state-level analyses, in essence, examined the extent to which variation in the coefficients for the intercept, SES, and race or ethnicity were related to states' graduation and accountability policies. Equation 2 shows the general model used for estimating the effects of these state policies.[5] Each of the policy variables was centered around its grand mean, which meant that γ_{k0} was the average effect of variable *k* across states and the other coefficients were adjustments to those coefficients, or interaction effects, for states that differed in their testing policies. The effect of a student-level variable was increased when the coefficient for a state policy variable was in the same direction (plus or minus) as the intercept for the student-level variable and reduced when the two coefficients were in the opposite direction. The term u_{kj} was the error term for estimation of the student-level coefficient for each state.

$$B_{kj} = \gamma_{k0} + \gamma_{k1-k4}(State\ Policies_j) + u_{kj} \quad (2)$$

The combined HLM model is shown in Equation 3.

$$
\begin{aligned}
Y_{ij} = & \left[\gamma_{00} + \gamma_{01\text{–}04}\left(State\ Policies_j\right) + u_{0j}\right] \\
& + \left[\gamma_{10} + \gamma_{11\text{–}04}\left(State\ Policies_j\right) + u_{1j}\right] * SES_{ij} \\
& + \left[\gamma_{2\text{–}30} + \gamma_{22\text{–}34}\left(State\ Policies_j\right) + u_{2\text{–}3j}\right] \\
& * Race/Ethnicity_{ij} \\
& + \gamma_{4\text{–}100} * Control\ Variables_{ij} + e_{ij} \qquad (3)
\end{aligned}
$$

Results

States vary in their approaches to raising high school students' academic attainment and promoting equality of opportunities for learning, but the extent to which these policies impact students' educational careers is uncertain. The purpose of our study was to examine variation across states adopting different strategies for raising standards and establishing accountability in two critical aspects of students' mathematics course enrollments: where they started as freshmen, and the amount of advanced-level course work completed by graduation. The goal was to determine whether these state policies were related to students' mathematics course placements as freshmen and their persistence in advanced mathematics as well as differences based on SES and race or ethnicity.

Freshman Mathematics Course Placements

The results for students' freshman mathematics course enrollments are shown in Table 1. The top panel of the table contains the coefficients for the intercept and independent variables modeled on the state level. The first column shows the Level-2 intercept, or average effect, for the student-level variables of interest. The other four columns show the coefficients for state policy variables. The lower panel contains the coefficients for the student-level controls, which were assumed to be constant across states.

All of the student-level control variables except urbanicity were significant predictors of students' mathematics course placements as freshmen. Students tended to enroll in a higher level course if they were female, lived with both natural parents, had higher mathematics grades in middle school, and enrolled in Algebra as an 8th grader.[6] Eighth graders who took remedial mathematics tended to be placed in lower level courses as freshmen, even taking into account their social backgrounds and middle school mathematics grades. Freshman course enrollments appeared to have been similar across urban, suburban, and rural locations.

The first row of Table 1 indicates that states' graduation and accountability policies were related to differences in where freshmen enter the high school mathematics sequence. On average, freshmen tended to enroll in pre-algebra (coded as 3). In states requiring more academic course credits for graduation, freshmen tended to take slightly higher level mathematics courses. Although statistically significant, this effect was small at less than 7% of a course level per standard deviation change in the number of courses required (.077 = .024 * 3.203). This difference, however, was only slightly smaller than those related to gender or family structure. Extensiveness of testing was also significantly related to freshman course enrollments, with students in states with more extensive testing tending to enroll in slightly lower level freshman mathematics courses (−.059 = −.017 * 3.461). Neither of the state accountability policy variables were significantly related to freshman course enrollments.

Extensive testing was also significantly related to a somewhat stronger effect of socioeconomic status on freshman mathematics course level. A standard deviation increase in the number of tests was related to almost a 20% increase in the effect of SES [.197 = (.018 * 3.461)/.314]. These results indicate the gaps between poor and rich students were larger in states that test high school students more frequently and in more subjects. The stronger effect of SES in states with more extensive testing was consistent with analyses of other academic outcomes such as earning a high school diploma (Muller & Schiller, 2000).

Our results identified no overall differences based on race or ethnicity after controlling for prior academic performance and SES. However, state policies were related to significant differences in freshman mathematics course enrollments between African American and white students. The tendency for African American students to enroll in somewhat lower level courses compared to similar whites was stronger in states requiring more academic courses for graduation or linking test performance to consequences for students. The latter policy strategy more than doubled the effect of being African American for each additional consequence. Conversely, the

TABLE 1
Effects of State Policies on the Level of Freshman Mathematics Courses

	State Policy			
Student-level Variable	Average Effect	Graduation Requirement	Extensiveness of Testing	Consequences for School	Consequences for Student
Intercept	3.507***	.024*	−.017**	.022	−.021
Socioeconomic status	.314***	.001	.018***	−.008	.017
Race/ethnicity					
Latino/a	−.030	.005	.017	.007	−.078
African American	−.074	−.035*	.001	.047**	−.084***
Student-level Control	Coefficient				
Male	−.091**				
Living with both parents	.089*				
Middle school math grades	.372***				
8th-grade math class					
Remedial	−.266**				
Algebra/advanced	.780***				
Urbanicity					
Urban	.033				
Rural	−.019				

* = $p < .05$, ** = $p < .01$, *** = $p < .001$.

gap between African American and white students was significantly smaller in states linking test scores to consequences for schools.

Number of Advanced Mathematics Course Credits

The analysis of the number of advanced mathematics course credits students accumulated in high school included the same student-level variables as the previous analyses with the level of freshman mathematics course included as an independent variable. Because of the sequential nature of the high school mathematics curriculum, what mathematics courses freshmen took was a strong predictor of how far they progressed in the subject before graduation. One of the main purposes of this analysis was to explore how state graduation requirements and accountability policies were related to students' course taking patterns in mathematics over time.

As before, Table 2 shows the coefficients for the intercept and slopes modeled on the state level in the top panel, and the coefficients for the student-level control variables in the bottom panel. Focusing on the control variables first, students who lived with both parents, had higher mathematics grades in middle school, and took Algebra in 8th grade tended to earn more advanced mathematics credits in high school. Gender and urbanicity were not significantly related to the number of credits students earned in courses such as Geometry, Algebra II, or Trigonometry. These results indicate that most factors related to where students entered the mathematics sequence continued to similarly influence their later trajectories through the high school mathematics curriculum.

The top panel of Table 2 shows that state policies were related to students' accumulation of advanced mathematics course credits, both directly on the average number of credits earned and through interactions with students' race or ethnicity, socioeconomic status, and freshman course placements. On average, students tended to earn 1.6 credits in advanced mathematics, approximately equivalent to a year of Geometry and over a half year of Algebra II. Even though they entered the mathematics sequence at a slightly higher level than students in other states, students in states requiring more academic courses to earn a high school diploma tended to earn fewer advanced mathematics course credits. This result may reflect that increasing core course requirements could discourage or prevent students from taking advanced courses in mathematics as they are forced to satisfy requirements in other subjects. Although linking test performance to consequences for schools did not appear to impact freshman course placements, students in states with more consequences tended to earn a somewhat greater number of advanced mathematics credits. Again, however, these statistically significant effects were fairly small at 4% (−.042 = −.013 * 3.203) of a credit decrease per standard deviation increase in number of academic courses required and about 9% (.089 = .046 * 1.929) of a credit more per standard deviation increase in the number of consequences for schools. While freshmen in states with more extensive testing tended to take slightly lower level courses, students did not earn significantly different numbers of advanced mathematics credits in states with less testing when their initial placements were taken into account. Overall, students' trajectories through high school mathematics, as well as their initial placements, appeared to have been shaped to some extent by states' graduation and accountability policies.

These state policies were also related to differences in the number of advanced mathematics credits based on students' SES or race and ethnicity. As with initial placements, the effect of SES tended to be slightly stronger in states with more extensive testing programs. The effect of SES on the number of advanced mathematics credits earned increased by 14% [.139 = (.013 * 3.461)/.323] per standard deviation change in the number of mandated tests. These results suggest that extensive testing had a persisting effect on social stratification not only through initial placements but also through increasing the gaps between poor and rich students over their high school careers.

States' graduation requirements and accountability policies were also related to differences in the number of advanced mathematics requirements earned by racial and ethnic groups. Latino/a students tended to earn on average slightly fewer credits in advanced mathematics than white or Asian American students, with this difference being almost a third smaller (.312 = .029/.093) for each additional required course. Taking into account their lower freshman mathematics courses, African American students tended to accumulate

TABLE 2
Effects of State Policies on Number of Advanced Mathematics Credits Earned

		State Policy			
Student-level Variable	Average Effect	Graduation Requirement	Extensiveness of Testing	Consequences for School	Consequences for Student
Intercept	1.631***	−.013*	.003	.046**	−.020
Socioeconomic status	.323***	−.012	.013*	.009	−.003
Race/ethnicity					
Latino/a	−.093*	.029*	.044	.042	−.033
African American	.039	.053**	−.007	.022	−.059*
Freshman math level	.448***	.013**	−.007	.028**	−.024*
Student-level control	Coefficient				
Male	−.039				
Living with both parents	.103**				
Middle school math grades	.249***				
8th-grade math class					
Remedial	−.109				
Algebra/advanced	.483***				
Urbanicity					
Urban	−.004				
Rural	−.027				

* = $p < .05$, ** = $p < .01$, *** = $p < .001$.

a slightly greater number of advanced mathematics credits compared to white students in states with higher graduation requirements. The effects of state policies specifying consequences for students showed a different pattern, with African American students tending to earn fewer advanced mathematics credits in high school. Both of these interaction effects were larger than the overall average difference between African Americans and whites. One possible explanation for these patterns is that requiring more courses encouraged African American students, who tended to start out in lower courses as freshmen, to persist in taking mathematics longer in order to accumulate the necessary number of course credits. In contrast, greater consequences for students might have create self-fulfilling prophecies that discouraged these minority students from entering more advanced level courses.

Finally, states' graduation requirements and accountability policies appear to have influenced students' trajectories through the high school mathematics curriculum. On average, students tended to accumulate .448 of a Carnegie unit more in advanced mathematics for each level higher they were placed as freshmen. The link between freshman course placements and accumulated course credits was stronger in states with a greater number of course requirements, more consequences for schools linked to test performance, and with a fewer number of consequences for students. These interaction effects were statistically significant but modest, amounting to about 9% to 12% change in the effect of freshman course placements per standard deviation increase in a given state policy measure. However, these results suggest that some state policies were associated with not only freshman starting in more difficult courses, but also helping these students persist in taking more advanced level courses.

Overall and cumulative effects of state graduation requirements and accountability policies

As noted above, state graduation requirements and accountability policies had complex relationships with students' mathematics course enrollments in high school. For example, students in states with a greater number of academic courses required for high school graduation tended to be placed in higher courses as freshmen, to earn fewer advanced mathematics credits and the influence of their freshman course placements was stronger in these states. In addition, this state policy was related to overall higher freshman course placements and a stronger tendency for African Americans to be placed lower than white students. To examine the overall and cumulative effects of state graduation requirements and accountability policies, we used the HLM equations to estimate the expected number of advanced mathematics credits for students with identical social backgrounds and middle school experiences but who differed on the key variables of interest for these analyses.

Table 3 shows the overall effects of a state policy on students' advanced mathematics course enrollments by estimating the expected number of credits earned by students who differed in their freshman course placements but were otherwise identical (i.e., had the same social backgrounds and middle school mathematics experiences). Low (or few) or high (or many) values for any of the variables were one standard deviation below (or the lower bound) or above the mean for that variable. For freshman mathematics course enrollments, the low and high placements were roughly equivalent, respectively, to Pre-Algebra and Geometry.

Clearly shown in Table 3 is the strong effect of freshman course placements on advanced math-

TABLE 3
Expected Number of Advanced Mathematics Credits Earned in High School by Freshman Course Enrollment and State Policy

	Level of Freshman Math Course[a]	
State Policy	Low	High
Graduation requirement[a]		
Few	1.161	2.186
Many	.966	2.211
Extensiveness of testing[a]		
Few	1.024	2.217
Many	1.103	2.181
Consequences for schools		
None	1.051	2.106
Many[b]	1.084	2.356
Consequences for students		
None	1.042	2.303
Many[b]	1.086	2.088

Note.
[a] ± 1 standard deviation from the mean.
[b] 1 standard deviation above the mean.

ematics courses, with the lower placed student expected to earn about one credit compared to two credits for the otherwise identical higher placed student. However, these gaps clearly varied between states with different policies, with the overall effect of the state policies ranging from .12 to .26 of a Carnegie unit, or approximately 1.5 months to half a semester of a yearlong mathematics course. The smaller change was in the gap between low and high students in states differing in amounts of testing, which was due to a weak effect of this policy on freshman course placements.

Both graduation requirements and linking test performance to consequences for schools were related to an increasing gap between high and low students, but by affecting different types of students. The impact of graduation requirements was strongest for the students placed in lower freshman classes, with those in states with many graduation requirements expected to earn less than one credit in advanced mathematics. In contrast, more consequences for schools were expected to increase the number of Carnegie units in advanced mathematics earned by both types of students, but the expected increase was dramatically larger for the high student (.250 compared to .033).

Similarly, the effect of linking test performance to consequences for students differed based on their freshmen course placements. In states with more consequences for students, the gap between low and high students closed by more than a quarter of a Carnegie unit. However, this trend was mostly due to the high student being expected to take fewer advanced level courses than an identical student in a state with fewer consequences.

In summary, the only policy that seemed to significantly reduce the gap based on freshman course placements was linking test performance to consequences for students, but only by possibly discouraging students on track toward taking advanced level courses from doing so. Linking test performance to consequences for schools appeared to encourage freshmen in higher courses to stay on track toward advanced mathematics, but the policy also seemed to increase inequity between these students and freshmen placed in lower courses.

Using a similar approach, we examined whether state graduation requirements and accountability policies might have mitigated or exacerbated differences in how far students progressed in advanced mathematics based on social class and race or ethnicity. To show the cumulative effect of these state policies, we took into account initial differences between groups by using the expected freshman mathematics course placement for a particular group of students in estimating the expected number of advanced mathematics credits for that type of student. Table 4 shows the estimates calculated for those state policies that had significant coefficients for the independent variable of interest—extensiveness of testing for SES and the other three state policies for race or ethnicity. These estimated differences were related to both direct effects of these policies and their indirect effects through freshman course enrollments, indicating how state graduation requirements and accountability policies may have influenced the process of educational stratification.

The stronger advantage of students from more affluent families in the accumulation of advanced mathematics credits in states with more extensive testing is clearly shown in the top portion of Table 4. In a state with extensive testing, a student from a high-SES family (defined as one standard deviation above the mean) would have been expected to earn over 2 Carnegie units of advanced mathematics credits compared to 1.210 credits by an otherwise similar low-SES student. This difference was 30% larger than that between similar rich and poor students in states with less testing, which was just under .6 of a credit. A good portion of the effect of extensive testing was through the freshman mathematics course placements such that, when freshman mathematics course placements were held constant, the difference between rich and poor students in states with extensive testing was about half a credit smaller (not shown). Thus, monitoring students' academic progress through state mandated testing appears to have exacerbated initial differences in academic placements based on social class.

The estimated differences in advanced mathematics credits earned between racial or ethnic groups varied between states such that African American, and sometimes Latino/a, students would have been expected to earn more advanced mathematics credits than similar white students in some states. In a state mandating *few* academic courses for graduation (one standard deviation below the mean for all states), a white student would have been expected to accumulate 1.756

TABLE 4
Expected Number of Advanced Mathematics Credits Earned in High School by State Policy, Social Class and Race/Ethnicity

Student Characteristic	Extensiveness of Testing[a] Low	High
Socioeconomic status[a]		
Low	1.341	1.210
Average	1.638	1.607
High	1.934	2.003
	High School Graduation Requirements[a]	
Race or ethnicity	Few	Many
African American	1.571	1.746
Latino/a	1.479	1.626
White	1.756	1.631
	Consequences for School	
Race or ethnicity	None	Many[b]
African American	1.561	1.838
Latino/a	1.444	1.728
White	1.600	1.749
	Consequences for Student	
Race or Ethnicity	None	Many[b]
African American	1.895	1.431
Latino/a	1.726	1.378
White	1.684	1.623

[a] ± 1 standard deviation from the mean.
[b] ± 1 standard deviation from the mean.
Note. The estimated number of credits reresent the cumulative effects of social background and a given state policy by taking into account expected freshman course placements.

credits in advanced mathematics compared to 1.571 and 1.479 credits for a similar African American and Latino/a students, respectively. In states mandating students complete *many* academic courses to graduate, African Americans would have been expected to accumulate slightly more (.11) advanced mathematics credits than white or Latino/a students with similar social backgrounds and middle school academic experiences. A similar but weaker pattern is also seen for state policies linking test performance to consequences for schools, with African American and Latino/a students being expected to earn fewer credits than similar whites in states with no consequences for schools and slightly more credits in states with many consequences. The apparent advantage of minority status reflects that these students exceeded expectations based on their social background and prior academic performance and that these states may have had greater equity in opportunities for learning.

In contrast, the effect of linking test performance to *fewer* consequences for students resulted in a greater number of advanced mathematics credits for African American and Latino/a students compared to similar white students. All racial and ethnic groups would be expected to earn more advanced mathematics credits in states with fewer consequences for students, with the differences between groups being slightly smaller in these states. In states with many consequences for students, the difference between Whites and similar Latino/as was almost a quarter of a credit and almost .20 of a credit between Whites and African Americans. These results suggest, like extensive testing, linking test performance to consequences for students may have exacerbated differences in opportunities for learning based on social background.

Discussion and Conclusions

No Child Left Behind has the stated dual goals of both increasing academic standards and decreasing inequality between social and economic groups by, among other reforms, increased use of standardized testing and accountability. Using data from the early 1990s, our results suggest that these policies are likely to have mixed effects on students' opportunities to learn mathematics in high school. Given the strong link between course work and learning, these policies' effects on student achievement and inequality also will be probably mixed. These findings, however, were not unexpected given the complex nature of students' academic careers over time.

Overall, our results indicated that state graduation requirements and accountability policies had small but statistically significant effects on students' mathematics course taking in high school, both on the types and number of courses taken and on stratification related to social class and race or ethnicity. The relatively small size of the effects was not surprising because individual students' course taking patterns were influenced by many factors, such as their educational aspirations and schools' class schedules (Oakes, 1985; Useem, 1991). In addition, we may have underestimated the total effect of these policies on advanced mathematics course taking due to controlling on students' freshman course placements. Regardless, even small differences between states were important because they reflect the experiences of large numbers of students.

Our results indicated that increasing school accountability for student test performance was the only strategy that seemed to increase all students' opportunities for learning mathematics in high school, but especially for minority students and those who took higher level courses as freshmen. While students in states linking test performance to a greater number of consequences for schools tended to enroll in similar freshman mathematics courses as those in other states, they appeared to persist in taking the advanced level courses desired by competitive colleges and necessary for entry into health care, science, and technology occupations. One possible explanation for this effect is that school accountability focused students and teachers on a common goal of academic excellence, with those students who showed potential being particularly encouraged to progress further in the mathematics curriculum (Muller, 1998; Roderick & Engel, 2001; Rosenholtz, 1987). Alternatively, higher rates of advanced mathematics course taking could also be the result of at-risk students being more likely to drop out of school in these states (Schiller & Muller, 2000). More research is needed into whether school accountability provides incentives to not only invest in academically able students, but also encourage students who are at-risk of failing to leave school early.

State high school graduation requirements had mixed effects on course placements and differences in enrollment based on students' social backgrounds. Students in states with more graduation requirements tended to enter the high school mathematics curriculum at a higher level as freshmen. However, students placed in lower level freshmen courses in these states were less likely than those in other states to take advanced level courses in mathematics. While African American students also tended to take lower level courses as freshman in states with more requirements, they appeared to overcome this disadvantage to earn more advanced level credits compared to similar students in other states. These results were consistent with findings from similar studies in the 1980s (Chaney et al., 1997; Clune & White, 1992) suggesting that requiring students to take more academic courses may promote both equity and excellence. However, our results suggest one caveat to this pattern, students who fall behind in the curriculum may be unable to gain access to advanced level courses in these states.

In contrast, holding students accountable for their test performance tended to depress the number of advanced mathematics credits they earned, especially for freshmen who took higher level courses such as geometry, and among minorities. Because student accountability is not directly related to course enrollments, the results for higher level freshman courses might be due to few incentives for students in these states to pursue more advanced level courses after mastering the basics necessary to perform adequately on the state mandated tests (Jacob, 2001; Muller, 1998). African American and Latino/a students may be particularly adversely affected by this policy because they are more likely to have difficulties with standardized tests and thus subject to sanctions that prevent them from taking more advanced level courses (Catterall, 1989). As a strategy independent of the others, increasing student ac-

countability appears to promote neither excellence nor equity.

Similarly, extensive testing was related to greater stratification based on students' socioeconomic status both in their freshman mathematics courses as well as the number of advanced mathematics credits they earned. Low-SES students tended to earn more advanced mathematics credits in states with fewer mandated tests, while high-SES students varied very little between states. Frequent testing may reinforce, rather than alleviate, academic problems through self-fulfilling prophecies concerning the academic ability of poorer children (Muller & Schiller, 2000). The weaker impact of this policy on affluent children may be a function of the additional academic support and encouragement they probably received from parents, teachers, and peers focused on college attendance. Interestingly, frequent testing slightly reduced the gap in the number of advanced course credits earned related to freshman course placements, but only by regression toward the mean for both higher and lower level students. Thus, extensive testing does not appear to have increased students' opportunities for learning and tended to exacerbate social class inequality.

Our analyses suggest some general ways in which various state strategies for increasing standards and accountability may impact students' opportunities for learning mathematics in high school. Additional research is needed to clarify the mechanisms through which state reform initiatives shape students' academic experiences. For example, subject specific analyses might examine whether students' achievement growth in mathematics or another subject is highest in the years in which they are tested in that subject. Multiple cohort studies would also allow exploration of the impact of policy changes over time. Additional research should also explore whether these policies also have differential impacts within states based on school characteristics, which would deepen our understanding of how educational stratification within states develops. Although we did not find any differences based on school location, schools serving disadvantaged populations may respond differently to various state policies than those with more affluent students. While almost all schools offer at least some advanced level courses, more affluent schools may have the resources to expand their offering of advanced level courses as demand for them increases in response to greater school accountability. In contrast, schools serving socially disadvantaged populations may have to invest their resources in bringing poor performing students up to a minimal level of proficiency. Both analyses of specific policies and changes in schools over time require longitudinal data, which is often expensive to collect but critical for understanding education as a process.

With increased public scrutiny of the U.S. education system since the 1980s, state policy makers started taking a more active role in adopting reforms intended to improve students' academic achievement by raising standards and creating accountability systems (Timar, 1997). Instead of students selecting from a plethora of courses and good behavior rewarded as much as learning in the "shopping mall high school," all students are expected to take a rigorous set of core academic courses and both schools and students are to be rewarded for meeting state performance standards. Our results suggest that such policies influence the educational process, but are likely to have mixed and unintended effects. Raising the bar through graduation requirements and holding schools accountable for student achievement may benefit all students. However, increased amounts of student testing are likely to exacerbate gaps in achievement between rich and poor students.

Notes

[1] The NELS sample design limits the number of transfer students in the transcript sample because only a subsample of schools with small numbers of panel participants were included in the follow-up and transcript studies (Ingles et al., 1995). About 2% of the transcript panel sample changed states between the first and second follow-ups, which means that the vast majority of the students' high school experiences were shaped by one state's policies. No clear differences in outcomes were found between those students who did or did not change states.

[2] Although achievement tests were administered to students during each wave of NELS, previous analyses (Schneider & Coleman, 1993) indicate an odd relationship between grades and test scores in NELS that makes comparison of African Americans and whites tricky. Our preliminary analyses indicated similar odd race and ethnic differences when examining course placements over time and test scores. For example, African Americans tended to be placed in *higher* level courses as freshman than white students with similar 8th-grade

math test scores. More substantively, the tests given in NELS were not designed to reflect mastery of material covered in the students' particular courses, were not related to state curriculum or performance standards, and were not provided to teachers or schools. Because grades are used for these purposes, we chose to use those in our models instead of test scores as indicators of mathematics achievement prior to high school.

[3] In preliminary analyses, we included Lee's (1997) indicators of policy trends and coherence in our models but dropped them when none of the coefficients for these variables were statistically significant. Preliminary analyses, in contrast, indicated that the number of mathematics credits required by states was strongly related to the number of advanced mathematics credits students earn but not freshman course placements. However, we were more interested in the general strategy of raising overall standards by increasing academic course requirements, which might create conflicting demands on students' time and negatively impact their likelihood of taking advanced level courses in even a key subject like mathematics. In addition, composite indicators of course requirements and mandated testing in the four core academic subjects were parallel measures with those for student and school accountability, which could not be linked to performance in a particular subject or test. Substantively, the composite measures were likely to be more reliable indicators of general policy strategies than the adoption of a specific policy, possibly in isolation. Another advantage of this approach was that indicators of general strategies (e.g., an emphasis on testing) were likely to be more stable than specific policies (e.g., the test used). For example, 80 states reported no increase or a moderate increase in testing or uses of testing from 1980. Thus, while the particular tests may have changed, the tendency to use them is more stable. Similarly, over 75% of states implemented testing or accountability policies in 1989 or earlier such that they were in effect over the NELS cohort's high school careers.

[4] In preliminary analyses we ran some 3-level models nesting students within schools within states but decided against using them for this article because (a) we were not interested in school effects per se, and (b) the 3-level models were substantively similar but dramatically less robust than the 2-level models. The latter was a result of the number of schools per state and students per school in NELS being too small for estimation of robust 3-level models.

[5] The limited number of states constrains the number of variables that can be included in the state-level models. Supplementary analyses, however, indicated no significant differences across states in the dependent variables or the effects of the independent variables based on geographic region and indicated no strong interaction effects between the state policy variables.

[6] Analyses of NELS and other data sets collected during the 1990s indicated that gender differences in mathematics course enrollments have either disappeared or show an advantage for girls over boys (Campbell, Hombo, & Mazzeo, 2000). Also, supplementary analyses indicated statistically significant variation in the coefficient for gender across states, but this variation was not related to our state policy measures.

Appendix A

Source, Coding, and Descriptive Statistics for Student-Level Variables

Student-level Variables	Sample *M*	Sample *Std*	Source and Coding*
Level of freshman mathematics course.	3.53	1.27	Obtained from high school transcripts.
Advanced mathematics credits	1.68	1.29	Obtained from high school transcripts, number of Carnegie units in algebra II, geometry, trigonometry, pre-calculus, and calculus.
Socioeconomic status	.01	.73	NCES constructed variable in the Second Follow-up Student file.
Race/ethnicity			
African-American	.11	.32	Constructed from an NCES variable based on student reports with European Americans and Asian Americans as the base category, and Native Americans excluded from analysis.
Latino/a	.08	.28	
Male	.49	.50	NCES variable based on student report. Coded 1 = male, and 0 = female.
Living with both Parents	.68	.47	Composite based on parents' and students' reports of adults in the household. Coded 1 = both parents, and 0 = other.
Middle school mathematics grades	4.04	.97	8th graders' report of mathematics grades "from the sixth grade until now."
8th-grade mathematics courses			
Remedial mathematics	.06	.24	8th grader's report of which mathematics courses they attended that year.
Algebra	.37	.48	
Urbanicity			
Urban	.20	.40	Constructed from an NCES variable with the suburban as the base category.
Rural	.36	.48	

Note. *All information is obtained from the National Educational Longitudinal Study of 1988–94.

Appendix B

Sources, Coding, and Descriptive Statistics for State-Level Variables

State Testing Policy	*M*	*Std*	Source and Coding*
High school graduation requirements	9.960	3.203	"Please indicate your State's high school graduation requirements for the class of 1992." The variable is the sum of the number Carnegie units required for a "regular diploma" in English, mathematics, science, and social studies.
Extensiveness of testing $\alpha = .8949$	4.020	3.461	"At what high school grades, and in which content areas does current State policy require that student performance be assessed?" Summed across math, reading, science, and history/social studies for 9th through 12th grades.
Consequences for students $\alpha = .5976$	2.066	2.189	"Does your State currently require or set guidelines for high school student testing for any of the following purposes?" Coded 2 = "state has mandatory policy"; 1 = "state has guidelines"; and 0 = "neither." Summed across high school graduation, placement in remedial (compensatory education) programs, diploma eligibility, and promotion.
Consequences for schools $\alpha = .8485$	1.137	1.929	"Does State policy set standards for high school's performance based on student test results?" Coded 0 if "describes neither acceptable nor unacceptable results." Otherwise, number of rewards for meeting standards (financial incentives, official recognition/publicity, accreditation, waivers from testing or reporting requirements, waivers from other regulations or deregulation) and sanctions for failing to meet standards (negative publicity, loss of accreditation, loss of control to higher educational authority).

Note. *All the variables in this table were responses to the questionnaire sent to State Departments of Education as part of the National Longitudinal Study of Schools.

References

Bryk, A. S., Raudenbush, S., & Congdon, R. (1996). *HLM: Hierarchical linear and nonlinear modeling with the HLM/2L and HLM/3L programs.* Chicago, IL: Scientific Software International.

Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). Newbury Park, CA: Sage Publications.

Campbell, J. R., Hombo, C. M., & Mazzeo, J. (2000). *Trends in academic progress: Three decades of student performance.* Washington, DC: U.S. Department of Education.

Catterall, J. S. (1989). Standards and school dropouts: A national study of tests required for high school graduation. *American Journal of Education, 98*(1), 1–34.

Chaney, B., Burgdorf, K., & Atash, N. (1997). Influencing achievement through high school graduation requirements. *Educational Evaluation and Policy Analysis, 19*(3), 229–244.

Clune, W. H., & White, P. A. (1992). Education reform in the trenches: Increased academic course taking in high schools with lower achieving students in states with higher graduation requirements. *Educational Evaluation and Policy Analysis, 14*(1), 2–20.

Elmore, R. F., Abelman, C. H., & Fuhrman, S. H. (1996). The new accountability in state education reform: From process to performance. In H. F. Ladd (Ed.), *Holding schools accountable: Performance-based reform in education* (pp. 65–98). Washington, DC: Brookings Institution Press.

Gamoran, A. (1987). The stratification of high school learning opportunities. *Sociology of Education, 60,* 61–77.

Heubert, J. P., & Hauser, R. M. (Eds.). (1999). *High stakes: Testing for tracking, promotion, and graduation.* Washington, DC: National Academy Press.

Ingles, S. J., Dowd, K. L., Taylor, J. R., Bartot, V. H., Frankel, M. R., & Pulliam, P. S. (1995). *National Education Longitudinal Study of 1988 second follow-up: Transcript component data file user's manual.* Washington, DC: U.S. Department of Education.

Ingles, S. J., Scott, L., Lindmark, J., Frankel, M. R., & Myers, S. (1992). *National Education Longitudinal Study of 1988 first follow-up: Student component data file user's manual.* Washington, DC: U.S. Department of Education.

Jacob, B. (2001). Getting tough? The impact of high school graduation exams. *Educational Evaluation and Policy Analysis, 23*(2), 99–121.

Lee, J. (1997). State activism in education reform: Applying the Rasch model to measure trends and examine policy coherence. *Educational Evaluation and Policy Analysis, 19*(1), 29–43.

Lee, J. (1998). State policy correlates of the achievement gap among racial and social groups. *Studies in Educational Evaluation, 24*(2), 137–152.

Levine, R., & Stevenson, D. L. (1997). *Changes in America's high schools, 1980–1993: The National Longitudinal Study of Schools.* Washington, DC: U.S. Department of Education.

Lucas, S. R. (1999). *Tracking inequality: Stratification and mobility in American high schools.* New York: Teachers College Press.

McDonnell, L. M. (1994). Assessment policy as persuasion and regulation. *American Journal of Education, 102*(4), 394–420.

Muller, C. (1998). The minimum competency exam requirement, teachers' and students' expectations and academic performance. *Social Psychology of Education, 2*(2), 199–216.

Muller, C., & Schiller, K. S. (2000). Leveling the playing field? Students' educational attainment and states' performance testing. *Sociology of Education, 73*(3), 196–218.

National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform.* Washington, DC: U.S. Government Printing Office.

Oakes, J. (1985). *Keeping track: How schools structure inequality.* New Haven, CT: Yale University Press.

Oakes, J., & Guiton, G. (1995). Matchmaking: The dynamics of high school tracking decisions. *American Educational Research Journal, 32*(1), 3–33.

Raudenbush, S., & Bryk, A. S. (1986). A hierarchical model for studying school effects. *Sociology of Education, 59,* 1–17.

Roderick, M., & Engel, M. (2001). The grasshopper and the ant: Motivational responses of low-achieving students to high stakes testing. *Educational Evaluation and Policy Analysis, 23*(3), 197–227.

Rosenholtz, S. J. (1987). Education reform strategies: Will they increase teacher commitment? *American Journal of Education, 95*(4), 534–562.

Schiller, K. S., & Hunt, D. (2001, April). *Leading up or out: Paths through high school mathematics.* Paper presented at the annual meeting of the American Educational Research Association, Seattle, WA.

Schiller, K. S., & Muller, C. (2000). External examinations and accountability, educational expectations, and high school graduation. *American Journal of Education, 108*(2), 73–102.

Schmidt, W. H., McKnight, C. C., Houang, R. T., Wang, H., Wiley, D., Cogan, L. S., et al. (Eds.). (2002). *Why schools Matter: A cross-national comparison of curriculum and learning:* New York: Jossey-Bass.

Schneider, B., & Coleman, J. S. (Eds.). (1993). *Parents, their children, and schools.* Boulder, CO: Westview Press.

Schneider, B., Swanson, C. B., & Riegle-Crumb, C. (1998). Opportunities for learning: Course sequences and positional advantages. *Social Psychology of Education, 2,* 25–53.

Stedman, L. C. (1997). International achievement differences: An assessment of a New Perspective. *Educational Researcher, 26*(3), 4–15.

Stevenson, D. L., & Schiller, K. S. (1999). State education policies and changing school practices: Evidence from the National Longitudinal Study of School, 1980–1993. *American Journal of Education, 107,* 261–288.

Stevenson, D. L., Schiller, K. S., & Schneider, B. (1994). Sequences of opportunities for learning. *Sociology of Education, 67,* 184–198.

Timar, T. B. (1997). The institutional role of state education departments: A historical perspective. *American Journal of Education, 105*(3), 231–260.

Useem, E. L. (1991). Student selection into course sequences in mathematics: The impact of parental involvement and school policies. *Journal of Research on Adolescence, 1,* 231–250.

Wells, A. S., & Oakes, J. (1996). Potential pitfalls of systemic reform: Early lessons from research on detracking. *Sociology of Education,* 135–143.

Willms, J. D., & Raudenbush, S. W. (1989). A longitudinal hierarchical linear model for estimating school effects and their stability. *Journal of Educational Measurement, 26*(3), 209–232.

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