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The Role of End-of-Course Exams and Minimum Competency Exams in Standards-Based Reforms

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This paper has not undergone formal review or approval of the faculty of the ILR School. It is intended to make results of Center research available to others interested in preliminary form to encourage discussion and suggestions.

Let us send a signal out to the world that the days of undereducating our young people, the days of underestimating our young people are over.

--Hugh Price, President of the National Urban League,
quoted in Education Week., July 14, 1999¹

I. THE PROBLEM

Educational reformers and most of the American public believe that most teachers ask too little of their pupils. These low expectations, they believe, result in watered down curricula and a tolerance of mediocre teaching and inappropriate student behavior. The result is that the prophecy of low achievement becomes self-fulfilling.

Although research has shown that learning gains are substantially larger when students take more demanding courses², only a minority of students enroll in these courses. There are several reasons for this. Guidance counselors in many schools allow only a select few into the most challenging courses. While most schools give students and parents the authority to overturn counselor recommendations, many families are unaware they have that power or are intimidated by the counselor's prediction of failure in the tougher class. As one student put it: ***"African-American parents, they settle for less, not knowing they can get more for their students."***³

In part the problem is ignorance. Students appear to be unaware of just how important courses like algebra and geometry are for getting into and completing college. Even though 80 percent of 10th graders in 1988 expected to go to college, and 53 percent aspired to a professional or technical job, only 20 percent of 8th graders in 1989 thought they would need geometry and only 24 percent said they would need algebra "to qualify for [their] first choice job."

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A second source of the problem is that most students prefer courses that have the reputation of being fun and not requiring much work to get a good grade. In the 1987 survey, 62 percent of 10th graders agreed with the statement, ***"I don't like to do any more school work than I have to."***⁵ Many parents support their children's preference for easier courses. Even in

wealthy communities, they often demand that their child switch to easier courses where good grades are easier to get. As one guidance counselor described:

A lot of... parents were in a 'feel good' mode. "If my kids are not happy, I'm not happy." ...Probably...25 percent ...were going for top colleges. They were pushing their kids hard. The rest---75 percent (I'm guessing at the numbers)---said "No, that's too hard, they don't have to do that."...If they [the students] felt it was too tough, they would back off. I had to hold people in classes, hold the parents back. [I would say] "Let the kid get C's. It's OK. Then they'll get C+'s and then B's." [But they would demand,] "No! I want my kid out of that class!"⁶

Teachers are aware of student preferences and adjust their style of teaching and their homework assignments with an eye to maintaining enrollment levels. Guidance counselors, students and parents avoid rigorous courses largely because the rewards for the extra work are small for most students. While selective colleges evaluate grades in the light of course demands, many colleges have, historically, not factored the rigor of high school courses into their admissions decisions. Trying to counteract this problem, college admissions officers have been telling students that they are expected to take the most rigorous courses offered by their school. This effort has been partly successful. More students are taking chemistry and physics and advanced mathematics. But apparently many students have not gotten the message and still think taking easy courses is a good strategy. One student told a reporter:

My counselor wanted me to take Regents history and I did for a while. But it was pretty hard and the teacher moved fast. I switched to the other history and I'm getting better grades. So my average will be better for college. Unless you are going to a college in the state, it doesn't really matter whether you get a Regent's diploma.⁷

Consequently, the bulk of students who do not aspire to attend selective colleges quite rationally avoid rigorous courses and demanding teachers.

When teachers try to set high standards, they often get pressured to go easy. The following story is from southern Texas in the early 1980s.

“In the first grading period I boldly flunked a number of students, including the daughter of an administrator of a local elementary school and a star fullback who was also the nephew of a school board member. Shortly thereafter I was called in to meet with my principal and the aggrieved parents. Such was my naivete that I actually bothered to bring evidence. I showed the elementary administrator her daughter’s plagiarized book report and the book from which it had been copied, and I showed the fullback’s father homework bearing his son’s name but written in another person’s hand writing. The parents offered weak apologies but maintained that I had not treated their children fairly.

My principal suddenly discovered a number of problems with my teaching. For the next few weeks he was in my class almost daily. Every spitball, every chattering student, every bit of graffiti was noted. When there were discipline problems my superiors sided with the offending students. Teaching became impossible.

So I learned to turn a blind eye to cheating and plagiarism and to give students, especially athletes, extra credit for everything from reading orally in class to remembering to bring their pencils. In this way I gained the cooperation of my students and the respect and support of my superiors.”⁸

This story is not an isolated example. Thirty percent of American teachers say they "feel pressure to give higher grades than students' work deserves." Thirty percent also feel pressured "to reduce the difficulty and amount of work you assign."⁹

Nerd Harassment

Interviews I conducted of middle school boys in Ithaca New York in 1996 and 1997 revealed that most of them internalized a norm against “sucking up” to the teacher. How does a boy avoid being thought a “Suck up?” He:

- Avoids giving the teacher eye contact
- Does not hand in homework early for extra credit,
- Does not raise his hand in class too frequently, and
- Talks or passes notes to friends during class (this signals that you value friends more than your rep with the teacher).

Similarly, Steinberg, Brown and Dornbusch’s recent study of nine high schools in California and Wisconsin concluded that:

...less than 5 percent of all students are members of a high-achieving crowd that defines itself mainly on the basis of academic excellence... Of all the crowds the ‘brains’ were the least happy with who they are--nearly half wished they were in a different crowd.¹⁰

Why are the studious called **suck ups**, **dorks** and **nerds** or accused of “**acting white**”? In part, it is because many teachers grade on a curve and this means trying hard to do well in a class is making it more difficult for others to get top grades. When exams are graded on a curve or college admissions are based on rank in class, joint welfare is maximized if no one puts in extra effort. In the repeated game that results, side payments--friendship and respect--and punishments—ridicule, harassment and ostracism--enforce the cooperative "don't study much" solution. If, by contrast, students are evaluated relative to an outside standard, they no longer have a personal interest in getting teachers off track or persuading each other to refrain from studying. Peer pressure demeaning studiousness should diminish.

Teacher Quality and Out-of-Field Teaching

The standards for getting into secondary school teaching are quite low. Most states using the National Teachers Examination/Praxis test have set remarkably low minimum passing scores.¹¹ Despite the low cut scores, failing these tests is not an absolute bar to entering the profession. Principals routinely fill open positions with uncertified teachers. School administrators are also remarkably willing to hire and assign staff to teach subjects that are outside their field of expertise and training. More than half of secondary school history classes are taught by teachers who neither majored nor minored in history in college. More than half of chemistry and physics students are taught by teachers who did not major or minor in a physical science or engineering in college.¹²

The Signals Sent by the Labor Market

Employers also have an important role in encouraging higher academic standards. American employers, however, have a difficult time getting information on student achievement in school so they seldom consider the rigor of high school courses or externally assessed student achievement when making hiring decisions. If a student or graduate has given written permission for a transcript to be sent to an employer, the Federal Education Rights and Privacy Act obligates the school to respond. Many high schools are not, however, responding to such requests. In Columbus Ohio, for example, Nationwide Insurance sent over 1,200 requests for transcripts signed by job applicants to high schools in 1982 and received only 93 responses. An additional barrier to the use of high school transcripts in selecting new employees is that when high schools do respond, it takes a great deal of time. In most high schools, the system for responding to transcript requests has been designed to meet the needs of college-bound students rather than the students who seek jobs immediately after graduating. The result is that a 1987 survey of a stratified random sample of small-and medium-sized employers who were members of the National Federation of Independent Business (NFIB) found that transcripts had been obtained prior to the selection decision for only 14.2 percent of the high school graduates

hired.¹³ Only 15 percent of the employers had asked high school graduates to report their grade point average. The absence of questions about grades on most job application forms probably reflects the low reliability of self reported data, the difficulties of verifying them, and the fear of EEO challenges to such questions.¹⁴ Tests are available for measuring competency in reading, writing, mathematics, science, and problem solving; but, after the 1971 Griggs decision, almost all firms were forced to stop employment testing by EEOC guidelines that made it prohibitively costly to demonstrate test validity.¹⁵ The 1987 NFIB survey found that basic skills tests had been given in only 2.9 percent of the hiring decisions studied.

These problems in signaling student achievement to employers are probably important reasons why tests assessing these skills have only modest effects on the wages and earnings of men and women under the age of 25.¹⁶ Over time, however, employers learn which employees are the most competent by observing job performance. Those judged most competent are more likely to get further training, promotions and good recommendations when they move on. Poor performers are encouraged to leave. Since academic achievement in high school is correlated with job performance,¹⁷ the sorting process results in basic skills assessed during high school having a much larger effect on the labor market success of 30 year olds than of 19 year olds even when contemporaneous measures of completed schooling are held constant.¹⁸

Altonji and Pierret's study of how scores on the Armed Forces Qualification Test (AFQT) taken while a teenager effect subsequent labor market success provides estimates of the magnitude of these effects in the late 1980s and early 1990s. Controlling for a contemporaneous measure of completed schooling, they found that a one standard deviation (4-5 grade level equivalent) higher AFQT score was associated with only a 2.8 percent increase in wage rates the first year out of school but a **16 percent** increase 11 years later.¹⁹ By contrast, the percentage impact of a year of schooling decreased with time out of school from 9.2 percent for those out just one year to 3 percent for those out for 12 years.

The long delays before the benefits of academic achievement in high school start accruing can send students the wrong signals. Teenagers are very aware that getting a college degree will yield substantial benefits. They can see in their community and on TV that college educated adults have good jobs and live in large attractive houses.

How by contrast do youngsters assess the rewards for taking tough courses and studying hard in high school? Those who aspire to attend competitive colleges realize they have to work hard in high school. But most students plan to attend the local state college or community college not a competitive state university or a selective private college. Their own experience tells them that this objective can be achieved without taking tough courses or working hard.²⁰ They do not know whether the successful adults they see in their community took rigorous courses and studied hard in high school. They may, however, know more about older siblings and other recent graduates. What lessons would they draw from observing their success in the labor market? As we saw above they will observe almost no relationship between academic achievement of their older siblings/friends and the quality of their jobs. So it would be reasonable for youngsters to conclude that while credentials are rewarded by employers, learning is not. If that is the conclusion they draw, the best strategy for the bulk of students is to study just hard enough to get the diploma and be admitted to college, but no harder. One student put it succinctly: "Why should I do the extra work, if I don't have to."²¹

II. POLICY RESPONSES TO LOW STANDARDS AND STUDENT'S "DOING THE MINIMUM"

State level political and educational leaders have been concerned about the low standards and weak incentives for hard study for decades. The traditional policy instruments—budgetary support for schools and school construction, teacher certification rules, etc.—did not address learning standards, so other instruments were sought. Five different strategies have been pursued.

1. Increased Graduation Requirements: During the past two decades many states have increased the number of core academic courses students must take to graduate. This has increased enrollment in college preparatory mathematics and science classes, but it can not assure that these courses are challenging or that students work up to their potential. It may also have the unintended consequence of inducing some students to drop out of high school altogether. The next four strategies will be collectively referred to as Standards-Based Reform strategies.

2. Achievement Tests, School Report Cards and Stakes for Teachers and Administrators: Another approach has been to develop content standards for required core academic courses, administer tests assessing that content to **all** students across the entire state and then publish the results--district by district and school by school. Thirty-seven states now publish school report cards for all or almost all of their schools.²² The hope is that publicly identifying low performing schools will spur administrators and school boards to take remedial action. Nineteen states have special assistance programs to help failing schools turn themselves around. If improvements are not forthcoming, eleven states have the power to either close down, take over or reconstitute failing schools. Positive reinforcements are also being tried. Nineteen states have a formal mechanism for rewarding schools either for year-to-year gains in achievement test scores or for exceeding student achievement targets.²³

3. Minimum Competency Exam Graduation Requirements: A growing number of states are applying stakes to students as well as to teachers. In 1996, seventeen states and a number of urban districts were awarding high school diplomas only to students who had passed a minimum competency exam. Table 1 presents 1980-82 and 1992 data from a survey of principals on the proportion of high school students who faced such a requirement. MCE graduation requirements were occasionally introduced by school districts, but in most cases by state legislatures, often in response to a popular perception that the state's K-12 education system had failed. Generally speaking it has been southern states and states with large urban

populations that have established MCEs. That is why students from low socio-economic backgrounds and students with low test scores are more likely to attend schools with MCEs.

**Table 1:
High Schools Requiring Passage of a Minimum Competency Exam to Graduate:
Proportion of Seniors Who Attend**

<i>Socio-Economic Status</i>		<i>Low</i>	<i>Medium</i>	<i>High</i>
	1980-2	.560	.503	.487
	1992	.647	.557	.442
<i>Reading & Math Scores</i>		<i>Low</i>	<i>Medium</i>	<i>High</i>
	1980-2	.547	.515	.466
	1992	.643	.565	.457

Source: Tabulations of HSB and NELS-88 principal survey responses weighted by the number of students sampled at the high school. Both surveys over sampled schools with large minority populations.

MCEs raise standards, but not for everyone.²⁴ The standards set by the teachers of honors classes and advanced college prep classes are not changed by an MCE. Students in these classes pass the MCE on the first try without special preparation. Often high school transcripts report only who has passed the MCE, not how far above the passing standard the student got. The higher standards are experienced by the students who are in the school's least challenging courses. Students pursuing the "Do the Minimum" strategy are told "you must work harder" if you are to get the diploma and go to college. School administrators will not want to be embarrassed by high failure rates, so they are likely to focus additional energy and resources on raising standards in the early grades and improving the instruction received by struggling students. In most states science, history and civics/government are not covered by the MCE, so their impact on achievement in these subjects is indirect. Presumably they raise achievement in reading, writing and mathematics and this then helps students do better in history and science classes and on tests covering these subjects.

MCEs typically set a pretty low minimum standard. In 1996 only 4 of the 17 states with MCEs targeted their graduation exams at a 10th grade proficiency level or higher. Failure rates for students taking the test for the first time varied a great deal: from a high of 46% in Texas, 34% in Virginia, 30% in Tennessee and 27% in New Jersey to a low of 7% for Mississippi.

However, since students can take the tests multiple times, eventual pass rates for the Class of 1995 were much higher: 98% in Louisiana, Maryland, New York, North Carolina and Ohio; 96 % in Nevada and New Jersey, 91% in Texas and 83% in Georgia.²⁵ Since the tests are designed to determine who falls below a pretty low standard, they typically do not assess material that college bound students study in 10th and 11th grade (e.g. Algebra II and geometry proofs).

4. Voluntary End-of-Course Examinations—Advanced Placement and End-of-Course Exams in New York, North Carolina and California: End-of-Course Exams (EOCEs) are different from MCEs in that they typically assess more difficult material and are taken by students nearing the end of a specific course or sequence of courses—e.g. Biology, French, American History or Calculus.²⁶ They are very much like the final exams that teachers give at the end of the year. Teachers are inevitably viewed as responsible, at least in part, for how well their class does on the exam. EOCEs signal the student's achievement level in the subject, not just whether the student exceeds or falls below a specific cut point that all high school graduates are required to surpass. Consequently all students, not just those at the bottom of the class, have an incentive to study hard to do well on the exam and, consequently, an EOCE is more likely to improve classroom culture than a MCE.²⁷ The consequence or stakes tend to be different, as well. For voluntary EOCEs, the stakes are typically getting an A rather than a B in a course or getting college credit for a high school course. For MCEs, the stakes are getting a high school diploma. To summarize, compared to MCEs, the standards are higher with voluntary EOCEs and the stakes are lower but they apply pretty much equally to all students in a particular class, though sometimes not to all students in a school.

Advanced Placement Courses and Exams: The number of students taking Advanced Placement (AP) examinations has been growing at a compound annual rate of 9 percent per year. In 1999 686,000 students, about 11 percent of the nation's juniors and seniors, took one or more AP exams.²⁸ Despite this success, however, 44 percent of the high schools do not offer

even one AP course and many others allow only a tiny minority of their students to take these courses.

North Carolina End-of-Course Tests: The Elementary and Secondary Reform Act of 1994 authorized the State Department of Education to develop end-of-course tests for ten core high school subjects. EOC tests were introduced for Algebra 1 and 2, Geometry, Biology, Chemistry, Physics, Physical Science, US History, Social Science and English 1 between 1988 and 1991. Except for a four year interlude in which some tests were made a local option, all students taking these courses were required to take the state tests. Easier versions of these courses not assessed by a state test do not exist, so virtually all North Carolina high school students take at least six of these exams. Test scores are reported separately on the student's transcript. Most teachers have been incorporating EOC exam scores into their course grades and a state law now mandates that, starting in the year 2000, the EOCE test scores must have at least a 25% weight in the final course grade.

California's Golden States Exams: California introduced voluntary EOCEs in Algebra I and Geometry in 1987, U.S. History and Economics in 1990, Biology and Chemistry in 1991, Written Composition in 1996, Government in 1997, Reading/Literature in 1998 and Physics and Spanish in 1999. By 1993 about 31 percent of California high school students were taking the Algebra exam, 20 percent were taking the geometry exam and 14 percent were taking the U.S. History and Biology exams.²⁹ Outstanding achievement on each exam is recognized by the state and appears on the student's transcript but is not part of the grade that the student receives from her teacher. Students who earn high honors, honors or recognition designations on 6 Golden State Exams (GSEs) get a special Golden State Diploma from the state. In 1998 about one percent of the states graduates received such a designation.

Regents Courses and Exams: Begun in the 1860s, New York State's curriculum-based Regents Examination System is the oldest American example of end-of-course

examinations. Sherman Tinkelman, Assistant Commissioner for Examinations and Scholarships described the system in a 1966 report:

The Regents examinations are closely related to the curriculum in New York State. They are, as you can see, inseparably intertwined..... These instruments presuppose and define standards.... They are a strong supervisory and instructional tool--and deliberately so. They are effective in stimulating good teaching and good learning practices.³⁰

They are taken throughout one's high school career. A college bound student taking a full schedule of Regents courses would typically take Regents exams in mathematics and earth science at the end of 9th grade; mathematics, biology and global studies exams at the end of 10th grade; mathematics, chemistry, American history, English and foreign language exams at the end of 11th grade and a physics exam at the end of 12th grade. To accommodate summer school students and courses ending in January, the exams are given three times a year.

These external exams have substantial effects on teachers. Since they grade the Regents exams of the students in their own classes, they can see the kinds of mistakes their students are making and use that information to improve their coverage of the material the following year. Essays are generally graded by more than one teacher and this results in feedback and discussions among colleagues that are an excellent professional development experience for most participants. The exams also provide a benchmark against which the teacher, her departmental colleagues and administrators may judge teaching effectiveness. On occasions, examinations have been deliberately revised to induce changes in curriculum and teaching.

For years our foreign language specialists went up and down the State beating the drums for curriculum reform in modern language teaching, for change in emphasis from formal grammar to conversation skills and reading skills. There was not very great impact until we introduced, after notice and with numerous

sample exercises, oral comprehension and reading comprehension into our Regents examinations. Promptly thereafter, most schools adopted the new curricular objectives.³¹

Publication of school level results puts administrators under pressure to hire teachers who have deep knowledge of their subject and to introduce whole school reform programs that upgrade instruction in the early grades.

For students the stakes attached to Regents exams were pretty low. Each district decides whether Regents exam grades are to be a part of the course grade and how much weight to assign to them. While almost all districts count Regents exam results as a final exam grade, teachers or departments generally give their own final as well so when grades on finals are averaged in with quarterly marking period grades Regents exam scores seldom account for more than an eighth of the student's final grade in a course. Eligibility for a "Regents" as opposed to a local diploma depends on passing the Regents exams but the benefits of getting a "Regents" diploma are small. While Regents exam grades appear on high school transcripts, college admissions decisions depend on grades and SAT scores, not Regents exam scores or Regents diplomas.³² Many students saw an advantage in taking easier "local" classes to enhance their GPA's.

AP and Regents exams raise standards through a variety of mechanisms. First, in the classes in which they are used, they push up teaching standards and help motivate students to study and to cooperate with each other. Students are no longer competing for a limited number of As and Bs. Now it is possible for everyone in the class to be recognized for excellence in the subject. Secondly, the external exam creates a signal of competence that colleges use in making admissions and placement decisions and this increases the rewards for learning and makes them more visible and immediate. This also increases student motivation. Thirdly, the honors and college credits that are awarded to those who demonstrate and signal their achievement attract students into the more challenging and demanding courses that prepare

them for these examinations. In many districts, this effect operates as far back as sixth grade where decisions about whether to accelerate in mathematics effectively determine whether a student can take AP calculus in his senior year. Fourthly, the share of students taking the externally examined courses and the results of those exams effect the community's perception of school quality and of the performance of the school district's teachers and administrators. Property values respond to these perceptions. School administrators will thus face strong incentives to focus on the school's core academic mission.

The power of these incentives depends, of course, on the share of students taking externally examined courses. Unfortunately, during the 1980s and early 1990s many students were not taking Regents courses and exams. In 1992 the most popular exam, Course I Mathematics, was taken by 62 percent of students, the Global Studies exam was taken by 57 percent of students and the English and Biology exams were taken by 50 percent of students. Only 38 percent of graduates earned Regent's diplomas signifying completion of a sequence of Regents courses in 1992/3.³³ New York State dealt with this problem by creating and expanding a system of Regents Competency Tests (RCTs) in reading, writing, math, science, global studies and U.S. history that set a minimum standard for those not taking Regents courses.

5. Compulsory End-of-Course Examinations: The RCTs were pretty low level tests, however. The mathematics RCT, for example, assumed no exposure to algebra or geometry. Concern grew that large numbers of students particularly in New York City were wasting their time in watered down courses. Ramon Cortines, Chancellor of New York City School System, for example, declared:

The easy way out is the road to nowhere. If achievement in our schools is to improve, we must raise our expectations for students and staff. Our system will fail in its obligation to this community unless we equalize educational opportunity and raise standards in all of our schools.³⁴

Under Cortines leadership the New York City Board of Education decided that starting with those entering 9th grade in the fall of 1994, all students would have to take 3 Regents level math and 3 Regents level science courses before graduating. With this step, New York City was abolishing the bottom track. Students were taught much more demanding material, but they did not have to pass the Regents exams to get credit for the course. That was their teacher's decision.

Two years later the State Board of Regents decided to raise the bar for the entire state. Students would not only be required to take Regents level courses, they would have to pass the Regents exams for these courses. Specifically, students entering 9th grade in 1996 or later were required to take a new six hour Regents English examination and pass it at the 55% level. The class of 2001 has the additional requirement of passing an examination in algebra and geometry. The class of 2002 must also pass Regents examinations in global studies and American history as well. When laboratory science exams come on stream, the phase in of all five new required Regents exams will be completed with the graduating class of 2003. While passing cut scores were lowered by 10 points, the content of the exams was not watered down.³⁵ The one-half of New York students who had been getting through high school taking unchallenging local courses will now be forced to demonstrate a level of mastery in the five core subjects that is pretty close to the minimum standard that had in the past applied to college preparatory classes. Supporting changes were also made in the elementary school curriculum.

The anticipated shift to an all Regents curriculum appears to have induced many districts to expand enrollment in Regents courses by students who will graduate before the graduation requirements kick in. The percentage of the state's high school students who took and passed Regents English (at the 65% level) rose from 42 percent in 1993 to 58 percent in 1997. During that four year interval, the share taking and passing Regents exams rose from 40 to 47 percent in Biology, from 52 to 59 percent in Course I Mathematics and from 40 to 49 percent in U.S. History.

While New York State has the most comprehensive system of end-of-course exams, a number of other states appear to be shifting toward end-of-course examinations. North Carolina has had end-of-course exams since 1988-91. California, Texas, Maryland, Mississippi, Oklahoma, Arkansas, Tennessee and Virginia are phasing in compulsory end-of-course exams in key subjects. In Maryland, Tennessee and Virginia there are plans for the EOCEs to eventually replace the state's MCE. Texas appears to be evolving its MCE system into MCE/end-of-course examination hybrid system.

What have been the effects of the standards based reforms and increased high school graduation standards? Section 3 examines effects on drop out rates and high school graduation rates. Section 4 examines effects on achievement in core academic subjects in 4th grade, 8th grade and at the end of high school. Section 5 examines their effects on college attendance rates of students. Section 6 examines effects on early labor market experiences of students.

III. IMPACTS OF HIGHER STANDARDS ON DROP OUT RATES AND GRADUATION RATES.

Effects of Graduation Requirements: Theory predicts that an increase in the number of courses required to graduate is likely to induce some students to give up on getting a diploma and drop out of high school.³⁶ Look at the situation faced students who have failed a number of courses and have therefore accumulated only 8 Carnegie units by the end of their sophomore year. If the state requires 16 Carnegie units to graduate (as Illinois did in 1992), getting a high school diploma looks feasible. If, by contrast, the state requires 23 Carnegie units to graduate (as Louisiana and District of Columbia did in 1992), getting a diploma starts looking very difficult. Reduced enrollment rates and graduation rates are likely to result.³⁷ Therefore:

H1—Enrollment rates and graduation rates will be lower in states with higher Carnegie unit graduation requirements.

Effects of MCEs on Dropout Rates: Minimum competency exams are different from Carnegie unit graduation requirements and, consequently, may have different effects. In our view, failing an MCE test the first or second time it's taken is only rarely going to lead the student to 'give up' and drop out. People tend to attribute bad outcomes to external factors, bad luck and other temporary circumstances (I was feeling sick, the test didn't cover the material I studied or I didn't try) rather than to their innate ability.³⁸ As a result, they are likely to be optimistic about their chances of passing the next time. Only 4.3 percent of the 10th graders in New York, New Jersey and Ohio who were questioned after failing an MCE expressed a fear that they would not graduate. Most reacted by "studying harder next year" (24%), taking summer school courses (29%), repeating the same course next year (24%), taking a special course the next year (9%) and/or getting tutoring help (30%).³⁹ In fact, incentives to stay in school to get the diploma will rise if the MCE signal makes academic achievement and/or the diploma more valuable in the labor market. Consequently, we will test for effects on dropout rates and enrollment rates without specifying a direction.

Hypothesis 2A—Enrollment rates and dropout rates will be different at schools/in states with MCEs.

Hypothesis 2B—Any negative effect of MCE's on enrollment rates will be confined to the students with below average 8th grade GPA's.

Effects of MCEs on Graduation Rates: Conventional wisdom predicts that a minimum competency exam will cause graduation rates to fall. But this too is not necessarily the case. Economic theory makes an unambiguous prediction of lower graduation rates only for the case where the rewards for getting a diploma and for effective teaching are unaffected by establishing a MCE. This, however, is not likely to be the case. Minimum competency exams improve the information content of the diploma signal, so the economic payoffs to getting a diploma, to literacy and to academic achievement are likely to increase, possibly substantially. The publicity that inevitably attends the publication of school results on medium and high stakes tests will

make teachers and administrators more accountable for the achievement of at-risk students. If the returns to greater student effort and to increased focus on teaching at-risk students do not diminish too rapidly, learning might improve so much that graduation rates rise when a MCE is established. The policy debate, however, is dominated by concerns that higher standards will lower graduation rates. Consequently, it is this hypothesis that will be tested. Therefore:

Hypothesis 3A—MCEs will increase the number of students who graduate more than 4 years after completing 8th grade.

Hypothesis 3B—A MCE graduation requirement will increase the likelihood of students getting a GED instead of a diploma. Since getting a GED also involves passing a test, it is not clear which types of students are more likely to be induced to pursue that option by an MCE.

Hypothesis 3C—MCEs will increase the number of students who have not obtained a diploma or GED within 6 years of completing 8th grade.

Hypothesis 3D—Any negative effect of MCE's on high school completion rates will be confined to the students with below average 8th grade GPAs.

Previous Studies: A number of studies have examined the effect of MCEs and Carnegie unit graduation requirements on enrollment and graduation rates. Dean Lillard and Phillip DeCicca found that enrollment rates were reduced by increases in the number of courses necessary to graduate but not by MCEs. Their analyses of the National Educational Longitudinal Survey of 1988 (NELS-88) found that different specifications produced different estimates of their impact on drop out rates. Models that controlled for state fixed effects and examined the effect of introducing a state MCE tended to find no effect.⁴⁰ Two independent sources of data—state aggregate data obtained from the Census Bureau and the National Center of Educational Statistics (NCES), and NELS-88—are analyzed below.

3.1 Cross section of States

State level data on enrollment rates and high school graduation rates for the early 1990s were analyzed. The dependent variables were the 1990 enrollment rate of 17 year olds and the high school graduation ratio (the ratio of the number of high school diplomas awarded in the state to the number of 17 year olds).⁴¹ Data on each state's compulsory education laws and high school graduation requirements—minimum competency exams and the number of Carnegie units required to graduate--were taken from the 1993 issue of the Digest of Educational Statistics and by contacting accountability staff in states with ambiguous data. The control variables characterizing the demographic background of the state's high school age youth were as follows:

- a parents' education index equal to the average of the percent of parents with a high school diploma and the percent of parents with a university degree,
- incidence of poverty for children under 18.
- percent population foreign born.
- percent of public school students African American.
- percent of public school students Hispanic.

The other policy variables included:

- A dummy variable for New York State (testing whether the voluntary Regents Exams have any impacts on dropout rates.)
- A dummy variable for whether 17 year olds are required to be in school by the state's compulsory attendance law.

The results of the regression analysis are presented in Table 2. The estimated effects of each of the state policies are graphed in Figure 1. The statistical significance of the coefficients is indicated by the number of asterisks (***) to the right of the coefficient and above or below the bar. The number of courses required to graduate has significant negative relationship with enrollment rates. Effects appear to be small, however. A four unit increase in requirements

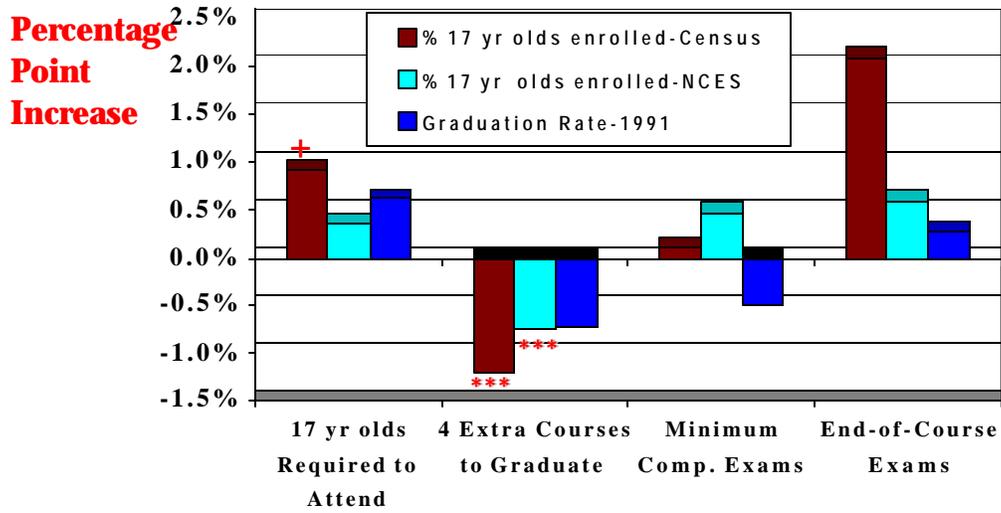
lowers the predicted enrollment rate by 1.2 percentage points in one regression and by .72 percentage points in the other.

School attendance laws may be having an effect, but the effect seems to be small. Point estimates of impact are positive but only in the model predicting enrollment rates in the 1990 Census are they significant at the 10 percent level on a two-tail test.

None of the coefficients on the Minimum Competency Exam variable are significant at even the ten percent level on a one-tail test. The point estimates for the models predicting enrollment rates are, contrary to conventional wisdom, positive. Clearly, there is no evidence in these data that the type of MCEs that existed at the beginning of the 1990s lower aggregate enrollment and graduation rates. New York State's voluntary Regents exams also have no significant effects on dropout rates or graduation rates.

Suicide rates for the 1994-1997 period collected by the Centers for Disease Control were also modeled as function of school policy variables. None of the school policy variables had large or statistically significant effects on suicide rates.

Figure 1-- Effects of State Policies on School Attendance and Graduation Rates



Analysis of state data from Education in States and Nations and the 1990 Census

**Table 2:
Determinants of School Enrollment and High School Graduation Rates**

	Percent of 17 year olds Enrolled in High School		High Sch. Diplomas per 100 17 year olds	Suicides per 100,000 10-19 year olds	Reading 4 th Grade	Mathematics 4 th Grade
	1990 Census	1991 NCES	1991 NCES	1994-97 CDC	1994 NAEP	1992 NAEP
State Minimum Competency Test⁵	.11 (.81)	.47 (.53)	-.50 (2.27)	-.51 (.45)	5.37** (2.41)	2.62* (1.42)
New York State	2.08 (1.90)	.60 (1.24)	.28 (5.35)	-.17 (.07)	8.6* (4.91)	5.93+ (3.92)
Number of Carnegie Units Required to Graduate	-.30*** (.11)	-.183** (.069)	-.179 (.297)	.18 (1.26)	-----	-----
No Carnegie Unit Grad Requirement	-5.13** (2.14)	-3.46** (1.40)	.70 (6.02)	1.32 (.46)	-----	-----
Attendance Required at age 17	.92 (.52)	.36 (.34)	.62 (1.46)	.12 (.16)	-----	-----
Parents Education Index¹	.33*** (.105)	.128* (.069)	.759 (.294)	.21 (1.59)	.12 (.28)	.68*** (.22)
Percent in Poverty (People 18 years or less)	.052 (.076)	-.022 (.049)	-.027 (.212)	-.014 (.30)	-.38* (.21)	-.35* (.18)
Percent Foreign Born³	-.192** (.081)	-.207*** (.053)	-.463** (.228)	-.35*** (2.79)	-.18 (.23)	-.24 (.19)
% of Public School Students Black⁴	-.052* (.028)	-.052*** (.019)	-.158* (.079)	-.045 (1.28)	-.46*** (.09)	-.32*** (.05)
% of Public School Students Hispanic⁴	-.044 (.037)	-.012 (.024)	-.071 (.103)	.075 (1.29)	-.34*** (.11)	-.17* (.09)
Adj R Squared	.5047	.5528	.5322	.2463	.7262	.8414
RMSE	1.636	1.072	4.59	2.23	4.11	3.42
# of Observations	50	50	50	50	38	41
Mean of Dep. Variable	88.9	84.2	76.0	6.94	213.9	217.3

+ Statistically significant at the 10% level one a one tail test

* Statistically significant at 5% level on a one tail test

** Statistically significant at 5% level on a 2 tail test

*** Statistically significant at 1 % level on a 2 tail test

1 Average of the percent of parents obtaining a secondary high school diploma and the percent of parents obtaining a university degree. Education in States and Nations. National Center for Education Statistics. 1991. Pg. 139.

2 Education in States and Nations. National Center for Education Statistics. U.S. Department of Education. 1991. Pgs. 49, 129, 119.

3 1990 Census of Population. Social and Economic Characteristics U.S. Pgs. 174-79.

4 Digest of Education Statistics. National Center for Education Statistics.1993. pgs . 61 & 76.

5 Columns 1, 2 & 3 regressions use a competency exam (MCE) variable for 1991 in which Virginia =0. The MCE96 ariable used in column 4, 5 and 6 adds Ohio and Virginia to the MCE category.

3.2 NELS-88 Analysis of Drop Out Rates and Non Completion of High School

The National Educational Longitudinal Study (NELS-88), is a longitudinal data set that followed a nationally representative sample of 8th graders in 1988 through the year 1994. Questionnaires were completed by the principal of the student's high school in both 1990 and 1992. This questionnaire asked whether students had to pass a minimum competency examination to graduate from high school. The MCE variable used in this paper is the average of the 1990 and 1992 responses to this question. Our estimations include controls for grade point average in 8th grade, 8th grade test scores in English, mathematics, science and social studies, whether they took remedial courses in 8th grade, whether they took advanced courses, TV and homework hours, reading for pleasure, an indicator for being handicapped, socio-economic status of the student's family, logarithm of the number of books in the home, parent involvement index, family size, marital and parental status in 8th grade, locus of control index, self esteem index and hours working for pay during 8th grade (and it's square), an index for smoking in 8th grade, dummies for race, ethnicity and religion, dummies for 3 Census regions and rural, suburban and urban residence and six variables describing the quality of the high school. The variables describing the quality of the student's secondary school were a dummy variable for Catholic school, for secular private schools and for schools formed by non Catholic religious organizations, average teacher salary, percent free lunch, percent students that were white, mean education of parents of students attending the school, mean 8th grade test scores of the high school's students and average enrollment per high school grade (and it's square).⁴²

Logit models were estimated in NELS-88 data predicting whether the student drops out at any time during high school, whether the student obtains a GED certificate and whether the student fails to get either a GED or a high school diploma. Results are presented in Table 3. The approximate effect of X_i (at the mean of the dependent variable) on the probability of not completing high school or attending college can be obtained by multiplying b_i times $P(1-P)$. Let us begin by examining the very large effects of 8th grade GPA and 8th grade test scores on the

probability of graduating. In non-MCE schools, an increase in the GPA from C+ to B+, lowers the probability of dropping out by 6.2 percentage points, lowers the probability of not getting a diploma or a GED by 4 percentage points and lowers the probability of getting a GED by 3.1 percentage points. Given the low incidence of these outcomes in the data set, these are large effects.⁴³

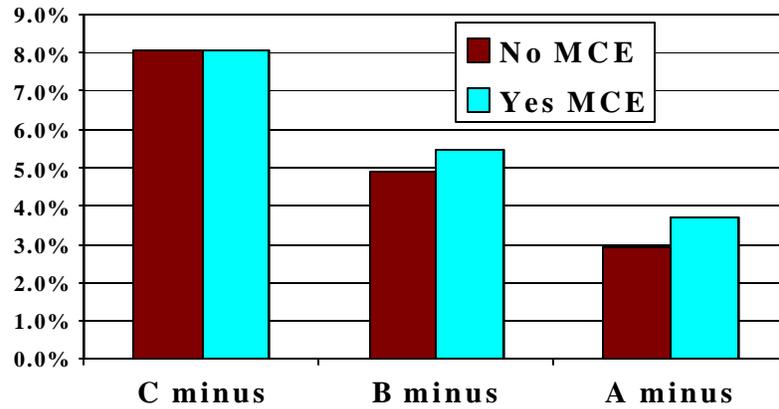
Results for the coefficient of the MCE variable and its interaction with GPA are reported in columns 3 and 4 of Table 3. The major finding is that for students with average grades in 8th grade, the MCE graduation requirement did not have significant effects on dropping out, getting a GED, a delay in getting a high school diploma or failing to get either a GED or diploma. Figure 2 presents the pattern of results for Getting a GED.

Table 3
Effects of Minimum Competency Examinations on
Non-Completion of High School
[Logistic Models with linear interaction]

	P bar	Min. Comp. Exam	MCE* 8 th Gr GPA	8 th Grade GPA	8 th Gr Math Test	8 th Gr English Test	8 th Gr Science Test	8 th Gr Social Studies Test	c2 w. 62 DF/ Nobs
Ever Dropped Out	.133	.033 (.093)	-.078 (.096)	-.54*** (.08)	-.32*** (.06)	.024 (.06)	-.08 (.05)	-.027 (.05)	2817 12,378
Dropout in 1992	.079	.034 (.120)	-.079 (.119)	-.49*** (.093)	-.31*** (.070)	-.051 (.066)	-.090 (.065)	-.020 (.060)	1867 12,337
No Diploma or GED	.092	.094 (.117)	-.301** (.118)	-.48*** (.09)	-.51*** (.07)	-.12* (.07)	-.12** (.07)	-.03 (.07)	2337 12,378
Obtained Diploma Late	.090	.122 (.106)	-.037 (.112)	-.73*** (.09)	-.084 (.064)	.069 (.061)	.006 (.062)	-.006 (.057)	1229 10,995
Obtained Diploma Early	.015	.090 (.213)	-.030 (.233)	.23 (.19)	.067 (.132)	.035 (.130)	-.229* (.131)	-.008 (.123)	1916 12,372
Obtained GED	.049	.113 (.149)	.128 (.148)	-.67*** (.11)	.003 (.078)	.083 (.074)	.025 (.074)	.022 (.079)	644 12,378

Source: Analysis of NELS88. Sample is the 8th graders interviewed in 1988 who were also interviewed in 1994. All models contain a full set of student background variables measured in the 8th grade: family SES, Books in the home, single parent, parents divorced, # of siblings, ethnicity, religion, gender, handicapping condition, test scores, GPA in 8th grade, hours watching TV, hours doing homework, Read for fun index, smoking, dummy for in advanced courses, dummy for taking remedial courses, dummies for 3 Census regions, locus of control index, self esteem index and hours working for pay (plus it's square). The following characteristics of the school the student attended during 10th grade were also controlled: Catholic school, secular private school, private school controlled by a church other than the Catholic church, teacher salary, percent student body white, percent free lunch, mean 8th grade test score, mean family SES and enrollment per grade (plus it's square). The GPA variable ranges from 0 to 4. The 8th grade test scores have been normalized to have a standard deviation of 1. Models were run unweighted. Numbers in parenthesis below the coefficient are standard errors. The approximate effect of X_i (at the mean of the dependent variable) on the probability of not completing high school or attending college can be obtained by multiplying **b**_i times P(1-P). Thus, for "No diploma" the multiplier is .085.

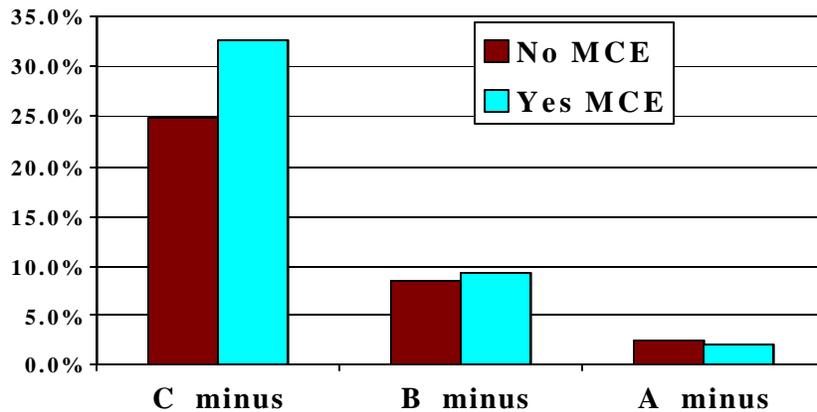
Figure 2—Effect of Minimum Competency Exams on Getting a GED



Source: NELS88—controls for Socio-Economic Status, Grades and test scores in 8th grade & HS characteristics

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Figure 3-- Effect of Minimum Competency Exams on Not Getting a Diploma or GED



Source: NELS88—controls for Socio-Economic Status, Grades and test scores in 8th grade & HS characteristics

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If, however, there is an unobserved school effect that is correlated with the MCE variable, the MCE coefficient will be biased. That is why the coefficient on the interaction variable may be a better test of the basic hypothesis. As long as the unobserved school effect influences high ability students as much as low ability students, the coefficient on the interaction will be unbiased. The GPA*MCE interaction is also not significantly different from zero for “Ever Dropped Out,” “Dropped out in 1992” and for “Delayed Diploma.” The hypothesis of an MCE effect for C- students was also tested and here again there were no significant effects on any of these three outcomes. Clearly Hypotheses 2A, 2B, 3A and 3B are rejected. By contrast, Hypothesis 3C and 3D receive support. For non-completion, there is a statistically significant negative interaction between GPA and MCE. MCEs have a more negative effect on the high school completion rates of low GPA students than of high GPA students. Non-completion rates are significantly higher for C- students when an MCE is present. Figure 3 presents predicted non-completion rates for students with different 8th grade achievement levels by whether their high school has a MCE graduation requirement. Achievement in 8th grade is powerfully related to high school completion rates. When it is low, MCEs have important effects on graduation rates. We estimate that non-completion rates of C- students rise from 24.7 percent when there is no MCE to 32.5 percent when an MCE is present.

Many states have increased their graduation requirements by 3 or 4 Carnegie units over the last few decades. The state cross section regressions imply that these increases in Carnegie unit graduation requirements should have, *ceteris paribus*, decreased enrollment rates of 17 year olds by about one percentage point. Data on trends in dropout rates are presented in Table 4. Despite these policy shifts event drop out rates for African-Americans fell from 10.5 percent in 1972-74 to 5.4 percent in 1990-92 and in 1996-98. Hispanic dropout rates fell from 10.2 percent in 1972-74 to 7.7 percent in 1990-92 and then rose slightly to 8.5 percent in 1996-98. Event dropout rates also fell for whites. Status drop out rates also declined during the period when MCEs were being introduced and graduation requirements were being increased. Clearly, if

tougher graduation standards do tend to increase dropout rates, their effects were counterbalanced by other forces that reduced dropout rates, such as growing incomes, the rising payoff to high school completion and college attendance and the introduction in 18 states of policies that make drivers licenses conditional on regular school attendance.⁴⁴

The decline in dropout rates, however, does not appear to have led to increases in diplomas awarded. In part this is due to students substituting GEDs for high school diplomas. But adding the American Council on Education’s reports of GEDs awarded to youth under age 20 to administrative reports of diplomas awarded by public and private schools does not really change the conclusion. When this sum is divided by the number of 17 year olds (column 10 of Table 4), this ratio is stable in the 1970s and 1980s and declines in the 1990s.⁴⁵ These data are consistent with the hypothesis that rising graduation requirements are lowering graduation rates even while they leave dropout rates unchanged.

Table 4: Trends in Dropout Rates by Ethnicity

	Event Dropout Rate Grades 10-12			Status Dropout Rate-15- 17 yr olds			Status Dropout Rate-18- 24 yr olds			Diploma + GED LT20 / 17 yr old
	White	Black	Hispanic	White	Black	Hispanic	White	Black	Hispanic	Total
1972-74 Avg.	5.80	10.47	10.23	6.83	7.90	---	14.63	25.93	38.83	77.3
1981-83 Avg.	5.07	8.10	9.97	5.70	5.47	10.83	14.53	21.73	35.17	76.6
1990-92 Avg.	3.87	5.40	7.73	4.27	4.90	9.47	13.30	15.67	32.87	77.8
1996-98 Avg.	4.37	5.37	8.47	4.07	4.07	7.17	12.87	16.67	29.63	74.7

Source: Bureau of the Census, Current Population Reports, Tables A-3, A-4 and A-5 and Tables 104 and 107 of Digest of Educational Statistics: 1999. The event dropout rate is the percent of 10-12th grade students in October of one year who are not enrolled in high school or graduated the following October. The status dropout rate is the percent of 15-17 and 18-24 year olds in the civilian non-institutionalized population who have not graduated from high school and are not attending high school currently. The 10th column is the ratio of the sum of the three-year average of (the number of high school diplomas awarded plus the number of GEDs awarded to people under 20 years of age) to the number of resident 17 year olds for that year. Changes in CPS interviewing and editing procedures may make data on event dropout rates in the late 1990s inconsistent with previous data.

IV. Effects of Standards Based Reforms on Student Achievement

Previous Studies: Past studies of the effects of statewide testing tied to curriculum frameworks with stakes attached to school results and/or minimum competency tests for graduating have found positive effects on student achievement. Lerner and New Jersey Office of Educational Assessment found that test scores of students increased after the introduction of minimum competency exams and that the increases were greatest for minority students, for central city students and for students in the bottom half of the test score distribution.⁴⁶ Mangino and Babcock's study found that test scores of low achieving students had risen the most after the introduction of the Texas Assessment of Basic Skills in the Austin Independent School District. This was particularly true for the items assessing higher level skills.⁴⁷

Norman Fredericksen's study is the most valuable because he had access to confidential data on NAEP test scores of public school students in 1978 and 1986 together with the location of the school they were attending. This enabled him to classify NAEP test takers in 1978 and 1986 by whether they lived in a state with high stakes testing, moderate stakes testing or no or low stakes testing in 1986. His 1978 base year was prior to the introduction of minimum competency testing systems. Student data for both 1978 and 1986 were available for 27 states. The "High Stakes" category was composed of states that "we judged, had not only mandated the use of MCTs [minimum competency tests]; they also required school officials and teachers to set standards in terms of MCT scores for granting diplomas and promoting students to the next grade." Ten of the 27 states were considered to have a "High Stakes" testing system. The "Moderate Stakes" states had MCTs but "professed to use the MCTs for such purposes as monitoring student performance, remediation of simple faults, or coaching those students who badly need assistance." Seven states were placed in the moderate stakes category. The remaining 11 states were placed in the low stakes category. Three states had no MCTs. None of the others "mandated the use of MCT scores for any specific purpose....Some states allowed local options regarding the use of MCTs by county, by district or by individual school."

Fredericksen selected NAEP mathematics items that had been administered in both years and classified them into routine items (generally simple computation) and non-routine items (assessing higher order thinking skills). Using a difference of differences methodology, he compared the 1978 to 1986 change in percent correct for high stakes states to the change in percent correct for low stakes states. Since stakes applied to promotion decisions as well as to graduation and to schools as well as to individual students, he studied all three of the age groups assessed by NAEP. He found that 1978 to 1986 gains in percent correct for routine items were 7.9 percentage points for 9 year olds (3.1 points for 13 year olds and .6 points for 17 year olds) higher in high stakes states than in low stakes states. On non-routine items the high stakes state advantage was 4.5 points for 9 year olds, 4.6 points for 13 year olds and 1.9 points for 17 year olds. With the exception of the routine items given to 17 year olds, these are very substantial differentials. Except in primary school the response appears to be greater for test items assessing higher level skills than for simpler test questions.⁴⁸

Now let us examine the new evidence we have assembled on the effects of the standards-based reform strategies discussed in Section 2. Two different data sets were analyzed: (1) Cross-sections of state mean NAEP 4th and 8th grade test scores in reading, mathematics and science in 1992, 1994, 1996 and 1998 and (2) NELS-88 data on test score gains from 8th grade to 12th grade for individual students. The first data set allows us to look at the effects of various standards based reform initiatives on the achievement of primary school and middle school children. The second data set allows us to look at the effect of minimum competency exams on learning gains after 8th grade and to disaggregate the analysis by the student's 8th grade GPA.

4.1 Cross section of States

The analysis of state cross-section data provides estimates of the consequences for statewide student achievement of six different but complementary standards based reform strategies:

1. Minimum competency exams

2. Voluntary end-of-course exams combined with minimum competency exams—i.e. the New York/North Carolina stakes for students policy mix during the middle of the 1990s⁴⁹
3. School by school reporting of the results of statewide testing
4. Rewards for schools that improve on statewide tests or exceed targets set for them
5. Sanctions for failing schools—closure, reconstitution, loss of accreditation etc.
6. Assistance programs for low performing schools

The dependent variables are state level means for 4th and 8th grade NAEP tests in 1992, 1994, 1996 and 1998 in reading, mathematics and science. The models estimated all have updated versions of the same six demographic controls—the parental education index, poverty rate for children, percent of public school students who are African-American in 199x, percent who are Hispanic in 199x and percent who are Asian in 199x—as our earlier analysis of enrollment rates and graduation rates.⁵⁰ We begin by focusing on the effects of the two policy options that raise the stakes for students: minimum competency exams and end-of-course exams. Since only two states, New York and North Carolina, had a comprehensive system of end-of-course exams during this period, the EOCE variable is a dummy that equals 1 for New York and North Carolina and a zero otherwise. At the beginning of the decade the Regents exams were voluntary and the North Carolina EOCEs had been in place for only a year or so. As the end of the decade approached, the New York students taking NAEP tests were facing the prospect of being compelled to take the Regents exams in high school and to pass five of them in order to graduate. The MCE variable is a 1 for states that had or were phasing in a minimum competency exam graduation requirement (i.e. students are actually taking pilot tests even if stakes are not yet being applied) and the students taking the NAEP test were subject to the MCE requirement. For regressions predicting 1996 and 1998 NAEP test scores, the MCE variable was set equal to 1 for Alabama, Florida, Georgia, Louisiana, Maryland, Nevada, New Jersey, New Mexico, Ohio, South Carolina, Tennessee, Texas and Virginia. Note that New York and

North Carolina are coded as zero on the MCE variable, so the coefficient on the EOCE variable measures the combined effects of an EOCE and a MCE.

The results are presented in Table 5. The estimated effect of living in a state with a MCE is given in column 1. The estimated effect of living in a state with a hybrid end-of-course/minimum competency exam system is given in column 3. The statistical significance of each coefficient is indicated by the number of asterisks (***) to its right. A single * means the coefficient has the predicted sign and is significant at the 5 percent level on a one tail test. A "+" indicates the coefficient has the predicted sign and is significant at the 10 percent level on a one tail test. Coefficient standard errors appear in columns 2 and 4 and adjusted R squares in column 7. Root mean square errors (RMSE), a measure of the accuracy with which the regression predicts actual values of the dependent variable, is found in column 8.

The strongest results are for the New York/North Carolina policy mix, a hybrid MCE/end-of-course exam system. The coefficient on the EOCE indicator variable is positive, large and statistically significant in the models predicting reading, mathematics and science achievement in 1994, 1996 and 1998. On the NAEP reading and math tests a grade level equivalent (GLE) is about 11.5 points. Thus going to school in New York or North Carolina is estimated to raise 4th grade math achievement by three-quarters of a grade level equivalent and 4th and 8th grade reading achievement by roughly two-thirds of a GLE. Science and mathematics achievement of 8th graders is roughly half a grade level equivalent higher. Looking over time the effect of attending school in an EOCE/MCE state grew substantially. This is what one would predict would occur as North Carolina teachers adjust to the introduction of EOCEs and New York teachers start responding to their voluntary EOCE system becoming compulsory.⁵¹

The estimated effects of minimum competency exams are also positive but smaller. Eleven of the 17 MCE coefficients in the table are positive and significant at the 10 percent level on a one-tail test. Our point estimates imply that 4th graders in MCE states are 30 to 40 percent of a GLE ahead of students in non-MCE states. Eighth graders are 12 percent of a GLE ahead in reading and about 24 percent of a GLE ahead in math and science.

Table 5
The Effects of Minimum Competency Exams and NYS Regents Exams on Reading and Mathematics Achievement in 4th and 8th Grade

	Minimum Comp Exam		EOCE/MCE New York and North Carolina		Poverty & Par. Educ	Af.Am, Hisp F Born	Adj R Square	RMSE	# of Obs
	Coef	StdEr	Coef	StdEr					
<u>Reading -8th Gd--1998</u>									
Overall Average	1.39	1.76	7.74***	2.46	x	x	.731	2.98	35
HS Dropout Parents	5.66*	3.07	8.83**	4.3	x	x	.217	5.21	35
HS Grad Parents	- .47	1.97	3.6	2.76	x	x	.586	3.34	35
Some College Parents	1.45	1.93	5.71**	2.7	x	x	.425	3.27	35
College Grad Parents	1.61	2.22	8.07**	3.11	x	x	.601	3.77	35
<u>Reading-4th grade</u>									
Overall Avg. in 1998	3.35+	2.24	9.9*	5.7	x	x	.686	4.91	39
Overall Avg. in 1994	4.64*	2.35	7.35**	3.17	x	x	.761	3.83	38
Overall Avg. in 1992	3.64**	1.43	4.53*	2.37	x	x	.874	3.04	34
<u>Math -8th grade--1996</u>									
Overall Average	2.71+	1.78	5.56*	2.93	x	x	.879	3.77	40
HS Dropout Parents	2.55	2.13	5.81+	3.5	x	x	.659	4.50	39
HS Grad Parents	1.09	2.19	5.61+	3.59	x	x	.816	4.62	40
Some College Parents	2.89+	1.96	3.37	3.22	x	x	.796	4.14	40
College Grad Parents	2.76+	1.74	5.16*	2.86	x	x	.876	3.68	40
1996 4 th grade Math	4.18**	1.88	9.7*	5.10	x	x	.728	4.45	43
1992 8 th grade Math	2.94*	1.53	2.67	2.83	x	x	.875	3.65	41
1992 4 th grade Math	3.24**	1.43	2.54	2.65	x	x	.842	3.42	41
<u>Science-8th grade-1996</u>	2.51+	1.50	5.7+	3.9	x	x	.893	3.24	39

- *** Statistically significant at 1% level on a 2 tail test
- ** Statistically significant at 5% level on a 2 tail test
- * Statistically significant at 5% level on a 1 tail test
- + Statistically significant at 10% level on a 1 tail test

Source: Authors analysis of NCES data from state NAEP studies in 1998, 1996, 1994 and 1992, The Reading Report Card and the Mathematics Report Card. A one grade level equivalent (GLE) test score differential is about 11 .5 points on both the reading and mathematics tests. In all models New York State and North Carolina were coded as EOCE/MCE and Alabama, Florida, Georgia, Louisiana, Maryland, Nevada, New Jersey, New Mexico, North Carolina, South Carolina, Tennessee, Texas and Virginia were coded as a 1 on the MCE variable. Ohio was introducing an MCE during this period so it was coded as a zero when 1992 test scores were predicted and as a 1 when 1996 and 1998 test scores were predicted. All of the regressions controlled for the following demographic characteristics of the state's students: the incidence of poverty for children under 18 (averaged from 1990 to the date of the dependent variable), the percent of population foreign born, the percent of 199x public school students African American, the percent of 199x public school students Hispanic, the percent of 199x public school students Asian and a parents education index. The Education Index was defined as the average of the percent of parents with a secondary high school diploma and the percent of parents with a 4 year college degree. Hawaii was not included in the analysis because we could not control for the effects of Pacific Islander ethnicity. The majority of Hawaiian students are Pacific Islanders and these students do significantly less well on NAEP tests than local Whites and Asians. RMSE stands for root mean square error or alternatively the standard error of the estimate.

MCE effects appear to be larger and more significant for 4th graders than for 8th graders. This pattern of larger effects for younger students suggests that the MCE variable may be proxying for other correlated features of the policy environment. And indeed SBR policies do tend to cluster. Table 6 presents a matrix of the correlations among our five SBR policy indicators. States that have MCE exams tend to also have well developed school report card systems. They are also more likely to reward schools that have improved significantly or exceeded achievement targets, to provide assistance to schools that are failing and to sanction failing schools that do not improve. Fifteen of the 16 states with MCEs either reward successful schools or sanction failing schools. Nine of the MCE states do both. Those nine states are: Georgia, Louisiana, Mississippi, New Jersey, New Mexico, North Carolina, South Carolina, Tennessee and Texas. Only 6 of the 34 non-MCE states do both. Nineteen of the non-MCE states have not adopted any of the school oriented SBR initiatives except for school report cards. These states tend to be small, middle class and largely white. Their students tend to score above the national average on nationally

Table 6
Correlations between State Standards-Based Reform Strategies

	Minimum Competency Exam	School Report Cards	Rewards for Successful Schools	Penalties for Failing Schools	Assistance for Failing Schools	Rewards + Penalties Index
Minimum Competency Exam in 1996	1.00	.271	.448	.411	.316	.554
School Report Cards	.300	1.00	.442	.356	.575	.414
Rewards for Successful schools	.333	.278	1.00	.205	.169	.668
Penalties for Failing schools	.544	.457	.429	1.00	.709	.839
Assistance for low performing schools	---	---	---	---	1.00	.605
Rewards + Penalties Index	.526	.442	.822	.867	---	1.00

Numbers below the diagonal are the correlations between averages of 0-1 indicator variables reported in Quality Counts for January 1997 and January 1998. Numbers above the diagonal are for policy intensity variables constructed from the detailed description of accountability systems in the January 2000 Quality Counts. The

minimum competency exam variable is a 0-1 variable that counts New York State as a MCE state. Hawaii is excluded. Information on the policies of the District of Columbia was obtained by interviewing the Washington Post reporters who cover DC schools.

normed tests, so state politicians probably do not feel the same need to impose a state accountability system intended to push reluctant local school administrators to raise standards. Most of these states have also not felt the need to identify a group of low performing schools and then provide special assistance to help these schools turn themselves around.

School focused SBR strategies tend to cluster together as well. States that sanction failing schools are much more likely to have programs that assist failing schools to get better. States that sanction failing schools are also more likely to reward successful schools.

What are the impacts of school focused SBR strategies—school report cards, rewards for success and sanctions for failure--on student achievement? Information on which states were pursuing these SBR strategies was taken from the 1997 and 1998 Quality Counts special issue of Education Week. Because the information on SBR reform initiatives was only available for the late 1990s, we ran regressions predicting mathematics and science achievement in 1996 and 4th and 8th grade reading achievement in 1998. As a first step, each policy variable was entered alone into the standard specification in which NAEP test scores are predicted by a parental education index, the poverty rate, percent African-American, percent Hispanic and percent foreign born.

The results are presented in Table 7. School report cards and other public reporting strategies appear not to have significant or consistent effects on the NAEP test scores. SBR strategies that involve rewards and consequence for schools, by contrast, do appear to have positive effects. Students in states pursuing the rewards strategy are significantly better in math and reading in 4th grade. Students in states pursuing the consequence strategy are significantly better in math and reading in 4th grade and also better in math and science in 8th grade. Point estimates of the differences between states with and without these strategies tend to be less

than a quarter of a GLE for 8th grade achievement levels and a half a GLE for 4th grade reading achievement.

Table 7
The Effects of Stakes for Teachers and Students on
Reading and Mathematics Achievement in 4th and 8th Grade

	Stakes for Schools & Teachers		Minimum Comp Exam		EOCE/MCE New York and North Carolina		Adj R Square	RMSE	# of Obs
	Coef	StdEr	Coef	StdEr	Coef	StdEr			
Public Reports									
Reading-1998--4 th grade	2.83	3.64					.673	5.07	39
Reading-1998--8 th grade	4.92+	2.93					.673	3.29	35
Math- 1996---4 th grade	.36	2.38					.689	4.76	43
Math-1996--8 th grade	-2.43	2.02					.863	4.01	40
Science-1996--8 th grade	-1.26	1.63					.893	3.24	40
Rewards									
Reading-1998--4 th grade	6.21**	2.44					.724	4.66	39
Reading-1998--8 th grade	2.37	1.79					.661	3.35	35
Math- 1996---4 th grade	3.41**	1.62					.724	4.48	43
Math-1996--8 th grade	1.86	1.57					.863	4.01	40
Science-1996--8 th grade	1.16	1.26					.894	3.23	40
Consequences									
Reading-1998--4 th grade	5.75***	2.06					.734	4.58	39
Reading-1998--8 th grade	2.17	1.80					.657	3.37	35
Math- 1996---4 th grade	3.86**	1.61					.733	4.41	43
Math-1996--8 th grade	2.55+	1.56					.868	3.94	40
Science-1996--8 th grade	3.07**	1.17					.910	2.97	40
Rewards + Consequences									
Reading-1998--4 th grade	4.56***	1.30					.762	4.33	39
Reading-1998--8 th grade	1.79+	1.11					.671	3.30	35
Math- 1996---4 th grade	2.70***	.95					.747	4.29	43
Math-1996--8 th grade	1.76*	.97					.870	3.91	40
Science-1996--8 th grade	1.68**	.76					.905	3.04	40
Reading-1998--4 th grade	4.07***	1.32	1.86	2.09	6.28*	3.34	.774	4.22	39
Reading-1998--8 th grade	1.60+	1.00	.99	1.76	7.23***	2.49	.748	2.94	35
Math- 1996---4 th grade	2.44**	.90	3.00*	1.78	8.63***	3.09	.789	3.93	43
Math-1996--8 th grade	1.61+	.96	2.17	1.84	5.77*	2.97	.879	3.77	40
Science-1996--8 th grade	1.52**	.72	2.21+	1.39	5.21**	2.24	.917	2.85	40

- *** Statistically significant at 1% level on a 2 tail test
- ** Statistically significant at 5% level on 2 tail test
- * Statistically significant at 5% level on a 1 tail test
- + Statistically significant at 10% level on a one tail test

Source: Authors analysis of NCES data from the NAEP Reading, Mathematics and Science Report Cards in 1996 and 1998. In the Math96 and Science96 regressions the indicators of state policy came from the January 1997 Quality Counts published by Education Week. Their primary source was "Bending without Breaking" a 1996 publication of the Education Commission of the States. For the reading in 1998 regressions the policy indicators in the 1997 and 1998 Quality Counts issue were averaged. The Reward + Consequences variable in the bottom two panels are the sum of the Reward dummy and the Consequences Dummy. All of the regressions controlled for the following demographic characteristics of the state's students: the incidence of poverty for children under 18 (averaged from 1990 to 1996), the percent of 1990 population foreign born, the percent of 1996 public school students African American, the percent of 1996 public school students Hispanic, the percent of 1996 public school students Asian and a parents education index. The Education Index was defined as the average of the percent of 1990 parents who have a secondary high school diploma and the percent of parents who have a university degree. Hawaii was not included in the analysis because we could not control for the effects of Pacific Islander ethnicity.

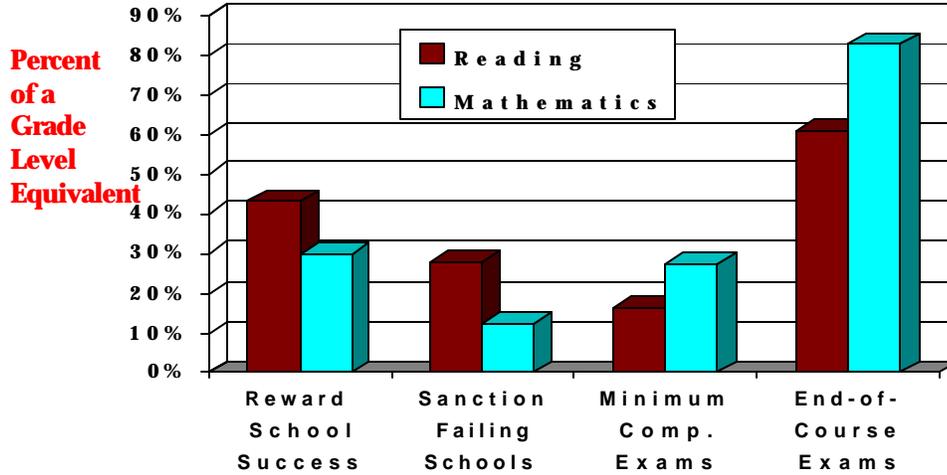
About half of Hawaiian students say they are Pacific Islanders and these students do significantly less well on NAEP tests than local Whites and Asians. The EOCE/MCE variable is a dummy =1 for New York and North Carolina.

When all three SBR policy indicators were entered simultaneously, the rewards and consequences variables continued to have positive effects, but the school report card variable became unstable and lost significance. We, therefore, dropped public reporting from future specifications of the model.

The coefficients on the rewards and consequence indicators were not significantly different from each other, so we imposed the assumption that they are in fact equal and used a sum of the two variables in our preferred specifications in the fourth and fifth panels of the table. In these models, the rewards + consequences SBR variable is a significant predictor of all five test scores. Adding indicator variables for minimum competency exams and for the EOCE/MCE policy mix has almost no effect on the estimated effect of school rewards and consequences on test scores.

We also estimated models that freely estimated the separate effect of each policy: Rewards, Consequences, Minimum competency exams and Hybrid End-of-course/MCE exams. These results of these estimations are graphed in Figures 4 and 5. An examination of these figures reveals that states that have implemented both policies--rewards for success and sanctions for failure--have 4th grade reading scores that are about three-quarters of a GLE greater than demographically similar states that have implemented neither policy and 4th grade math scores about 40 percent of a GLE greater. Their 8th grade test scores are between a quarter and a third of a GLE greater.⁵²

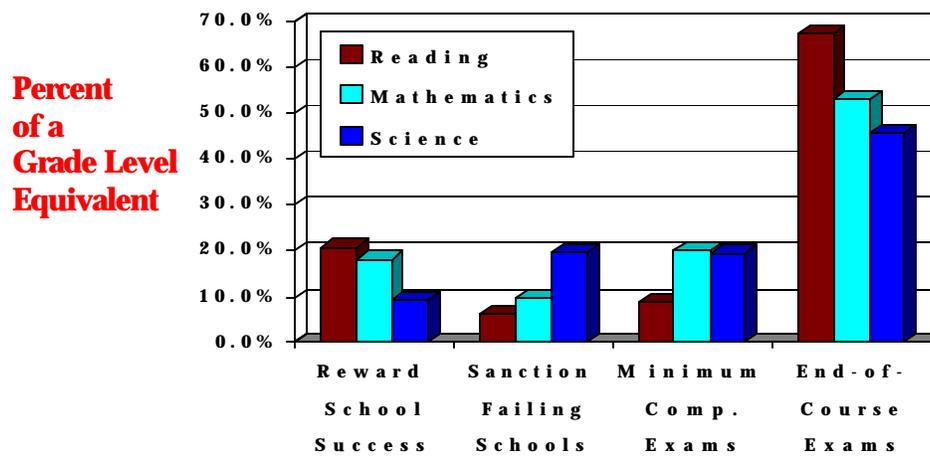
Fig. 4-- Effects of Standards-Based Reform Initiatives on 4th Grade Reading & Math Ability



Education Commission of the States was the source of information on state policies

Cornell University, School of Industrial and Labor Relations

Figure 5-- Effects of Standards-Based Reform Initiatives on NAEP 8th Grade Test Scores



Education Commission of the States was the source of information on state policies

Cornell University, School of Industrial and Labor Relations

Do scaled measures of SBR initiatives improve our ability to predict student achievement? The rewards programs, assistance programs and sanctions programs implemented by various states differ dramatically. Some target many schools, others just a few. Some are well funded, others are not. Some are effective, others are probably ineffective. Why not construct policy intensity scales that distinguish 'effective' SBR programs from 'ineffective' SBR programs and then enter the intensity variables into our cross-state regressions? The problem with this research strategy is that all of the people who know enough about state SBR initiatives to construct such scales also know which states have had the most success in improving student achievement. Inevitably the numeric values they would assign to a state's SBR initiative would be influenced by that knowledge. The scales would not have been defined on an a priori basis and, as a result, tests of the effect of the SBR initiative scales would be invalid. Our solution to this problem was (1) to assign the task of developing SBR intensity indexes to a member of our team who was unfamiliar with which states have raised test scores the most and (2) to construct the indexes by applying a formula to the published indicators of state SBR initiatives published in Quality Counts in January 2000. Four indexes were created: a school report card index, a rewards for improving index, a sanctions for failure index and an index of assistance for low performing schools index. The results of the analysis are reported in Table 8. Clearly our effort was a failure. None of the SBR indexes we created are good predictors of student achievement. Why did the simpler dummy variable specifications do so much better? The dummy variables described the policy environment in 1996 and 1997; while the indexes characterized it in 1999. Policies have been changing. As a result, the correlation between the 1996/7 dummy variables and the 1999 indexes are not high.⁵³ Since we were predicting 1996 and 1998 test scores, the dummy variables did a better job.

Table 8
The Effects of Stakes for Teachers and Students on
Reading and Mathematics Achievement in 4th and 8th Grade

	Stakes for Schools & Teachers		Minimum Comp Exam		EOCE/MCE New York and North Carolina		Adj R Square	RMSE	# of Obs
	Coef	StdEr	Coef	StdEr	Coef	StdEr			
Public Reports Index									
Reading-1998--4 th grade	.53	.53					.677	5.04	39
Reading-1998--8 th grade	.17	.38					.641	3.44	35
Math- 1996--4 th grade	.38	.49					.694	4.72	43
Math-1996--8 th grade	-.25	.43					.859	4.08	40
Science-1996--8 th grade	-.36	.34					.894	3.21	40
Rewards Index									
Reading-1998--4 th grade	-.20	1.35					.667	5.12	39
Reading-1998--8 th grade	.35	.92					.641	3.45	35
Math- 1996--4 th grade	1.74+	1.12					.709	4.60	43
Math-1996--8 th grade	.90	1.07					.860	4.06	40
Science-1996--8 th grade	.68	.85					.893	3.24	40
Sanctions Index									
Reading-1998--4 th grade	.79+	.50					.692	4.92	39
Reading-1998--8 th grade	.54+	.34					.670	3.30	35
Math- 1996--4 th grade	.54	.44					.702	4.66	43
Math-1996--8 th grade	.04	.40					.857	4.10	40
Science-1996--8 th grade	-.19	.32					.892	3.25	40
Help Failing Schools Index									
Reading-1998--4 th grade	.48	.41					.681	5.01	39
Reading-1998--8 th grade	.43+	.28					.668	3.31	35
Math- 1996--4 th grade	.67	.79					.695	4.71	43
Math-1996--8 th grade	.39	.73					.858	4.08	40
Science-1996--8 th grade	.00	.59					.891	3.27	40
Reward + Sanctions									
Reading-1998--4 th grade	.48	.41					.681	5.01	39
Reading-1998--8 th grade	.43	.28					.668	3.31	35
Math- 1996--4 th grade	.68*	.34					.721	4.51	43
Math-1996--8 th grade	.19	.32					.858	4.08	40
Science-1996--8 th grade	.00	.26					.891	3.27	40
Reading-1998--4 th grade	.12	.44	3.51+	2.40	7.43*	4.17	.700	4.86	39
Reading-1998--8 th grade	.15	.29	1.06	1.92	6.93**	2.88	.714	3.07	35
Math- 1996--4 th grade	.32	.36	3.50*	2.02	7.67**	3.60	.747	4.29	43
Math-1996--8 th grade	-.10	.34	2.95+	1.97	6.16*	3.34	.868	3.94	40
Science-1996--8 th grade	-.31	.26	3.31**	1.49	6.34**	2.52	.909	2.98	40

- *** Statistically significant at 1% level on a 2 tail test
- ** Statistically significant at 5% level on 2 tail test
- * Statistically significant at 5% level on a 1 tail test
- + Statistically significant at 10% level on a one tail test

Source: Authors analysis of NCES data from the NAEP Reading, Mathematics and Science Report Cards in 1996 and 1998. Indicators of state policy were taken from the January 1999 Quality Counts published by Education Week. The Reward + Sanctions variable in the bottom two panels are the Sanctions Index plus 2 times

the Reward Index. All of the regressions controlled for the following demographic characteristics of the state's students: a parents' education index, an updated child poverty, % African American, % Hispanic and % Asian.

Estimated Effects of EOCEs and MCEs when models include indicators of School-

Based SBR initiatives: Adding the school rewards and consequences variable to the models containing EOCE and MCE variables leaves the coefficient on the end-of-course/MCE strategy variable, the New York state dummy, essentially unchanged. We conclude, therefore that our earlier finding that the New York/North Carolina student stakes policy mix has a large effect on achievement is not changed by including controls for other SBR initiatives.

Adding the school rewards and consequences variable does reduce our estimates of the backwash effects of minimum competency exams on achievement in 4th and 8th grades. The biggest change is in the model predicting 4th grade reading achievement where the estimated effect falls by one-half. The estimated effects of MCEs on math and science achievement in 8th grade are reduced by only about 20 percent. Point estimates imply that when other SBR policies are held constant, that 8th grade students in MCE states are about 20 percent of a GLE ahead of comparable students in non MCE states in math and science and about 10 percent of a GLE ahead in reading. If this were to be the only effect that MCEs had, most advocates for the policy would probably be disappointed. But we have not yet looked at the effect of MCEs on learning during the high school years. One would expect the effects of MCEs to be greatest on students who are approaching graduation. We now turn to an analysis of exactly that issue.

4.2 Analysis of Longitudinal Data on Test Score Gains during High School

Models were estimated predicting test score gains for English, mathematics, science and social studies and for the average of the four tests in NELS-88 data. We used the Thetas produced by the IRT model because they have the normal distribution called for by the statistical program, SAS's Proc Mixed, we are using to estimate our models. Separate models were estimated for the difference between 10th grade and 8th grade test scores, the difference between 12th grade and 10th grade test scores and for the gain over the full 4 year period from 1988 to 1992. Students who dropped out of high school were given the tests along with those who remained in school. In order to prevent the measurement error in the test scores from

biasing the results, the lagged value of the test whose gain score is being predicted never appeared on the right hand side of the regression.⁵⁴ When the gains on individual tests were being predicted, however, the student's scores on the other three 8th grade tests were included as control variables. The student's GPA in 8th grade was also one of the control variables in all models.

Results: We expect MCE's to have most of their impact on high school students who are at risk of failing them. This is why two variables were included in each model to measure the effects of minimum competency exams: a dummy variable for high schools with a MCE graduation requirement and an interaction between the MCE dummy variable and the student's 8th grade GPA. The interaction variable was defined as $MCE \cdot (GPA - 2.93)$. By deviating GPA from its mean of 2.93 before constructing the interaction variable, the coefficient on the MCE dummy variable becomes an estimate of the impact of MCEs on students who have a B/B- averages in 8th grade. The coefficient on the MCE dummy can be found in the third column of Table 9. It is hypothesized to be positive and indeed it is in 11 of the 15 estimated models. It is, however, positive and significant at the 10 percent level in only 3 of the models. Most importantly it is not significant in the model predicting gains in the test composite. Point estimates suggest that MCE's may have larger effects on learning gains between 10th and 12th grade than the gains between 8th and 10th grade.

If, however, there is an unobserved school effect that is correlated with the MCE variable, the MCE coefficient will be biased. That is why the coefficient on the interaction variable may be a better test of the basic hypothesis. As long as the unobserved school effect influences high ability students as much as low ability students, the coefficient on the interaction will be unbiased. The interaction variable tests the hypothesis that MCEs have more positive effects on the learning of low GPA students than of high GPA students. It can be found in column 5 of Table 3. It is hypothesized to be negative and indeed all 15 coefficients are negative and 8 of them are significantly negative at a 10 percent level on a one tail test. Most importantly it is significantly

negative in the models predicting gains in the composite test scores. Our estimates of the effect of MCEs on test score gains of C- and A students are given in columns 6 and 7 of Table 9.

Table 9
Effect of Minimum Competency Examinations on
Test Score Gains by 8th Grade GPA

	Grade Span	Minimum Comp. Exam	MCE Std Error	MCE* 8 th Grade GPA	Interact Std Error	Effect on C-Stud.	Effect on A Stud.	-2 times Res. Log Likelihood	Mean of Dep. Var.
Gain Scores									
Test Average	8-12	.102	(.161)	-.252*	(.150)	.42+	-.17	55752	7.43
	10-12	.157	(.144)	-.225*	(.124)	.44*	-.08	50151	3.53
	8-10	.013	(.137)	-.183+	(.113)	.24	-.18	63601	4.15
Science Test									
	8-12	.421*	(.234)	-.272	(.227)	.76	.13	63557	7.20
	10-12	.533**	(.211)	-.289+	(.213)	.90**	.22	57949	2.67
	8-10	.070	(.217)	-.169	(.200)	.28	-.11	74831	4.60
Math Test									
	8-12	.090	(.191)	-.216+	(.167)	.36	-.14	57983	8.49
	10-12	.029	(.132)	-.354***	(.134)	.48**	-.35*	49687	3.26
	8-10	.194+	(.146)	-.010	(.132)	.21	.18	65819	5.33
Social Studies									
	8-12	.093	(.265)	-.335+	(.236)	.51	-.27	62497	9.38
	10-12	.187	(.267)	-.154	(.215)	.38	.02	56956	5.87
	8-10	-.116	(.233)	-.356*	(.194)	.33	-.50*	73339	3.46
English Test									
	8-12	-.171	(.221)	-.185	(.224)	.06	-.37	63023	5.94
	10-12	-.084	(.222)	-.139	(.201)	.09	-.23	57980	2.42
	8-10	-.016	(.188)	-.215	(.171)	.26	-.25	72271	3.65

Source: Analysis of NELS-88. Sample is the 8th graders interviewed in 1988 who were also interviewed in 1994. The dependent variables are the difference between a student's thetas (derived from the IRT scaling model) for grade t and her theta for grade t-2 or t-4.. In 8th grade cross section data, the standard deviation of the Thetas is approximately 8.5 for all four of the tests. All models contain a full set of student background variables measured in the 8th grade: family SES, Books in the home, single parent, parents divorced, # of siblings, ethnicity, religion, gender, handicapping condition, test scores in the three other subjects [not the one for which the gain score is calculated], GPA in 8th grade, hours watching TV, hours doing homework, Read for fun index, smoking, dummy for in advanced courses, dummy for in remedial courses, dummies for 3 Census regions, locus of control index, self esteem index and hours working for pay (plus it's square). The following characteristics of the school the student attended during 10th grade were also controlled: Catholic School, secular private school, private school controlled by a church other than the Catholic church, teacher salary, percent high school student body white, percent free lunch, mean 8th grade test score of the students in the respondent's high school, mean family SES and enrollment per grade (plus it's square). Teacher pupil ratio was not included because it was often missing and its coefficient was never significant and typically of the wrong sign in the specifications that included it. There are no controls for 8th grade test scores in the model predicting average test score gains. The models were estimated by SAS Proc Mixed assuming random school effects. Numbers in parenthesis to the right of the coefficient are robust standard errors that are corrected for multi-stage sampling.

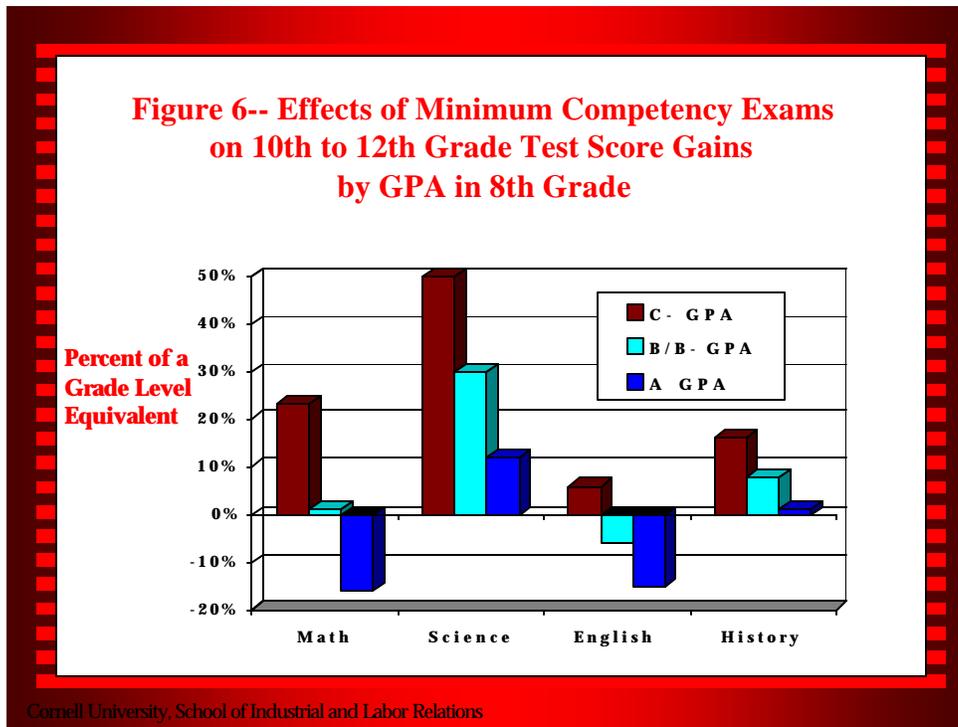


Table 10
Effects of Minimum Competency Examinations on
College Attendance
[Logistic Models]

	Mean of Dep. Var.	Min. Comp. Exam	MCE* 8 th Gr GPA	8 th Grade GPA	8 th Gr Math Test	8 th Gr English Test	8 th Gr Science Test	Social Stud Test	c 2 w. 52 DF/ # Obs
1st Semester	.563	.002 (.060)	-.035 (.073)	.730*** (.056)	.307** * (.04)	.082** (.038)	.05 (.04)	.12*** (.04)	4472 12,276
2nd Semester	.563	-.020 (.061)	-.075 (.075)	.744*** (.059)	.31*** (.04)	.05 (.04)	.03 (.04)	.12*** (.04)	4333 12,276
3rd Semester	.547	.102* (.060)	-.121* (.076)	.758*** (.057)	.28*** (.04)	.09** (.04)	.02 (.04)	.13*** (.04)	4498 12,281
4th Semester	.528	.098* (.060)	-.178** (.075)	.749*** (.057)	.27*** (.04)	.07** (.04)	.016 (.04)	.16*** (.04)	4501 12,273

Source: Analysis of NELS88. Sample is the 8th graders interviewed in 1988 who were also interviewed in 1994. All models contain a full set of student background variables measured in the 8th grade: family SES, Books in the home, single parent, parents divorced, # of siblings, ethnicity, religion, gender, handicapping condition, test scores, GPA in 8th grade, hours watching TV, hours doing homework, Read for fun index, smoking, dummy for in advanced courses, dummy for in remedial courses, dummies for 3 Census regions, locus of control index, self esteem index and hours working for pay (plus it's square). The following characteristics of the school the student attended during 10th grade were also controlled: Catholic school, secular private school, private school controlled by a church other than the Catholic church, teacher salary, percent student body white, percent free lunch, mean 8th grade test score, mean family SES and enrollment per grade (plus it's square). There are no controls for whether the student dropped out of high school so non-graduates are a zero on the dependent variable. Models were run

unweighted. Numbers in parenthesis below the coefficient are standard errors. The approximate effect of X_i (at the mean of the dependent variable) on the probability of not completing high school or attending college can be obtained by multiplying b_i times $P(1-P)$. Thus, for "Attending college in the 4th semester" the multiplier is .246.

How big are MCE induced gains in test scores from 10th to 12th grade? It depends on the student's GPA in 8th grade. A calculation of the effects is presented in Figure 6. For C- students the effect was about 24 percent of a grade level equivalent (GLE) on the test score composite, 50 percent of a GLE in science, 23 percent of a GLE in mathematics, 16 percent of a GLE in social studies and 6 percent of a GLE in English.⁵⁵ For B/B- students the effect was 8 percent of a GLE for the composite, 30 percent of a GLE in science, 1 percent of a GLE in math, 8 percent of a GLE in social studies and -6 percent of a GLE in English. For A students the point estimate of the effect is -4 percent of a GLE in the composite, 12 percent of a GLE in science, -16 percent of a GLE in math, 1 percent for social studies and -15 percent of a GLE in English. These results make a strong case that MCEs induce schools to focus more on teaching struggling students. However, this emphasis may result in the students with A averages in 8th grade learning less. This may be one reason why the grassroots opposition to MCEs appears to come mainly from good students in upper middle class school districts. Additionally, our point estimates of the MCE effect on C- students in 8th grade is not as impressive as one would like, and the estimated effect of MCEs on B/B- students is essentially zero.⁵⁶

What were the other statistically significant determinants of 8th to 12th grade learning as measured by the four subject composite? During the 4 year interval, males learned .45 of a grade level equivalent more than females, Asians learned .48 GLEs more than whites, African-Americans learned .49 GLEs less than whites, students not living with a parent learned .47 GLEs less, and students living in the North Central and Southern regions learned .16 to .24 GLEs less than students in the Northeast and students in non-public high schools learned a non significant .18 GLEs more. Learning gains were also greater for students from high SES families, for students high on the read for fun index and high on the internal locus of control index, for students who watched a great deal of TV in 8th grade and when parent involvement was high.

Learning gains were greater at high schools serving high SES students and at high schools where entering students had low 8th grade test scores.

V. The Effects of Minimum Competency Exam Graduation Requirements on College

Enrollment Rates

If MCEs raise academic achievement, as intended, they are likely to increase the proportion of high school graduates who attend and complete college. Opponents of MCEs concede this point but argue that it is accomplished by reducing the number of high school graduates not by increasing the numbers attending and completing college. They predict that the reductions in high school graduation rates they expect MCEs to cause will in turn lower the proportion of 8th graders who eventually attend college. Proponents of MCEs disagree. They argue that MCE tests assess very basic skills and that students who cannot, after many tries, pass such tests are not prepared for college level work. Open door institutions will admit them, yes, but they will need extensive remedial course work and are unlikely to complete any course of study. It is better, they argue, for high schools to hold **all** students to higher standards and to tell poorly prepared students of their deficiencies early enough for something to be done about it. Students will then take learning more seriously and fewer will find they lack the skills and knowledge necessary to succeed and thrive in college. They predict that, even if MCEs reduce the number of high school graduates, the proportion of 8th graders who enroll in college five years later will not decline. Indeed, drop out rates during the first years of college should be reduced and so a larger proportion of 8th graders will be in college 6 years later in 1993/94 (the sophomore year of college for students who graduate on schedule and enter college the following September).

If as hypothesized above, the effects of MCEs on learning are larger for students who were in the bottom half of the class in 8th grade, the impacts of MCEs on college attendance rates will have a similar pattern.

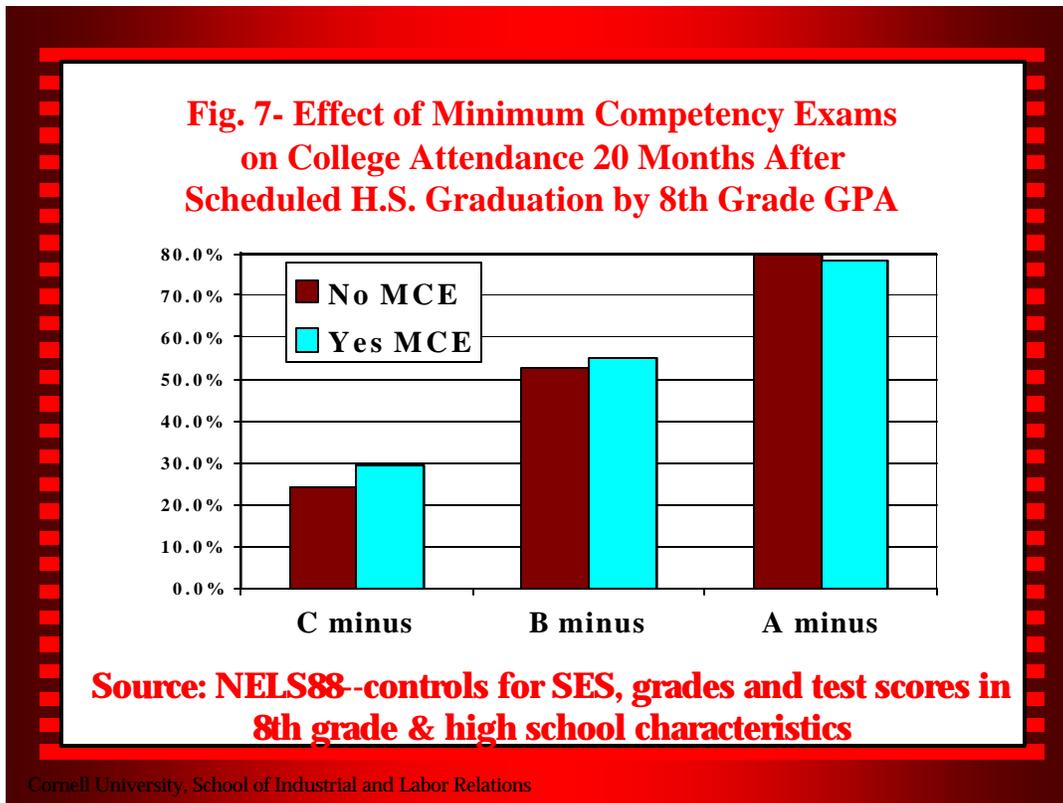
Hypothesis 4A--Minimum Competency Examinations will increase college enrollment rates. Impacts should be larger on sophomore year enrollment rates than freshman year enrollment rates.

Hypothesis 4B—Minimum competency exams will substantially raise college enrollment of students who had below average 8th grade test scores and GPA. Students with high test scores and high GPAs in 8th grade will be unaffected by MCEs.

5.1 Results using NELS-88 data

Analyzing HSB data, Bishop and Mane found that high school graduates coming from high schools with an MCE graduation requirement [as reported by the principal] had significant positive effects on the probability of being in college during the four-year period immediately following high school graduation.⁵⁷ See Table 10. Effects were largest for students in the middle and bottom of the test score distribution and tended to be greater in the 2nd and 3rd years out than in the 1st, 4th and subsequent years out. This study, however, has an important limitation: only high school graduates were studied. This means that if MCEs lowered the high school graduation rate, they could increase the proportion of high school graduates going to college without increasing the total number of students going to college.

We will avoid this problem by analyzing longitudinal data on a sample of 8th graders. We assess the effects of MCEs on the college attendance rates from 1992 to 1994 of students who were in 8th grade in 1988. Logistic regressions were estimated predicting college enrollment in the fall of 1992, spring of 1993, fall of 1993 and the spring of 1994. The results presented in Table 10 and Figure 7 support hypotheses 4A and 4B. The estimated effect of MCEs on enrollment of B/B- students was significantly positive in the second academic year after high school graduation. As predicted, the effect of MCEs on the probability of attending college grew with time out of high school rising from zero in the 1992/93 academic year 1992/93 to 2.5 percentage points in the 1993/94 academic year.



Consistent with Hypothesis 4B, MCEs have a larger effect on the college attendance of students with low GPAs in 8th grade. The interaction variable was significantly negative in the models predicting college attendance in fall 1993 and spring 1994. For C- students the MCE increased college attendance rates by about 1 percentage point in the 1992/93 academic year, by 4.5 percentage points in the fall of 1993 and by 5.4 points in the spring of 1994. These are very substantial effects. Figure 4 presents the college attendance rates predicted by the model for Spring 1994.

With respect to the control variables, few of the findings are surprising. Students with the highest college enrollment rate were from small, intact, high SES families, Asians or African-American rather than white, a Catholic or Jewish religion rather than Protestant, no religion or no response, high on the internal locus of control index, non-smokers who did not read for fun much but spent many hours doing homework in 8th grade, and attended a small high school or a Catholic high school.

VI. The Effects of Minimum Competency Exam Graduation Requirements on Wages and Employment After High School

MCE's are hypothesized to improve job opportunities in three ways. First, by improving student achievement they raise worker productivity.⁵⁸ Even when this does not immediately raise workers' earnings, the effect of academic achievement on wages grows with time and eventually becomes very large⁵⁹.

The second way MCEs improve job opportunities is by sending a signal to employers that "ALL the graduates of this high school meet or exceed your hiring standards." The fact that they have passed the MCE is the proof. In most communities, competencies developed in the local high school are poorly signaled to employers. The lack of signals of achievement in high school tends to make employers with the best jobs reluctant to risk hiring recent high school graduates. Indeed they often carry in their head very negative stereotypes regarding recent high school graduates. A black personnel director interviewed for a CBS special on educational reform proudly stated, "We don't hire high school graduates any more, we need skilled workers."⁶⁰ They prefer, instead, to hire workers with many years of work experience because the applicant's work record serves as a signal of competence and reliability that helps them identify the most qualified.

Establishing a minimum competency exam, therefore, is one way a school district or state education system can try to overcome this signaling problem and help it's graduates get good jobs. The existence of the minimum competency exam graduation requirement should be well known to local employers. With the MCE requirement, the school's diploma now signals more than just seat time; it signals meeting or exceeding certain minimum standards in reading, writing, mathematics, science and social studies as well. Because of pooling, all high school graduates should benefit from a MCE regime, not just the students with low achievement levels in 8th grade.

The third way that MCEs can affect job opportunities is by improving the quality of the information that employers have on the academic achievement of recent high school graduates.

If employers become more able to assess the academic achievement of job applicants, they will give these traits greater weight in the selection decisions and rewards for academic achievement will rise. MCEs will significantly improve signals of achievement if MCE test scores (or the grade level at which the student passes the MCE) are included on the high school transcript or if employers use the MCE pass rates reported on school report cards as a handicapping factor for evaluating grade point averages from different schools.

The foregoing logic generates a number of testable predictions regarding the graduates of high schools with a MCE graduation requirement. Holding constant socio-economic status (SES), 8th grade test scores, 8th grade GPA, working during 8th grade, attitudes in 8th grade, whether the individual gets a diploma or a GED, current and past college attendance and a complete set of other individual and school characteristics:

Hypothesis 5A---Students at MCE high schools will obtain higher wage rates and higher earnings than students at schools without MCE graduation requirements.

Hypothesis 5B---The rewards for academic achievement will be greater in states and school districts with minimum competency examinations.

6.1 Results using NELS-88 data

Analyzing High School and Beyond data and controlling for college attendance and a host of other variables, Bishop, Moriarty and Mane (1998) found that females graduating from high schools with a minimum competency exam graduation requirement [student report] earned more than women graduating from schools without an MCE. Concern about the accuracy of student reports of the existence of a MCE at their high school led Bishop and Mane (1999) to reanalyze HSB data using principal reports of the existence of a MCE graduation requirement. They found even larger effects. Principal reports of a MCE graduation requirement had positive effects (significant in some but not all years) on wage rates of male and female graduates and on the earnings of graduates four and five years after graduation. The wage rate effects of

MCE's appeared to be larger for students in the bottom three quarters of the test score distribution.

Here we analyze data from NELS-88. Models were estimated predicting five indicators of early labor market outcomes: earnings in calendar 1993, average monthly earnings when working, monthly earnings in January/February 1994, the hourly wage rate and the total number of months worked in the 21 month period following high school graduation. The models predicting these labor market outcomes were generally the same as those used to predict high school completion and college attendance. The first exception to that generalization was the inclusion of controls for high school completion: dummies for "Ever dropped out," "Obtained a GED," "Failed to get either a diploma or a GED," "graduated early and, for late graduates, "the length of the delay in graduation." The second exception was the inclusion of controls for current and past college attendance: a dummy variable for full-time college attendance during the period for which earnings is measured, a dummy for part time attendance during that period and the number of semesters of college attendance prior to the earnings measurement period.

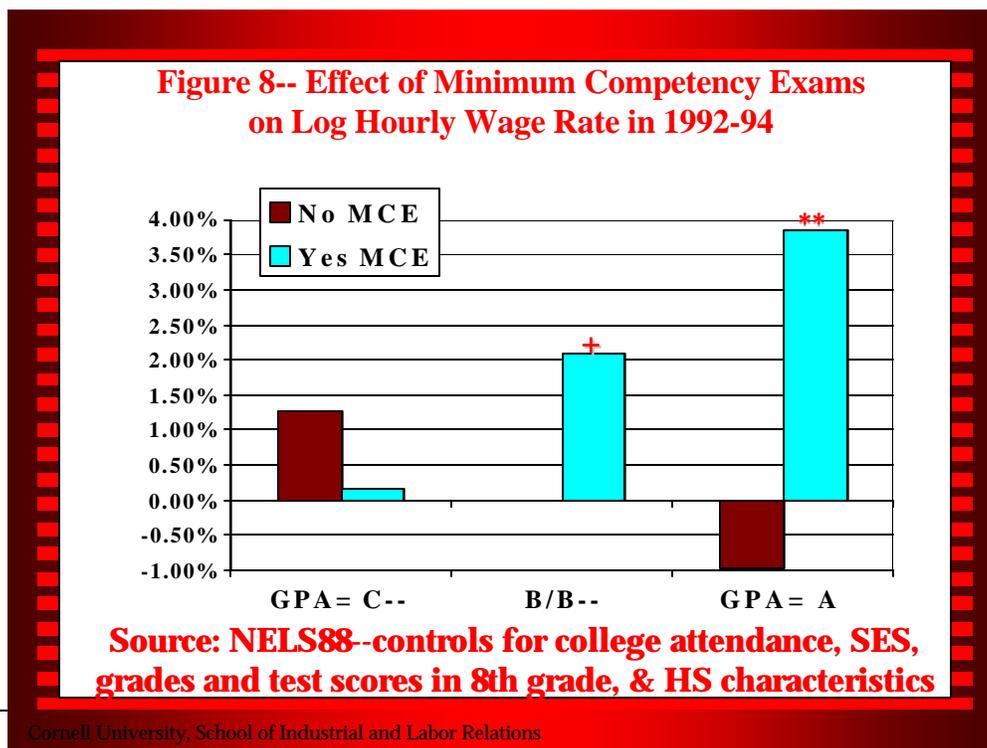
Table 11 presents our analysis of the effects of minimum competency examination graduation requirements on earnings and employment using the same interaction specification used for predicting high school completion and college attendance. Consistent with Hypothesis 5A, minimum competency examinations had a consistently positive effect on earnings for students with average grades. The MCE coefficient was positive in all four of the models predicting wage rates and earnings and significant in two. Students with average grades from high schools with MCEs earned 8 percent more during calendar 1993 and, conditional on having worked during the month, they earned about 8.6 percent more than students graduating from high schools without MCEs. Going to a high school with a MCE was, by contrast, not associated with more months of employment.

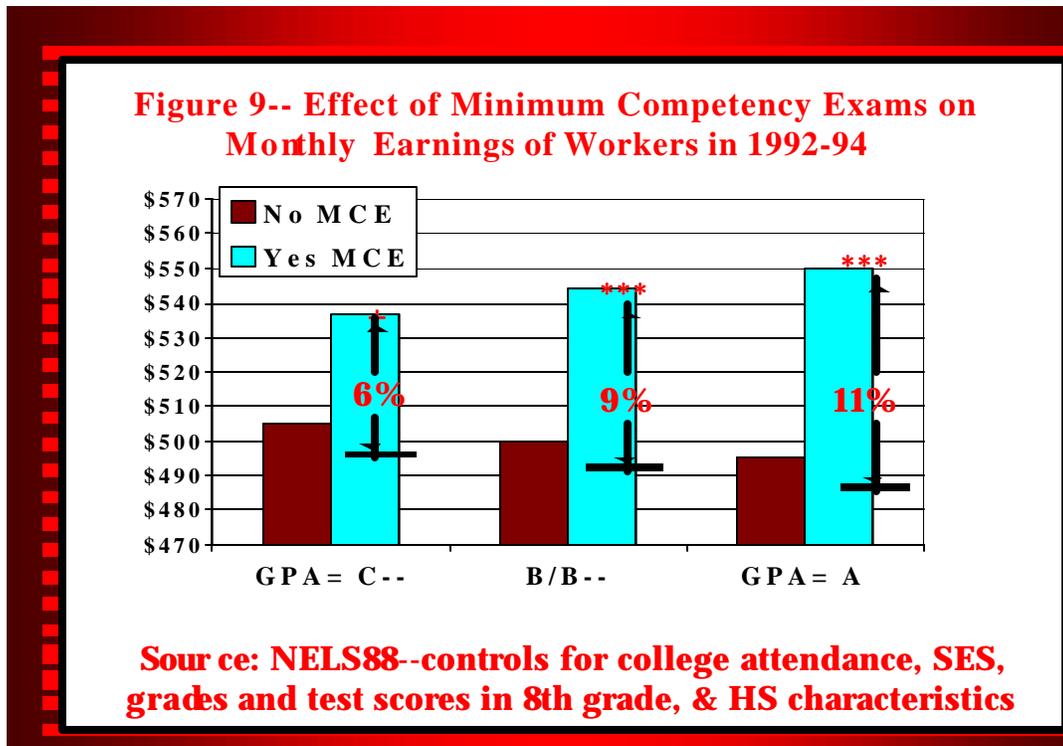
Table 11

The Effect of Minimum Competency Exams on Employment Outcomes after High School
[8th Grade GPA Interactions]

	Mean (SD)	Min Comp Exam	MCE* 8 th Gr GPA	Effect on A Student	Effect on C-Student	No Diploma	Obtain GED	8 th Gr GPA	Adj R Sq OLS
1993 Annual Earnings	\$5225 (5696)	432*** (139)	321** (162)	775*** (191)	28 (276)	-2113*** (318)	53 (426)	-331*** (127)	.2117
<u>When Working</u>									
Average Earnings/mo	\$ 512 (\$526)	44.1*** (11.8)	9.8 (13.2)	54.6*** (16.0)	31.8+ (22.7)	-138*** (26)	38 (37)	-2.8 (10.7)	.2052
1994 Earnings /mo	\$ 495 (\$670)	25.8* (15.1)	24.5+ (13.9)	52.0** (20.7)	-5.1 (29.7)	-132*** (32)	26.6 (47.9)	-11.1 (13.7)	.2069
Log Hourly Wage Rate	1.272 (.569)	.021+ (.015)	.026+ (.016)	.048** (.021)	-.011 (.026)	-.088*** (.029)	.027 (.037)	-.015 (.012)	.0917
Total Months Worked	13.66 (7.72)	.185 (.200)	-.056 (.199)	.124 (.291)	.256 (.321)	-2.75*** (.36)	-.37 (.43)	.12 (.15)	.1396

Source: Analysis of NELS88. Sample is the 8th graders interviewed in 1988 who were also interviewed in 1994. Models reported in this table contain controls for whether the respondent was in college full time during spring 1994, whether respondent was a part-time student in spring 1994, the number of months spent attending college full-time and months spent attending part-time and when the student completed high school. Models also contain a full set of student background variables measured in the 8th grade: family SES, Books in the home, single parent, parents divorced, # of siblings, ethnicity, religion, gender, handicapping condition, test scores, GPA in 8th grade, hours watching TV, hours doing homework, Read for fun index, smoking, dummy for in advanced courses, dummy for in remedial courses, dummies for 3 Census regions, locus of control index, self esteem index and hours working for pay (plus it's square). The following characteristics of the school the student attended during 10th grade were also controlled: Catholic School, secular private school, private school controlled by a church other than the Catholic church, teacher salary, percent student body white, percent free lunch, mean 8th grade test score, mean family SES and enrollment per grade (plus it's square). The Random effects model was estimated in SAS's Proc Mixed without weighting the observations.. Numbers in parenthesis below the coefficient are robust standard errors that are corrected for multi-stage sampling.



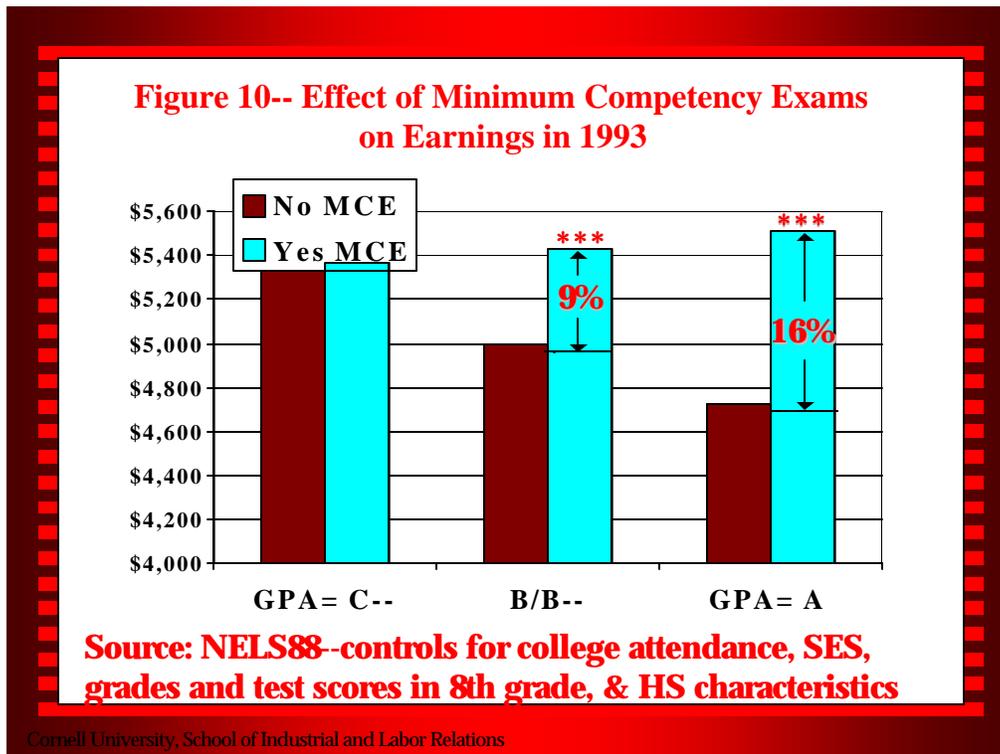


Column 3 of the Tables 11 presents a test of hypothesis 5B. It receives considerable support. All four coefficients on the GPA*MCE interaction in the earnings and wage regressions are positive and three are significantly positive at the 10 percent level on a one tail test. The model's estimate of the impact of MCEs on A students is in column 4. Effects on C- students are in column 5. Results are also graphed in Figures 8, 9 and 10. For students with A averages in 8th grade, those who attended a high school with a MCE graduation requirement were paid 4.8 percent extra per hour, earned \$54.60 (about 10.6 percent) more per month and about 15 percent more during 1993. All of these estimates are significantly greater than zero.

These are striking findings. The effects are quite large and appear to have grown since 1981. Our (1999) analysis of the effects of MCEs on the 1981-82 labor market outcomes of 1980 graduates found no effects on annual earnings and statistically insignificant effects (of about 1.6 percent) on wage rates. By contrast, the regressions presented above predicting the 1993-94 labor market outcomes get much larger MCE effects particularly for monthly and annual earnings. In addition the pattern of MCE effects by student grades and test scores

changed dramatically. In 1981-82 MCEs were associated with a 2.5 percent higher wage for low test score graduates, a 2.0 percent higher wage for middle test score graduates and only a 0.5 percent higher wage for high test score graduates. In 1994, by contrast, the linear interaction specification produces the following estimates of MCE effects on wage rates: -1.1 percent for those with C- GPAs in 8th grade, +2.1 percent for those with average grades and +4.8 percent for those with A GPAs in 8th grade.

Why did the impact of MCEs grow? Why did MCEs have a much more positive impact on high GPA students than low GPA students in 1993-94 but not in 1981-82. Four explanations come to mind. First, in 1981-82 most state level MCE graduation requirements were very new and employers had probably not fully adapted their hiring policies to the innovation. Secondly, during the 1980s employers began to recognize that jobs were becoming more cognitively complex and started to give cognitive skills more emphasis in hiring. The payoff to years of schooling and test scores rose⁶¹ and a rising premium for graduating from an MCE high school may be part of the same phenomenon. Thirdly, the legal environment shifted.



The Wards Cove decision of the Supreme Court shifted the burden of proof in cases challenging employer use of basic skills tests that have adverse impact on minorities and this may have lowered the perceived legal risk of taking high school records into account when making hiring decisions. Finally, starting in 1989, the American Federation of Teachers and a number of blue ribbon panels began urging employers to reward achievement in high school.⁶² Employers in jurisdictions with MCEs were apparently more responsive to these urgings. The reward for reading and math achievement in high school has apparently risen more in communities with MCE graduation requirements than in communities without such requirements.

Turning briefly to the effects of other variables, not getting a high school diploma or a GED lowered hourly earnings by 8.8 percent and monthly earnings (conditional on working during the month) by 27 percent. If the GED was obtained on the same date, wages and monthly earnings and total earnings in 1993 were the same as for high school graduates. Those with neither a diploma or a GED earned 40 percent less.

At high schools without MCE graduation requirements, test scores and GPA have small non-significant negative effects on wage rates and monthly earnings. At MCE high schools, however, higher GPAs are associated with slightly higher wages and monthly earnings. GPA and test scores have significant negative effects on annual earnings for graduates from schools without an MCE but essentially zero effects when there is an MCE. Students who have 1 SD higher test scores and one point higher 8th grade GPA earned 4.7 percent less in 1993 when they attended high schools without an MCE and earned a non significant 1.4 percent more when they attended MCE high schools.⁶³

VII. Summary and Conclusions

Now let us summarize our findings on the effects of educational reforms initiated and led by state governments. We looked at the effects of one old style educational reform--higher graduation requirements—and five standard-based reforms—school report cards, rewards for school improvement, sanctions for failing schools, minimum competency examinations and end-

of-course examinations. For minimum competency exams, effects on eight outcomes-- enrollment rates, high school graduation rates, suicide rates, test scores, college attendance rates, employment, wage rates and earnings—were studied using two very different data sets. For school-based SBR policies, only test scores were studied. For end-of-course exams, enrollment rates and graduation rates were studied as well. Our results are summarized in Table 12. For test score outcomes the figures in the table are in grade level equivalents. A number in the table that does not have *'s or a + to it's right is not significantly different from zero. The other numbers in the table are percentage increases or decreases in the outcome labeled in column 1. Note that the table reports the percentage increases or decreases in enrollment and graduation rates not the percentage change in the dropout rate.

Caveats: The large number of empty cells with a '---' display our current ignorance and lay out an agenda for future research. In future research we plan to try to fill in some of Table 12's empty cells.

Table 12

Effects of Standard-Based Reform Initiatives on Enrollment Rates, Graduation Rates, Test Scores, College Attendance and Labor Market Success

	Carnegie Unit Grad. Requirements	Minimum Comp. Exam	End-of-Course & MCEs CBEEES	School Report Cards	Sanction Failing Schools	Reward School Success	Assist Failing Schools
Analysis- State Cross Sections							
Enrollment at age 17	Neg**	0	0	---	---	---	---
High School Graduation	ns	0	0	---	---	---	---
Suicide Rate 10-19 yr olds	0	0	0	---	---	---	---
4 th grade Reading-1998	t=0	.16	.55*	0	.35***	.35***	0
8 th grade Reading-1998	t=0	.09	.63***	0	.14*	.14*	0
4 th grade Math-1996	t=0	.26*	.75***	0	.21**	.21**	---
8 th grade Math-1996	t=0	.19	.50*	0	.14+	.14+	---
8 th grade Science-1996	t=0	.21+	.50**	0	.14**	.14**	---
Longitudinal for 8th Graders in 1988							
Test Gain 10 to12 th --GPA B/B-	---	.08	---	---	---	---	---
Test Gain 10 to12 th --GPA is C-	---	.24*	---	---	---	---	---
Test Gain 10 to12 th --GPA is A	---	-.04	---	---	---	---	---
Enrollment 12 th Gd--GPA B/B-	---	0.2 %	---	---	---	---	---
Enrollment 12 th Gd--GPA is C-	---	- 0.6 %	---	---	---	---	---
Get Diploma/GED--GPA B/B-	---	- 0.9 %	---	---	---	---	---
Get Diploma/GED--GPA is C-	---	-10%***	---	---	---	---	---
Attend College 1994:GPA B/B-	---	4.5 %*	---	---	---	---	---
Attend College 1994:GPA is C-	---	23 %***	---	---	---	---	---
Attend College 1994:GPA is A	---	- 1.6 %	---	---	---	---	---
Earnings in 1993: GPA is B/B-	---	8 %***	---	---	---	---	---
Earnings in 1993: GPA is A	---	15 %***	---	---	---	---	---
Earnings in 1993: GPA is C-	---	1 %	---	---	---	---	---
Avg. Earnings/mo: GPA is B/B-	---	8 %***	---	---	---	---	---
Avg. Earnings/mo: GPA is A	---	9 %***	---	---	---	---	---
Avg. Earnings/mo: GPA is C-	---	6 %+	---	---	---	---	---
Hourly Wage Rate: GPA is B/B-	---	2.1%+	---	---	---	---	---
Hourly Wage Rate: GPA is A	---	4.8%**	---	---	---	---	---
Hourly Wage Rate: GPA is C-	---	-1.1 %	---	---	---	---	---
# of Months Employed--93-94		1 %					

+ Statistically significant at the 10% level one a one tail test
 * Statistically significant at 5% level on a one tail test
 ** Statistically significant at 5% level on a two tail test
 *** Statistically significant at 1 % level on a two tail test
 ----- means data were not available for testing this hypothesis
 t=0 indicates the relationship was assumed to be zero a priority

SBR policies tend to cluster. This means that unbiased estimates of the effect of a particular SBR initiative are possible only when the presence or absence of other initiatives is taken into account. Our analysis of the state cross sections of NAEP test scores handles this problem by controlling for other SBR policies. The number of students tested is also quite large and one can repeat the analysis for different subjects and for different years. These features of the state cross-section analysis probably make it our best estimate of the overall effects of individual SBR policies.

Impacts of SBR Policies on Test Scores: The policy that clearly has the biggest effects on test scores is the Hybrid End-of-Course/Minimum Competency Exam System that has been in place in New York State since the early 1980s and in North Carolina since about 1990. This confirms and extends earlier findings that New York State did significantly better on SAT tests and the 1992 8th grade NAEP math tests than other states with demographically similar populations.⁶⁴ This policy package is also often referred to as a Curriculum-Based External Exit Exam System. Most countries have such systems and studies have found that young people living in provinces and countries with such systems have higher reading, math and science achievement than students in jurisdictions that lack curriculum-based exit exams.⁶⁵

The next most powerful intervention appears to be stakes for teachers and schools particularly when rewards for successful schools are combined with sanctions for failing schools. Public reporting is necessary for the implementation of these other policies but on its own it has no discernable effect on student achievement.

MCEs also have modest effects on average levels of achievement. They do, however, clearly have desirable distributional consequences for they focus their incentive effects on the school's struggling or lagging students. When they are combined with stakes for teachers and schools, as they typically are, the package has very respectable effects on test scores.

Impacts of Graduation Requirements and Minimum Competency Exams on School

Enrollment and Graduation Rates: Increases in the number of courses required to graduate significantly reduce school enrollment rates but have no effect on the number of students getting a high school diploma or GED. By contrast, the minimum competency exam graduation requirements that were in place in the early 1990s did not increase overall drop out rates or significantly lower overall high school completion rates as some had feared. When, however, we analyzed longitudinal data that controlled for the grades and test scores of students in 8th grade, we found that students at MCE schools with C- grades in 8th grade, while not more likely to drop out, were about 10 percent less likely to get a high school diploma or a GED within 6 years. MCEs had no significant effect on graduation rates of students with A averages or B/B- averages.⁶⁶

Effect of Minimum Competency Exams on Post High School Outcomes: MCEs have significantly raised the college attendance rates and earnings of 18-19 year olds. The students with B- and C- averages in 8th grade were significantly more likely to be attending college 2 years after the scheduled date of their high school graduation. Students with B/B- averages who attended schools with MCE graduation requirements were paid 2.1 percent more per hour after graduating and A students were paid 4.8 percent extra. Students with B/B- averages in 8th grade earned about **8 percent more per month and per year** than students who attended schools without MCEs. The earnings benefits of graduating from a MCE high school were larger for the people graduating in 1992 than in 1980. Students with average or above average grades in 8th grade got higher wage jobs and earned more per month after high school only when their school had a MCE graduation requirement. MCEs have not only induced employers to pay typical graduates more, they have apparently induced them to increase the reward they offer for higher achievement in high school.

Thus the benefits of MCEs are a rise in the immediate economic payoff to learning, increased time spent in schooling, lower college drop out rates and higher wage rates and earnings immediately after leaving high school. The college attendance effects were

concentrated on students with average and below average grades in 8th grade. The wage rate and earnings effects were larger for students with average and above average grades in 8th grade, but they were positive for C students as well. These very substantial benefits were not costless, however. While the overall high school graduation rate did not change, students with low GPAs in 8th grade had significantly lower graduation rates when they faced a MCE. Since their college attendance rates rose significantly, it is not clear that low GPA students were made worse off by the MCE graduation requirement. By contrast, students with average or above average grades in 8th grade were definitely made better off, often very substantially.

Endnotes

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- ¹ Hugh Price, Speech at an induction into Thurgood Marshall Achievers' Society, quoted in Caroline Hendrie, "Urban League Effort Targets Young Achievers," *Education Week*, July 14, 1999, 6-7.
- ² James A. Kulik and Chen-Lin Kulik, "Effects of Accelerated Instruction on Students," *Review of Educational Research*, Vol. 54 No. 3 (Fall 1984), pp. 409-425; David Monk, "Subject Area Preparation of Secondary Mathematics and Science Teachers and Student Achievement," *Economics of Education Review*, Vol. 13 No. 2 (1994), pp. 125-145. and John H. Bishop, "Incentives to study and the organization of secondary instruction." *Assessing Educational Practices*, eds. William Baumol and Becker (Cambridge, Mass.: MIT Press, 1996), pp. 99-160.
- ³ Pam Belluck, "Reason is sought for lag by Blacks in school effort," *New York Times*, July 4, 1999, p. 15.
- ⁴ Longitudinal Survey of American Youth, "Data File User's Manual" (Dekalb, Ill: Public Opinion Laboratory, 1988), Q. AA17A, AA17B, & AA26A.
- ⁵ Longitudinal Survey of American Youth, "Data File User's Manual" Q. AA37N.
- ⁶ interview with counselor at a wealthy suburban school, August 1997
- ⁷ Ward, "A Day in the Life," *N.Y. Teacher* (Albany, New York, January 1994).
- ⁸ Jerry Jesness, "Why Johnny Can't Fail?" *Reason* (July 1999), [reprinted in *Selected Readings on School Reform* (Thomas Fordham Foundation, Fall 1999), p. 87.]
- ⁹ Peter D. Hart Research Associates, "Valuable Views: A public opinion research report on the views of AFT teachers on professional issues" (Washington D.C.: American Federation of Teachers, 1995), pp. 1-24.
- ¹⁰ Laurence Steinberg, Bradford Brown, and Sanford Dornbusch, *Beyond the Classroom* (New York: Simon and Schuster, 1996), pp. 145-146.
- ¹¹ Robert P. Strauss, "Who should teach in New York's public schools? Implications of Pennsylvania's Teacher Preparation and Selection Experience," forthcoming in *Economics of Education Review*.
- ¹² Richard Ingersoll, *Out of Field Teaching and Educational Equity* NCES 96040, (Washington, DC: National Center for Educational Statistics, 1996).
- ¹³ The survey was of a stratified random sample of the NFIB membership. Larger firms had a significantly higher probability of being selected for the study. The response rate to the mail survey was 20 percent and the number of usable responses was 2014.
- ¹⁴ Employers appear to believe that school performance is a good predictor of job performance. Studies of how employers rate job applicant resumes that contain information on grades in high school have found that employers give substantially higher ratings to job applicants with high grade point averages. K. Hollenbeck and B. Smith, "The Influence of Applicants' Education and Skills on Employability Assessments by Employers," (Columbus: National Center for Research in Vocational Education, Ohio State U., 1984).

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- ¹⁵ Toby Friedman and E. Belvin Williams, "Current Use of Tests for Employment." *Ability Testing: Uses, Consequences, and Controversies, Part II: Documentation Section*, eds. Alexandra K. Wigdor and Wendell R. Gardner, (Washington, DC: National Academy Press, 1982), pp. 99-169.
- ¹⁶ John H. Bishop, "Impact of Academic Competencies on Wages, Unemployment and Job Performance," *Carnegie-Rochester Conference Series on Public Policy*, Volume 37, (December 1992), pp. 127-194.
- ¹⁷ M. H. Brenner. "The use of high school data to predict work performance," *The Journal of Applied Psychology* Vol. 52, # 1 (1968), pp. 29-30.
Department of Labor, "General Aptitude Test Battery Manual" (Superintendent of Documents, 1970).
John E. Hunter, James J. Crosson and David H. Friedman, "The Validity of the Armed Services Vocational Aptitude Battery (ASVAB) For Civilian and Military Job Performance" (Department of Defense, August 1985).
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Bishop, "Impact of Academic Competencies," pp. 127-194. [2d reference; see n. 13]
- ¹⁸ J. C. Hauser and Thomas M. Daymont, "Schooling, ability and earnings: Cross-sectional evidence 8-14 years after high school," *Sociology of Education*, Vol. 50 (July 1977), 182-206.
Paul Taubman and Terence Wales, "Education as an investment and a screening device," *Education, Income and Human Behavior*, ed. F. T. Juster, (New York: McGraw Hill, 1975), pp. 95-122.
Henry Farber and Robert Gibbons, "Learning and Wage Dynamics," *Quarterly Journal of Economics* (1996), pp. 1007-47.
- ¹⁹ Large as it is, this 16 percent figure substantially understates the total effect of improved K-12 learning on earnings as an adult. First, test scores influence hours of work and the risk of unemployment, not just wage rates. Secondly, compared to the MCEs of many states, the AFQT is an incomplete measure of what students are learning in high school. If reliable measures of other skills learned in school (such as science, social studies, writing, technical and computer skills) were included in the model, the total effect of test scores would be larger. The third and most important source of bias comes from using a contemporaneous measure of schooling as a control. Much of the benefit of learning in the first 12 years of school comes from the assistance it provides in continuing schooling beyond high school. Yet, this benefit of learning in high school does not get picked up by the AFQT coefficient, it is captured by the contemporaneous measure of schooling. If a prospective measure of schooling (completed schooling at the time of the AFQT test) were substituted for the contemporaneous measure, the coefficient on the AFQT would have been much larger.
Joseph Altonji and Charles Pierret, "Employer Learning and Statistical Discrimination" (Northwestern University, 1997), pp. 1-55.
- ²⁰ Admission to a non-selective college is feasible without working in high school, but graduation may not be. Many high school students who avoid tough academic courses or put in only the minimum of effort into their academic courses later find that even nonselective colleges are too difficult for them and they drop out (Rosenbaum 1998 and Clifford Adelman, "Answers in the Tool Box: Academic Intensity, Attendance Patterns and

Bachelors Degree Attainment." Wash, DC: Office of Educational Research and Improvement, 1999, 1-87.

- ²¹ Ward, "A Day in the Life," *N.Y. Teacher* (Albany, New York, January 1994).
- ²² "Quality Counts," *Education Week*, January 11, 1999, p.87.
- ²³ "Quality Counts," *Education Week*, January 11, 1999, p.93.
- ²⁴ Minimum competency exams are additions to, not a replacement for teacher imposed standards. In a MCE regime, teachers continue to control the standards and assign grades in their own courses. Students must still get passing grades from their teachers to graduate. The MCE regime imposes an additional graduation requirement and thus cannot lower standards (Costrell 1998). The General Education Diploma (GED), by contrast, offers students the opportunity to shop around for an easier (for them) way to a high school graduation certificate. As a result, the GED option lowers overall standards. This is reflected in the lower wages that GED recipients command
Stephen V. Cameron and James J. Heckman, "The Nonequivalence of High School Equivalents" Working Paper # 3804 (Boston, Mass.: National Bureau of Economic Research, 1991).
- ²⁵ American Federation of Teachers, *Making Standards Matter:1996* (Washington, DC: American Federation of Teachers, 1996) p. 30.
- ²⁶ End-of-course examination (EOCE) are similar to MCEs in the following ways. Both are set by and graded to rubrics devised by a state government or a national organization (e.g. The College Board) and both carry consequences for students, the teachers and school administrators.
- ²⁷ Costrell, Robert M. (1998) "Can Centralized Educational Standards Raise Welfare?" *Journal of Public Economics*,
- ²⁸ College Board, "More Schools, teachers and students accept the AP challenge in 1998-99," (New York, Aug. 31, 1999), pp. 1-8.
- ²⁹ Participation rates are calculated by dividing the number of exams taken by the average enrollment per grade in high school. Participation rates have been rising and in 1999 were 52 percent for Algebra, about 33 percent for geometry and biology, about 28 percent for US history, Spanish and written composition and about 22 percent for economics and chemistry.
California Department of Education, "Communications Assistance Packet: Golden State Examinations" (November 1999).
- ³⁰ Sherman N. Tinkelman, "Regents Examinations in New York State after 100 Years" (Albany, N.Y.: The University of the State of New York, The State Education Department, 1966), p. 12.
- ³¹ Tinkelman, "Regents Examinations," p. 12. [2d reference; see n. 30]
- ³² John H. Bishop, "Nerd Harassment and Grade Inflation: Are College Admissions Policies Partly Responsible?" Center for Advanced Human Resources Discussion Paper #99-14, (1999c).

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- ³³ Participation rates are calculated by dividing the number of exams taken by the average enrollment per grade in high school.
The New York State Education Department, "New York: The State of Learning—Statistical Profile of Public School Districts" (Albany, February, 1997).
- ³⁴ Charisse Jones, "New York City to Stiffen Rules for Graduating." *New York Times*, 5/2/94, p. 1
- ³⁵ For example, in the new Regents English exam, four essays written under timed conditions responding to source material or literature account for more than half of the points in the exam. A sample writing prompt is: "Write a critical essay in which you discuss **two** pieces of literature you have read from the perspective of the statement that is provided to you in the 'critical lens.' In your essay, provide a valid interpretation of the statement as you have interpreted it, and support your opinion using specific references to appropriate literary elements from the two works. **{Critical lens: "The test of a courageous person is the ability to bear defeat without losing heart."}** Another sample prompt is: "Write an article for the community health newsletter. Using relevant information from text **and** graphs, discuss the factors that influence teenage smoking and the implications of those factors for reducing teenage smoking." Once schools have adjusted to the revised exams and the requirement that all students take them, the Regents intend to raise the scores necessary to pass from the 55% level to 60% and then to 65%. See www.nysed.gov/rscs/test123.html for copies of the new Regents exams, scoring rubrics and a complete description of the testing program.
- ³⁶ In models developed by Kang (1985) and Costrell (1994) some of the students faced with higher graduation standards conclude that the effort necessary to get a diploma is too great and so give up on the idea of getting a diploma. While these theoretical models associate "giving up" with dropping out of school, this is not necessarily the case. Students who believe they cannot graduate might nevertheless continue to attend high school because they enjoy socializing and playing sports or because they are learning a trade.
- Suk Kang, "A Formal Model of School Reward Systems," *Incentives, Learning and Employability*, ed. John H. Bishop, (Columbus, Ohio: National Center for Research in Vocational Education, 1985).
- Robert M. Costrell, "A Simple Model of Educational Standards," *American Economic Review*, vol. 84, no. 4, (1994) pp. 956-971.
- ³⁷ Increased Carnegie unit requirements are also likely to raise the number of students who remain in high school for a 5th or 6th year. Its not clear which effect is larger, so there is no way of predicting whether increased graduation requirements will increase or decrease the ratio of students enrolled in high school to the number of 14-17 year olds.
- ³⁸ D. T. Miller and M. Ross, "Self-serving biases in attribution of causality: fact or fiction?" *Psychological Bulletin* (1975), pp. 82, 213-225.
- M. Zukerman, "Attribution of success and failure revisited: or The motivational bias is alive and well in attributional theory," *Journal of Personality* (1979), pp. 47, 245-287.
- R. Buehler, D. Griffin, and M. Ross, "Exploring the 'Planning Fallacy': Why people underestimate their task completion times?" *Journal of Personality and Social Psychology* (1994), pp. 67, 366-381.

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- ³⁹ Tabulation of Educational Excellence Alliance survey data collected from 3949 tenth grade students in New York, New Jersey and Ohio who had failed one or more state graduation exams.
- ⁴⁰ Dean Lillard and Phillip DeCicca, "Higher Standards, More Dropouts? Evidence within and across Time" (Forthcoming in *Economics of Education Review*, 2000), pp. 1-33.
Dean Lillard and Phillip DeCicca, "The Effects of State Graduation Requirements on High School Dropout Decisions" (College of Human Ecology, Cornell University 1997a), pp. 1-27.
Dean Lillard and Phillip DeCicca, "State Education Policy and Dropout Behavior: An Empirical Investigation" (College of Human Ecology, Cornell University, 1997b) pp. 1-23.
- ⁴¹ The population of 17 year olds was used as the base rather than 18 year olds because the number of 18 year olds may be inflated by in-migration of college students and military personnel. The sample included 49 states plus the District of Columbia. Hawaii was not included because we could not control for the effects of Pacific Islander ethnicity. The majority of Hawaiian students report Pacific Islander ethnicity and these students are significantly more likely to drop out than local Whites and Asians. United States Census Bureau, 1990 Census
National Center for Education Statistics, "Education in States and Nations" (U.S. Department of Education, 1991).
- ⁴² These controls for school characteristics and region may not be sufficient to avoid omitted variable bias. States and school districts with such exams may be different along unmeasured dimensions that have direct effects on graduation rates, college attendance and wage levels. A positive selection bias is unlikely, however, because most states appear to have adopted MCEs as a response to a perception that the state's schools were failing to teach basic skills. By 1992 MCEs had been adopted by every southern state except Arkansas and Oklahoma. With the exception of New Mexico, none of the Mountain, Plains or Midwestern states had established a MCE prior to 1992. National Center for Educational Statistics, *The Digest of Education Statistics: 1993* (US Department of Education, 1993), p. 149.
- ⁴³ Other traits that increased the risk of not graduating were "parents are divorced," living in a single parent family, smoking in 8th grade, high levels of reading for fun in 8th grade, many siblings, working for pay in 8th grade and attending a large high school. Traits that significantly lowered the risk of not graduating were socio-economic status of parents, Asian, Catholic religion, attending a Catholic high school, attending a high SES high school and attending a high school whose students had high test scores in 8th grade.
- ⁴⁴ Jessica Sandham, "Florida driver's license revocations improve attendance," *Education Week*, April 26, 2000, p. 28. When, for example, West Virginia established effective enforcement mechanisms for their "no attend, no drive" policy, there was a drop in annual dropout rates from 3.93 percent on average between 1991 and 1996 to 2.87 percent between 1996 and 1999. Event dropout data comes from NCES, *Dropout Rates in the United States in 1996* (1998), various issues of the *Digest of Educational Statistics*, and the West Virginia Department of Education.

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- ⁴⁵ The discrepancy is caused in part by the exclusion of incarcerated youth from the CPS household interview data from which event and status dropout rates are calculated. By contrast, the denominator of the high school graduation ratio includes all 17 year olds whether incarcerated or not. Incarceration rates have been rising, but even if one adds incarcerated youth to the numerator and denominator of the status dropout rates for 18 to 24 year olds, the new ratio would still have fallen substantially during the past 30 years.
- ⁴⁶ Barbara Lerner, "Good News about American Education," *Commentary*, Vol. 91, No. 3, (March 1990), pp. 19-25. and New Jersey Office of Educational Assessment (1990)
- ⁴⁷ E. Mangino and M. A. Babcock, "Minimum competency testing: Helpful or harmful for high level skills," (Presented at the annual meeting of the 1986 American Educational Research Association in San Francisco, California).
- ⁴⁸ Norman Fredericksen, "The Influence of Minimum Competency Tests on Teaching and Learning" (Princeton, New Jersey: Educational Testing Service, 1994), p. 8.
- ⁴⁹ California is not counted as a EOCE/MCE state because (a) the state did not have a MCE graduation requirement, (b) teachers could not use Golden State exam scores in their own grading, (c) other rewards for doing well on the exams were weak and (d) the program was being phased in slowly so by the middle of the 1990s most students and schools were not participating and most participating teachers had not been teaching in the new environment long enough to change their expectations of what students were to achieve.
- ⁵⁰ For models predicting 1996 NAEP scores, the poverty rate was an average of the 1990 Census figure for children under 18 years old, an overall poverty rate for 1991 to 1993 and an overall poverty rate for 1994 to 1996. For models predicting 1998 NAEP scores, the poverty rate was an average of the 1990 Census figure for children under 18 years old, an overall poverty rate for 1992 to 1994 and an overall poverty rate for 1995 to 1997. The parental education index was based solely on the 1990 Census. We did not update the family education index because the small number of CPS respondents in many states made the CPS estimates of state specific changes in years of schooling of adults between 1990 to 1997 unreliable.
- ⁵¹ We also estimated models with separate effects for New York and North Carolina. The finding that EOCE/MCEs had bigger effects in 1996 and 1998 than in 1992 is almost entirely a North Carolina phenomenon. This is reasonable since EOCEs were phased in between 1988 and 1991 so the students taking NAEP tests in 1992 should have had only a year or so of exposure to the backwash effects of EOCEs on teaching in earlier grades.
- ⁵² We also estimated models to test for (1) diminishing (or increasing) returns to additional ways of creating stakes for schools and students and (2) an interaction between MCEs and stakes for schools. The coefficients on the square of the number of different SBR programs was invariably insignificant and almost equal to zero in four of the five regressions. Only for science did the point estimate on the square term suggest diminishing returns for additional programs. None of coefficients on the interaction between MCEs and (rewards + consequences) were statistically significant but the point estimates were all positive and of substantively important magnitude. This suggests that there may indeed be a synergy between stakes for students and stakes for schools.

- ⁵³ Education Commission of the States, "Bending without Breaking: Improving Education through Flexibility and Choice" (1996). was the original source of the 1996/97 indicator variables. A survey conducted by Education Week provided information for 1998 "Quality Counts," *Education Week*, January 11, 1999. The different methods of data collection may be an additional reason for some of the differences. Correlations between the two measures of policy were .57 for the rewards indicators, .56 for the sanctions indicators and .41 for the public reporting index.
- ⁵⁴ Robert Meyer, "Applied versus Traditional Mathematics: New Evidence on the Production of High School Mathematics Skills" Institute for Research on Poverty Discussion Paper 966-92 (1994), pp. 1-62.
- ⁵⁵ The effect of MCE on a C- student is $\Delta T_{Cstudent} = \beta_{MCE} + (-1.26)*\beta_{MCE*GPA}$. The effect on a B/B- student is $\Delta T_{Bstudent} = \beta_{MCE}$. The effect on an A student is $\Delta T_{Astudent} = \beta_{MCE} + (1.07)*\beta_{MCE*GPA}$. To put the figure into a grade level equivalent metric the increase in the test score is divided by .5*(the mean gain in test scores from 10th to 12th grade given in the 8th column of Table 3). For the composite test gain from 10th to 12th grade and C- students, $\Delta T_{Cstudent} = .24$ in test score metric and .24 in grade level equivalent metric.
- ⁵⁶ At the suggestion of a reader of an earlier version of this paper, we re-estimated these models using a non-linear transformation of the theta, the IRT model's prediction of the percent correct, as the dependent variable. Estimates of MCE effects are smaller and less significant when the percent correct transformation of theta is used.
- ⁵⁷ John H. Bishop and Ferran Mane, "The Impacts of Minimum Competency Exam Graduation Requirements on College Attendance and Early Labor Market Success of Disadvantaged Students," Forthcoming in *Civil Rights Implications of High Stakes K-12 Testing*, eds. Gary Orfield and Mindy Kornhaber, pp. 1-41.
- ⁵⁸ Brenner, "High school data to predict work performance," pp. 29-30. [2d reference; see n. 17]
 Dept. of Labor, "General Aptitude Test Battery Manual." [2d reference; see n. 17]
 Hunter and others, "Validity of ASVAB for job performance." [2d reference; see n. 17]
 Hartigan and Wigdor, *Fairness in Employment Testing*. [2d reference; see n. 17]
 Bishop, "Impact of Academic Competencies," pp. 127-194. [3d reference; see n. 16]
- ⁵⁹ Taubman and Wales, "Education as an investment," pp. 95-122. [2d reference; see n. 18]
 Bishop, "Impact of Academic Competencies," pp. 127-194. [4d reference; see n. 16]
 Farber and Gibbons, "Learning and Wage Dynamics," pp. 1007-47. [2d reference; see n. 18]
 Altonji and Pierret, "Employer Learning and Stat. Disc." pp. 1-55. [2d reference; see n. 19]
- ⁶⁰ CBS, (1990, September 6) "America's toughest assignments: solving the education crisis." New York.
- ⁶¹ Richard Murnane, John Willett, and Frank Levy. "The growing importance of cognitive skills in wage determination," *Review of Economics and Statistics*, Vol. 77, no. 2, (May 1995), pp. 251-266.
- ⁶² The Commission on Workforce Quality and Labor Market Efficiency, appointed by the Secretary of Labor, concluded: "*The business community should...show through their hiring and promotion decisions that academic achievements will be rewarded* (p. 9)" and

"National educational and employer associations should work together to develop easily understood transcripts, based on voluntary achievement testing programs, that assess student proficiency in a wide variety of academic and vocational areas (Commission on Workforce Quality and Labor Market Efficiency, Investing in People: A Strategy to Address America's Workforce Crisis. Wash, DC: Dep. of Labor, 1989, p. 12). The Competitiveness Policy Council advocated that "external assessments be given to individual students at the secondary level and that the results should be a major but not exclusive factor qualifying for college and better jobs at better wages (Competitiveness Policy Council, Reports of the Subcouncils, March, Washington, D.C.: Competitiveness Policy Council, 1993, p. 30)."

- ⁶³ Other student characteristics that were associated with significantly lower monthly earnings or lower wage rates were: current attendance at college, female, African American, Asian, handicapped, rural location, Northeastern location, many siblings, and attending a school with a high incidence of free lunch. Monthly earnings were higher for students who had worked for pay in 8th grade, who had an internal locus of control and high self esteem and for students with parents who set tighter limits on behavior in 8th grade.
- ⁶⁴ John H. Bishop, Joan Moriarty and Ferran Mane, "Diplomas for Learning: not Seat Time," *Educational Finance to Support High Learning Standards* (The University of The State of New York and State Education Department, 1998), pp. 56-77.
- ⁶⁵ Bishop John. "Do Curriculum-Based External Exit Exam Systems Enhance Student Achievement?" University of Pennsylvania, , Consortium for Policy research in Education, CPRE Research Report RR-40, 1998, 1-32. John H. Bishop, "Nerd Harassment, Incentives, School Priorities and Learning," *Earning and Learning*, ed. by Susan Mayer and Paul Peterson, (Washington, DC: Brookings Institution Press, 1999a). John H. Bishop, "Are National Exit Examinations Important For Educational Efficiency?" *Swedish Economic Policy Review*, (1999b).
- ⁶⁶ There are probably two reasons why the NELS-88 analysis gets larger estimates of the negative effect of MCEs on graduation rates. First, our model lacks controls for the number of courses students must take and pass to graduate. Since the two policies are positively correlated, some of the impacts of course requirements may be captured by the MCE variable. Second, our analysis of NAEP scores suggests that states with MCEs have higher 8th grade test scores. Students with higher 8th grade test scores are more likely to complete high school. Consequently, by controlling for 8th grade test scores and GPA, we do not give the MCE credit for the positive effects it has had on graduation probabilities that operate through enhanced 8th grade achievement.