



Are Expectations Alone Enough? Estimating the Effect of a Mandatory College-Prep Curriculum in Michigan

We examine the effects of a rigorous high school curriculum designed to improve educational outcomes and prepare high school graduates for college-level courses.

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Key Findings

- 1 This brief demonstrates the difficulty in estimating the effect of a program that is launched simultaneously across a state and underscores the benefit of pilot testing new policies whenever possible.
- 2 Our analyses suggest that the higher expectations embodied in the Michigan Merit Curriculum has had little impact on student academic outcomes. The only clear evidence of a change in academic achievement comes from the students' scores on the ACT science exam, with students who entered high school with the weakest academic preparation improving at a faster rate than their peers.
- 3 The policy may have led to a small reduction in high school graduation, concentrated among students who entered high school with the weakest academic preparation. However, the evidence on this point is sufficiently inconclusive that we suggest readers take this result with caution.

Introduction

One common refrain in the education reform movement is that expectations play an important role for student outcomes. The idea is that students rise to the expectations they are held to, high or low. George W. Bush made the idea famous when lamenting “soft bigotry of low expectations;”¹ but a belief in the importance of high expectations isn’t the domain of any one party. In 2014, the progressive Center for American Progress pointed to the positive correlation between teacher expectations and students’ likelihood of completing college as evidence of the value of states raising expectations for their students by putting into place rigorous curricula such as the Common Core State Standards.²

Even before the Common Core, though, states throughout the country began to raise expectations by implementing college preparatory curricula. Michigan became part of this movement to increase rigor when Governor Jennifer Granholm signed legislation to create the Michigan Merit Curriculum (MMC) in April 2006. By raising graduation requirements to include four years of math and English and three years of science and social studies, lawmakers hoped to equip students with the knowledge to succeed in the world waiting for them after high school.³ See Table 1 for all MMC requirements.

In Michigan, these new requirements meant many students would be taking courses — especially in mathematics and science — that their peers in previous cohorts had not covered. For example, an internal department survey of school districts demonstrated that before the requirements were in place, only about a third of Michigan schools reported requiring four years of math or three years of science, a new requirement of the Michigan Merit Curriculum. Though many more schools previously required four years of English (roughly 60 percent), the new requirements raised standards for a substantial number of schools in this subject area as well.

Table 1:
Michigan Merit Curriculum High School Graduation Requirements

Mathematics: 4 credits	
Algebra I	Geometry
Algebra II	1 math course in final year of HS
English Language Arts: 4 credits	
English Language Arts 9	English Language Arts 11
English Language Arts 10	English Language Arts 12
Science: 3 credits	
Biology	Chemistry or Physics
One additional science credit	
Social Studies: 3 credits	
½ credit in Civics	½ credit in Economics
U.S. History and Geography	World History and Geography
Physical Education and Health: 1 credit	
Visual, Performing, and Applied Arts: 1 credit	
Online Learning Experience	
World Language: 2 credits (Class of 2016)	

However, the MMC involved few changes beyond the introduction of the new standards. While the requirements of the MMC are extensive, state oversight of compliance is relatively limited. The state does provide a detailed framework for each required course, including instructional guidelines, but implementation of these standards and enforcement of curriculum requirements are local responsibilities. Districts and schools write and administer their own course assessments, which can consist of (for example) a final exam, a portfolio, a project, or a series of tests given throughout the course. The state does not audit these assessments or student transcripts to confirm that the MMC is being followed. The state does require that all students take (but not pass) the Michigan Merit Exam (MME) in 11th grade. The MME⁴ consists of the ACT college entrance examination, components of the ACT's WorkKeys[®] job skills assessment, and Michigan-developed assessments in mathematics, science, and social studies.

The MMC implementation can help us test the power of expectations on student achievement. Moreover, it serves as a window into what states might expect as they implement the Common Core standards.

Background

It is possible to imagine both positive and negative effects of a curriculum change like the MMC. On one hand, many believe in the power of high expectations to increase achievement among students. Perhaps with clear, high expectations for what students need to do to graduate, students, teachers and schools might rise to the occasion and maintain the same graduation rate, while leaving students better prepared for their post-secondary experiences. On the other hand, making any task harder may mean that fewer people are able to accomplish it. And of course there is also the possibility that some combination of the two would occur; perhaps fewer students would graduate, but those who do would have learned more.

These competing theories reveal the many potential mechanisms through which increased graduation requirements can affect student outcomes. Researchers have examined the effects of rigorous coursework, both voluntary and required, in a variety of contexts, and their work can help inform our understanding of the apparent effects of the MMC. First, there is a strong association between successful completion of math and science classes with improved short term academic and social outcomes⁵ and increased college attendance, particularly at four-year schools.⁶ But the association of rigorous coursework with positive outcomes is not limited to the short term; evidence is increasingly showing that certain core courses, especially in math and science, are correlated with better long-term job prospects for students.⁷ Though not necessarily causal, these pieces of evidence are at least consistent with a story of rigor improving student outcomes.

Still, this evidence largely examines the association between students *electing* to take more rigorous courses and their future outcomes. Would the relationship be the same when students are *required* to take harder classes? Prior research on reforms similar to the MMC finds little evidence of positive academic effects and a good bit of evidence suggesting that the graduation rates declined, at least in the short term. One 2001 national study found that graduation requirements increased dropout rates.⁸ Similarly, the literature on high school exit exams, which require students to pass an exam or set of exams to graduate, strongly suggests that such policies increase dropout rates,⁹ with scant evidence of any attendant increase in student achievement.¹⁰

Two studies in particular shed light on how requiring more rigorous high school courses influences student outcomes. In 1997, the Chicago Public Schools implemented a college-prep curriculum that required students to take, among other coursework, Algebra I and English I in 9th grade. Studying this

change, the Consortium on Chicago School Research found that the requirement induced much greater similarity in course-taking habits between students of different races and achievement levels than had previously been observed.

This newfound parity in course-taking came with a downside, however. Average grades in Algebra I dropped, and failure rates for the course increased. In the medium and longer term, students affected by the policy did not see any change in standardized test performance or likelihood of college-going. Finally, high school graduation rates in Chicago in the years immediately following the new policy declined sharply, but ultimately recovered to their pre-policy levels.¹¹

In 2005, Illinois implemented similar requirements within all public schools in the state. In this case, the state required students to complete three years of math and two years of science to graduate. Though this seems to have resulted in students increasing their science course-taking, the policy induced no change in their math course-taking patterns, college attendance rates, or science achievement scores.¹²

Data and Methods

To examine the effect of the MMC, we compiled a student-level longitudinal dataset¹³ that tracks all public school students in Michigan from kindergarten through college. The Michigan data includes nearly a million observations of students entering high school from the academic year (AY) 2003-04 through 2009-10. This data incorporates information on student enrollment, demographics, academic achievement as measured by standardized assessments such as the MEAP and ACT, and high school completion. In order to account for changes in the local economy, we included annual county-level unemployment rates as well as measures of per pupil spending at the school and district level each year.

For our analysis, we examine eight cohorts of Michigan students, from students who entered high school in 2002-03 through 2009-10, with students entering in 2007-08 being the first group for whom the new requirements were mandatory. The inclusion of cohorts that experienced high school both before and after the policy change allows us to explore the effects of the reforms.¹⁴ We utilize two complementary analysis strategies.

In the first, we use the detailed student-level data to examine how student achievement and high school graduation changed after the introduction of the new requirements. In the second, we utilize publicly available data to compare high school graduation trends in Michigan with analogous trends in a set of comparison states that did not introduce MMC-like reforms during the same period.

As we show below, there were important changes in outcomes even before the implementation of the MMC, likely due to changing local economic conditions and other education reforms in the state. For this reason, we carefully explore the *trends* in student and achievement that existed prior the MMC, and then look at whether these *trends* changed in any noticeable ways after the new requirements became mandatory.

For example, if student achievement levels are trending upward each year, we would expect them to continue to rise in the year following the policy, based solely on the existing trend in achievement. The question that interests us is whether the policy *changed* the existing trend in some way. Does student achievement not only increase, but increase more steeply after the implementation of the MMC? Does the downward trend in dropout rates in Michigan slow down following the implementation of the graduation requirements? After controlling for any changes in students, schools, and districts that we can measure, we attribute any such differences between the pre-policy trend and the post-policy trend to the effect of the policy.

Findings

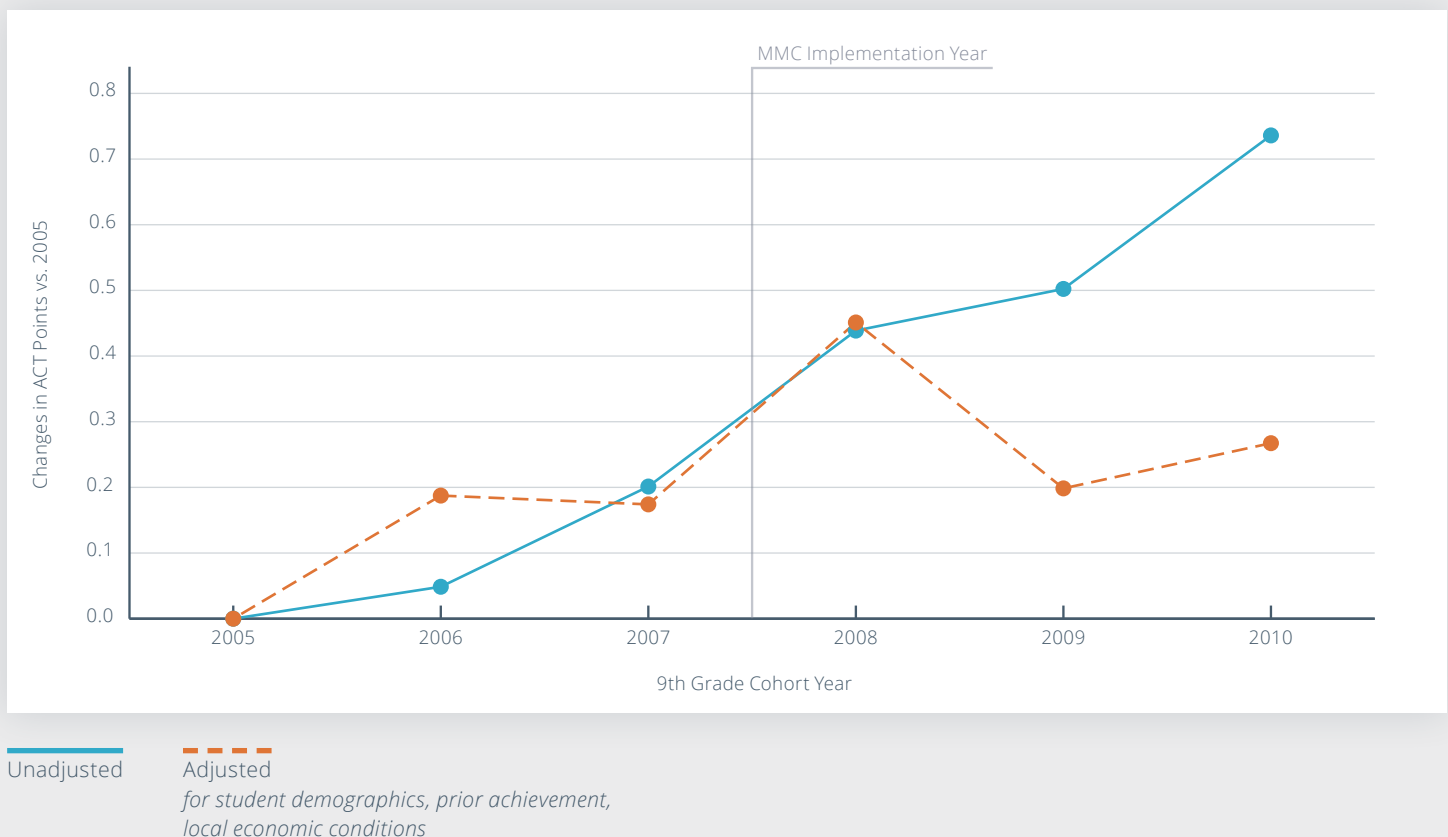
In this brief, we present results for high school achievement and graduation. In subsequent work, we will explore college enrollment, performance and graduation.

High School Achievement

Turning first to the effect of the MMC on student achievement, we use the composite and subject-specific ACT scores of Michigan students to measure student learning. As is clear from the trend in ACT scores shown in Figure 1, ACT scores in the Michigan were rising in the years before the new requirements

took effect. Focusing on the solid line in this figure, which shows the ACT scores before controlling for any student or school characteristics, we see ACT scores improving steadily in each year. Students who entered high school in 2009-10 averaged nearly a 20 on their ACT, while their 2004-05 counterparts scored just below 19 on average.

Figure 1: Change in Score in ACT Composite, All Students



Notes:

The graph represents the average change in ACT composite score for students who entered 9th grade between 2005 and 2010. All scores are normed to 2005 as the baseline year.

The unadjusted line represents raw scores while the adjusted line controls for student demographics, prior achievement and local economic conditions.

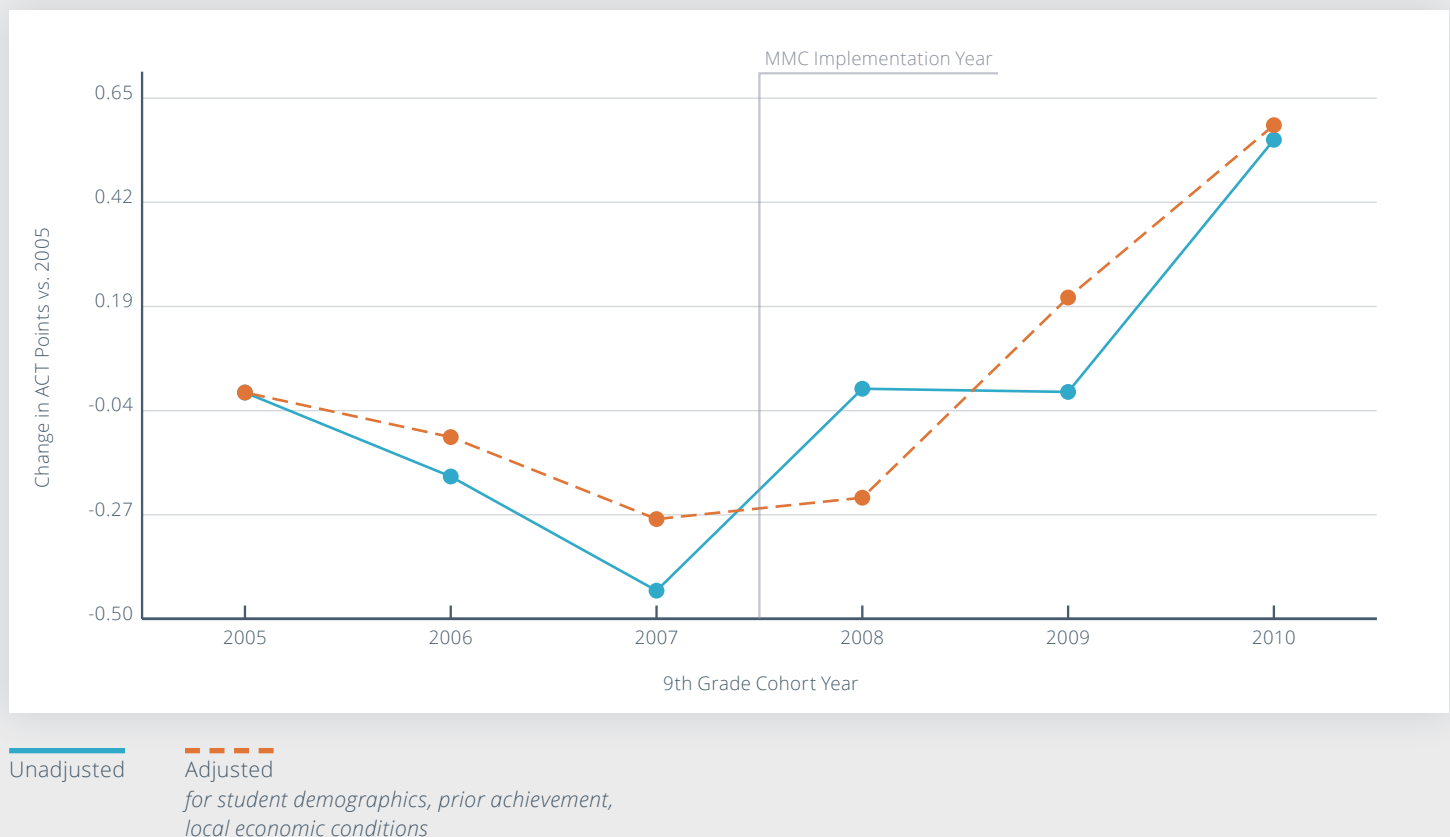
The sample consists of 727,776 student records from the student-level longitudinal dataset, excluding students without 8th grade test scores. Between 16-19 percent of each cohort were excluded from the analysis due to lack of 8th grade test scores.

While this is good news, the upward trend makes a simple before-after analysis misleading because whatever factors were driving the increase in ACT scores before the MMC went into effect were likely still at play after the change to the new curriculum. Thus, to make a fair comparison across time periods, we must adjust for changes to the economy and any other changes in Michigan that could affect students and schools. This is demonstrated by the dashed line in Figure 1. Relative to the solid line, the dashed line shows notably lower scores for the 2009 and 2010 cohort. The reason for this is that these students entered high school with higher

math scores than prior cohorts and for this reason, all else equal, we would have expected them to score even higher on the ACT than they did. After controlling for preexisting trends and student and school background characteristics, we find very little evidence of any effect of the graduation requirements on ACT scores.

While there are slight, marginally significant or significant gains on composite, science and reading ACT scores, even the largest positive effect we see — that for science — amounts to a very small positive change in scores of about .2 of a point overall. However, as shown in Figure

Figure 2: Change in Score in ACT Science, Least Prepared Students



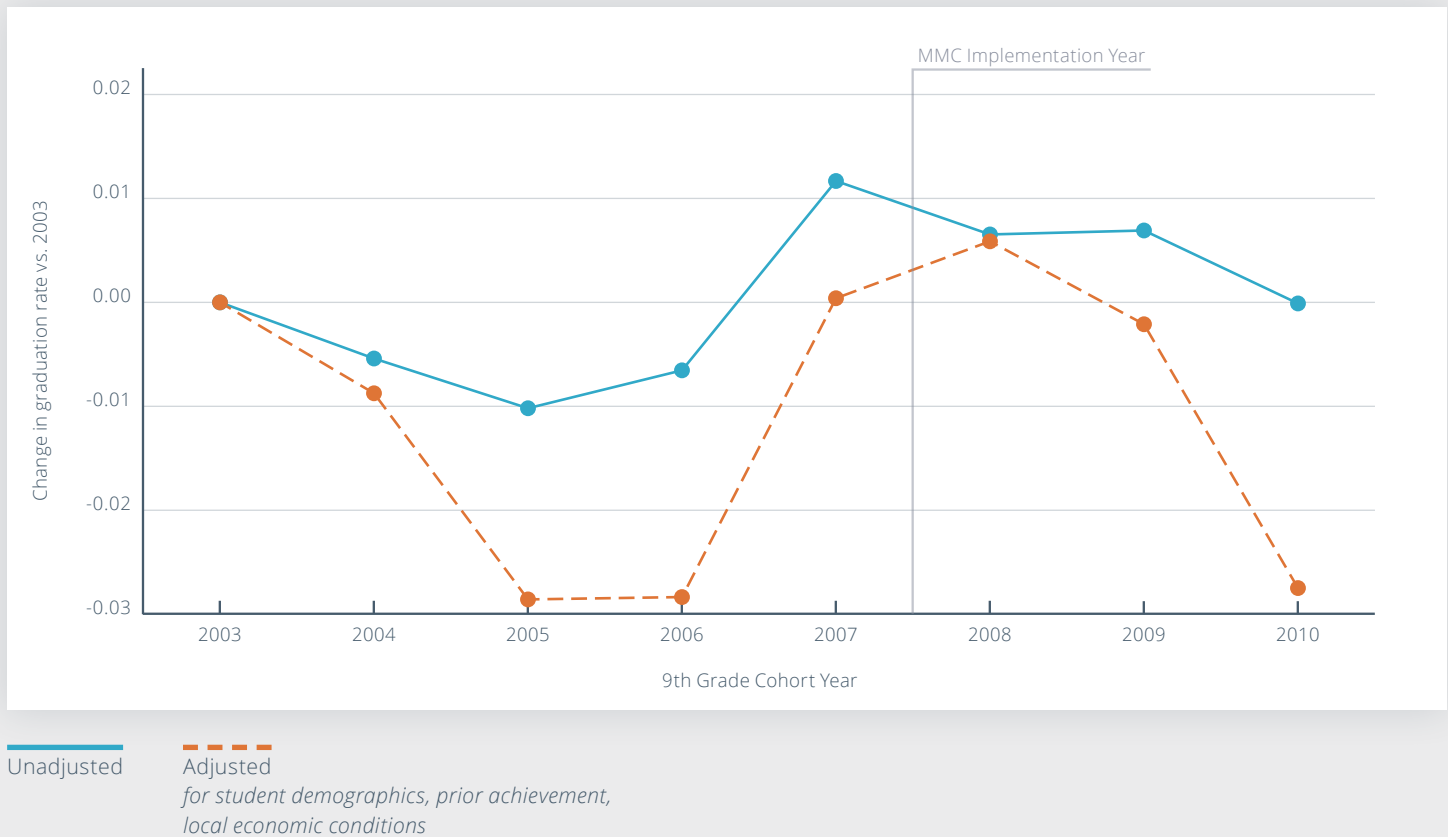
Notes:

The graph represents the average change in ACT science score for students who entered 9th grade between 2005 and 2010 and were in the lowest quintile of academic performance, based on 8th grade test scores.

All scores are normed to 2005 as the baseline year. The unadjusted line represents raw scores while the adjusted line controls for student demographics, prior achievement and local economic conditions.

The sample consists of 159,770 student records from the student-level longitudinal dataset, excluding students without 8th grade test scores. Between 16-19 percent of each cohort were excluded from the analysis due to lack of 8th grade test scores.

Figure 3: Change in Five-Year Graduation Rate, All Students



Notes:

The graph represents the average change in five-year graduation rates for students who entered 9th grade between 2003 and 2010. All scores are normed to 2003 as the baseline year.

The unadjusted line represents raw scores while the adjusted line controls for student demographics, prior achievement and local economic conditions.

The sample consists of 960,830 student records from the student-level longitudinal dataset, excluding students without 8th grade test scores. Between 16-19 percent of each cohort were excluded from the analysis due to lack of 8th grade test scores.

2, we see very positive effects for students in the bottom quintile of academic performance (based on 8th grade math scores). When we adjust for student demographics, prior academic achievement and economic conditions, we observe that Michigan's least prepared students reversed an earlier downward trend and, instead, increased their average ACT science scores in the years after MMC implementation.

When we examine the same effects with slightly different analysis methods (not shown here), the story changes very little. Because of concern that

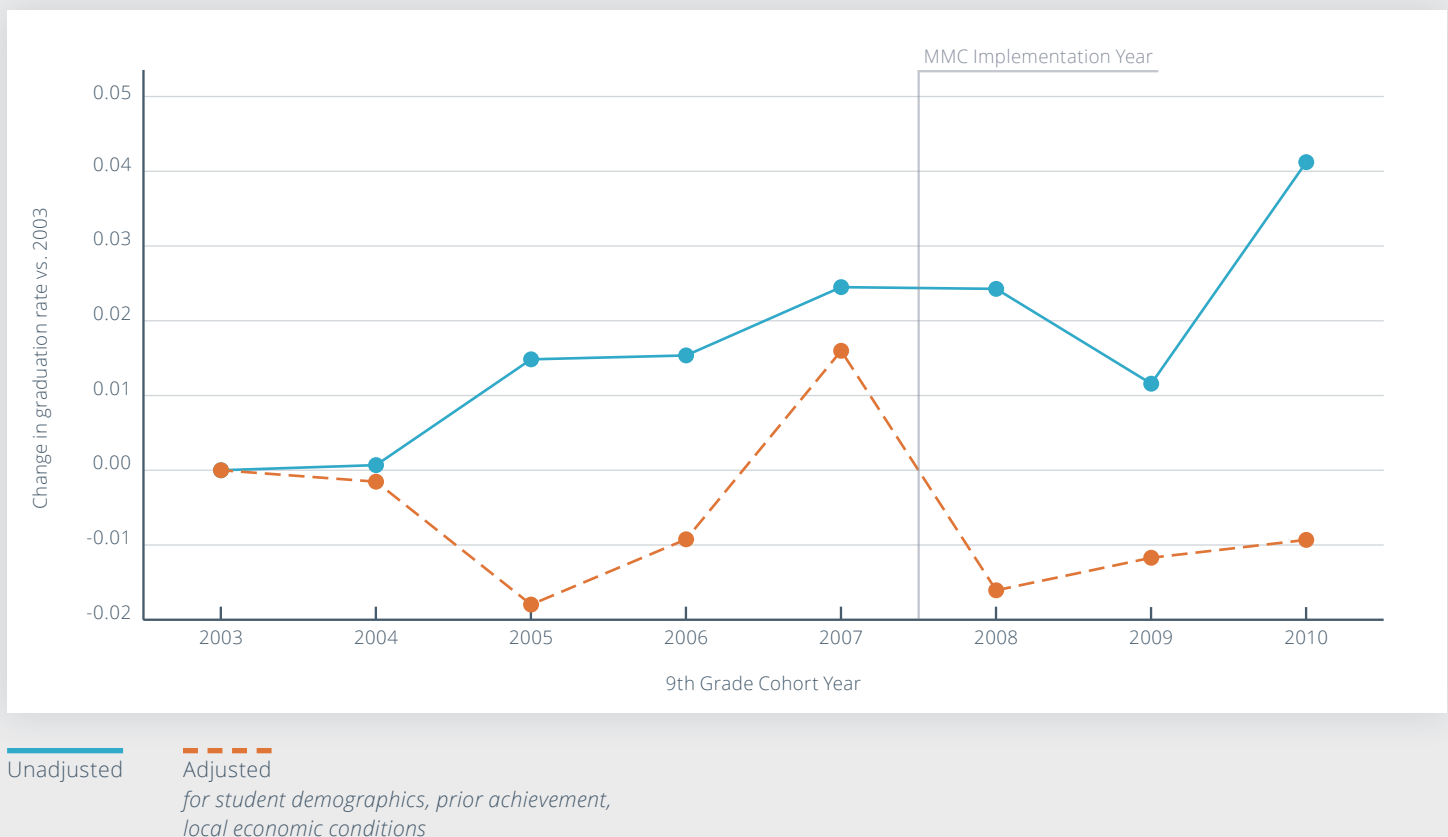
changes in ACT test results over time may be due to changes in the testing instrument, economic or other factors, we compared Michigan's results to trends nationally as well as to other states where the ACT is mandatory. Through this careful analysis we again see small but significant gains in science. When we examine the results of the Michigan Merit Exam, a state exam administered to 11th graders in Michigan that has the ACT as one of its components, the results are again quite similar, with the only modest positive gains in science.

High School Graduation

Turning next to high school graduation, Figure 3 shows that graduation rates in Michigan varied considerably prior to the introduction of the MMC. The solid line – which shows the unadjusted five-year graduation rate for our analysis sample – declined slightly from 2003 to 2005 and then increased sharply in 2007. The dashed line — which shows the trend after controlling for changes in student demographics, prior achievement and local economic conditions — shows an even more accentuated pattern.

As in the case of student achievement, our method for determining the effect of the MMC depends crucially on pinning down the trend in graduation rates *before* the MMC. Unfortunately, the fact that the trend in graduation rates prior to the MMC was so variable makes any estimate of the MMC effect highly sensitive to small changes in the sample or specification. For example, if we assume that the sharp increase in graduation rates in 2007 should have continued, we would conclude that the introduction of the MMC reduced high school completion. If, on the other hand, we take into account the entire period from 2003 through 2007,

Figure 4: Change in Five-Year Graduation Rate, Least Prepared Students

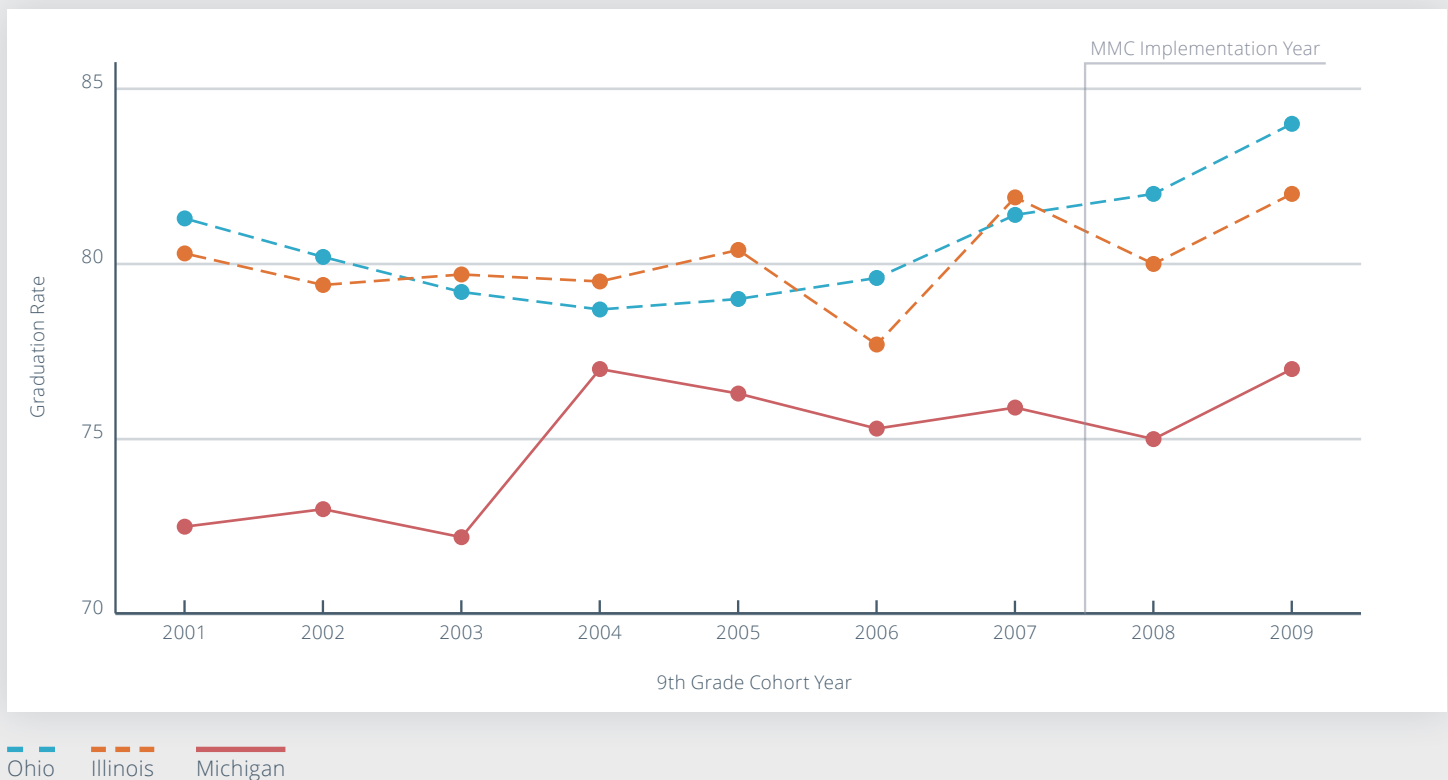


Notes:

The graph represents the average change in five-year graduation rates for students who entered 9th grade between 2003 and 2010 and were in the lowest quintile of academic performance, based on 8th grade test scores. All scores are normed to 2003 as the baseline year. The unadjusted line represents raw scores while the adjusted line controls for student demographics, prior achievement and local economic conditions.

The sample consists of 207,058 student records from the student-level longitudinal dataset, excluding students without 8th grade test scores. Between 16-19 percent of each cohort were excluded from the analysis due to lack of 8th grade test scores.

Figure 5: Four-Year High School Graduation Rates, by Cohort



Note:
The figure shows the unadjusted 4-Year Average Freshman Graduate Rate (AFGR) for Michigan, Ohio and Illinois. Data is collected by the National Center for Education Statistics (NCES) as part of the Common Core of Data (CCD).

the jump in 2007 might appear to be an anomaly, in which case we could conclude that the MMC had no substantive effect on high school completion.

Figure 4 shows the trends in five-year high school graduation rates for students who entered high school with the lowest academic preparation based on their 8th grade math scores. For this group, the drop from 2007 to 2008 is much starker, and the overall trend is more suggestive of a negative impact.

An important assumption in the analysis above is that, in the absence of the new graduation requirements, high school graduation would have continued along its prior path. However, in Michigan (and the nation) over the period of our study, the

rapidly deteriorating economic conditions caused by the Great Recession may well have changed the likelihood that students graduate from high school. If it did, and we were unable to fully control for its effect through our adjustment for economic conditions, we would erroneously count the effect of the recession as part of the effect of the MMC.

To guard against this and any potential changes beyond the MMC that could affect graduation rates, we also compare the trends in educational attainment in Michigan to the trends in a set of comparison states. We use the four-year Average Freshman Graduate Rate (AFGR) collected by the National Center for Education Statistics (NCES) as part of the Common Core of Data (CCD). While

this measure has several limitations, it is the best available information for this type of analysis.¹⁵

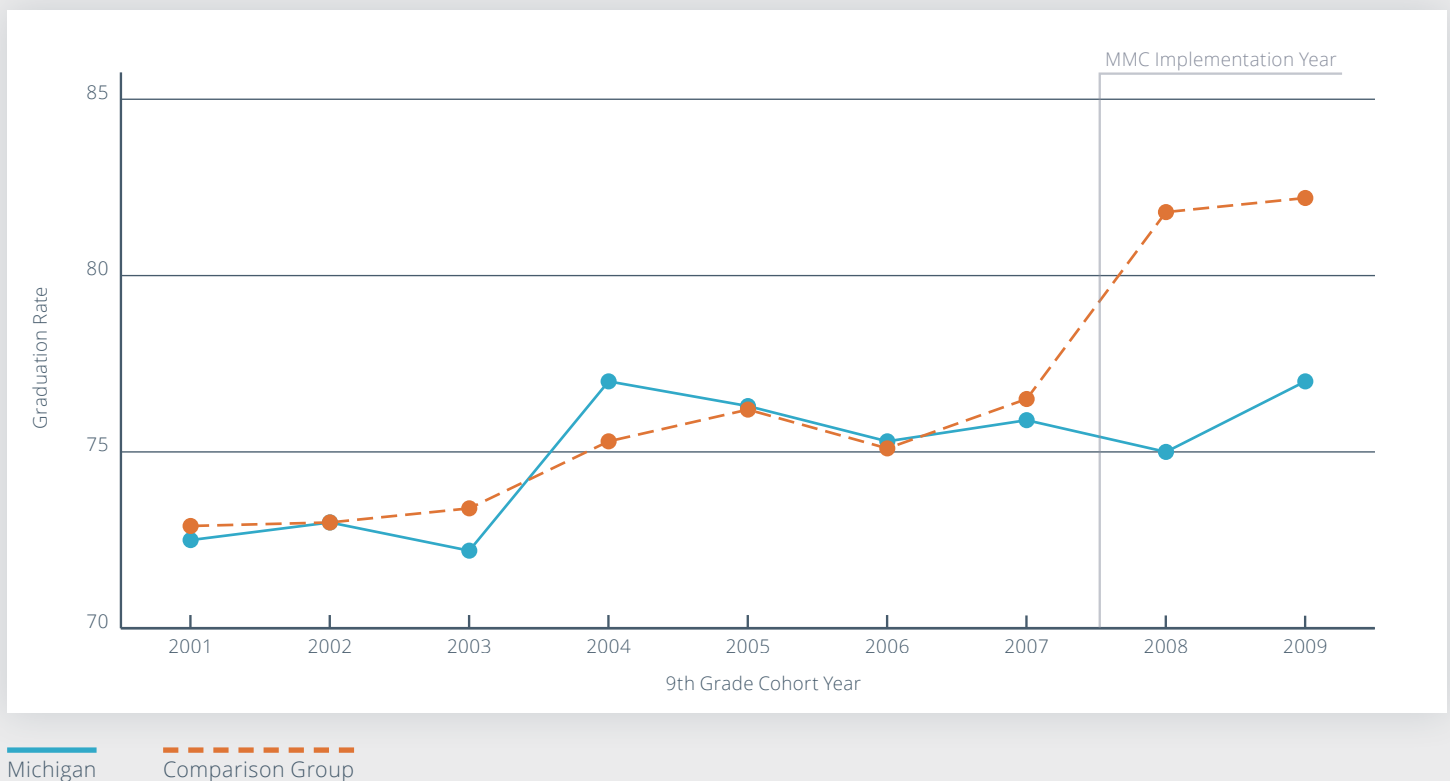
Figure 5 shows the four-year AFGR for Michigan (solid red line) along with the analogous trend for Ohio (long-dashed blue line) and Illinois (short-dash orange line).¹⁶ Focusing at the changes around the time of the policy implementation (shown by the solid black vertical line between 2007 and 2008), we do not see any clear evidence to suggest that the new course requirements had an important impact on high school graduation.

At the same time, the level and trends of high school graduation prior to 2008 appear different in Michigan relative to Ohio and Illinois, suggesting that despite their geographic proximity these states may not be

the best comparisons for Michigan. As an alternative, we use a statistical technique to choose a set of comparison states that best matched Michigan prior to the policy reform.¹⁷ Figure 6 plots the trends in four-year AFGR for this group. Here it appears that high school completion rates in Michigan declined by roughly 5 percent relative to the comparison states after the introduction of the new requirements.

Despite the difficulties in pinning down a precise effect of the MMC on graduation rates, it seems clear that the new standards did not have a positive effect on graduation rates for Michigan students. And for the least prepared students, the evidence suggests that the new requirements may have slightly reduced high school completion.

Figure 6: Four-Year High School Graduation Rates



Note:

The figure shows the unadjusted 4-Year Average Freshman Graduate Rate (AFGR) for Michigan and a set of comparison states. Data is collected by the National Center for Education Statistics (NCES) as part of the Common Core of Data (CCD).

Conclusion

This brief demonstrates the difficulty in estimating the effect of a program that is launched statewide and underscores the benefit of pilot testing new policies whenever possible. If the MMC had been implemented on a pilot basis in a limited set of schools, we might have been able to more precisely identify when, and for whom, the policies were most and least effective. Armed with this knowledge, policymakers could have subsequently launched a modified program, flexible to the needs of students across achievement levels, statewide.

Moreover, our study of the MMC provides a good test of the hypothesis that increasing expectations, in and of itself, improves outcomes for students. If increasing standards in Michigan had indeed given students the missing vote of confidence they needed to ignite new levels of achievement, we would expect to see positive effects on both our achievement and attainment outcomes.

Unfortunately, our evidence shows that the introduction of the MMC had a small positive effect on science achievement and little evidence of any effect in other subjects. Increased expectations also seem not to have had any positive effects on high school graduation rates and may well have had a significant negative effect on the least prepared students.

Also important for policymakers to consider are the differential effects of this change on students of different achievement levels. Though our best estimates of the MMC's impact show that lower achievers demonstrate the largest gains in academic achievement, they also suffer the most in attainment. And the academic gains are quite small compared to our best estimate of the decline in graduation rates.

We conclude that, though high expectations for students are likely a necessary condition for student success, Michigan's experience with the MMC suggests that increasing standards alone is not sufficient for improving student outcomes.

End Notes

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13. This research is the result of the Michigan Consortium for Educational Research, a collaboration between the Michigan Department of Education, Center for Educational Performance and Information, University of Michigan and Michigan State University, which is supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305E1000008 to the University of Michigan. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.
14. We examine all students in the state of Michigan except those that are missing 8th grade achievement scores. Excluding these students means that we do not study between 16 and 19 percent of each cohort.

15. Other measures, such as the Average Cohort Graduate Rate (ACGR) are more reliable, but are not available for our entire time period. For a full discussion of the limitations of the AFGR and other measures of educational attainment, see: Heckman, J. & LaFontaine, P. (2010). "The American High School Graduation Rate: Trends and Levels," *The Review of Economics and Statistics*, 92(2), pages 244-262. Because AFGR data on subgroups, such as African-American and Hispanic students, appears extremely unreliable, we do not present it here.
16. The notable increase in graduation rates for the 2004 cohort of 9th graders in Michigan is not apparent in the student-level data, and we suspect it may be due to changes in the quality of data reporting at the time.
17. For more description on this method, see the longer technical report accompanying this brief, "Are Expectations Alone Enough? Estimating the Effect of a Mandatory College-Prep Curriculum in Michigan" that can be found here: <http://edpolicy.umich.edu/publications/#working-papers>.

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The Michigan Consortium for Educational Research

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