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The Effects of Merit Awards on District-Level High School Graduation: Evidence From Michigan

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To the Graduate Council:

I am submitting herewith a thesis written by Brandon Lee Harrison entitled "The Effects of Merit Awards on District-Level High School Graduation: Evidence From Michigan." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Economics.

Matthew N. Murray, Major Professor

We have read this thesis and recommend its acceptance:

Celeste K. Carruthers, Christian A. Vossler

Accepted for the Council:

Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

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**The Effects of Merit Awards on
District-Level High School
Graduation: Evidence From
Michigan**

A Thesis Presented for

The Master of Arts

Degree

The University of Tennessee, Knoxville

Brandon Lee Harrison

August 2012

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I dedicate this research to anyone who has had to overcome disparity to reach their educational goals.

I also dedicate this and give special thanks to my family and friends who have supported me in any way over the years.

To my mother, April and my siblings, Brittany, Brooke, and Trevor: You are the best!

To Joe: You are one of the few people in my life that has said out loud, “I am proud of you, Brandon.” Ne’er shall I forget that and I strive to make you even prouder.

To my late Grandma Ada, my childhood mentor, who always said, “It’s okay to be smart, Brandon, but not a smart aleck.” Grandma, I think I have succeeded at both depending on who is defining ‘smart’ and ‘smart aleck.’

To my late Aunt Ruby and late Uncle Carl: Your support when I was young has never gone unrecognized. A day does not go by that I don’t think of you. I hope I have made you both proud.

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Whatever the cost of our libraries, the price is cheap compared to that of an ignorant nation. Walter Cronkite

Abstract

This paper considers the effects of the Michigan Merit Award, a college scholarship program, on high school graduation rates. Students qualify via a standardized high school proficiency exam. Identification is achieved through difference-in-differences estimation using both a broad set of controls and a stricter set of controls. The effects on graduation rates differ depending on the model specification, as some significant results show a positive correlation between the introduction of the program and graduation rates, while others a negative effect. Where it appears the award increased graduation rates, pinpointing the exact impact of the award on graduation levels is difficult because it appears that some of the gains in Michigan were continuations in existing trends. Other significant results shed some more light on educational inputs and their effects on graduation. Results are inconclusive on net, but tend to reject the notion that the award led to increased graduation rates.

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Chapter 1

Introduction

This paper studies the effects of a particular merit-based scholarship program on district-level graduation rates in the State of Michigan. This introduction provides an overview of the field of education economics, discuss some seminal research in the field, and brings to light some recent research related to merit aid. While most research in this field has studied the effect of merit awards on gains in college attendance and/or completion, the contribution of this paper is different. Rather than looking at how scholarship programs effect college attendance, this paper focuses on the effects of scholarship awards on a step required to go to college: high school graduation.

A difference-in-differences estimation approach is utilized with both a broad set of control districts and a stricter set, controlling for various factors that may affect graduation rates. Three different model specifications will be used in this study applied to a larger set of controls and also a stricter set of controls. Some specifications find that the introduction of the Michigan Merit award is associated with higher graduation rates. Another specification finds that these increases may be continuations of pre-existing upward trends in graduation rates. Still another specification finds that the introduction of the award program was associated with lower levels of graduation rates in Michigan.

1.1 Beginnings of Education Economics

“Educational production functions” is one approach for studying the impacts on educational outputs used by economists. The output in an educational production function is achievement. This refers to some sort of cognitive output, or more concretely, some academic achievement like high school graduation, college attendance, labor market outcomes, or standardized test scores. The inputs to this type of function include things like family, schools, peers, neighborhoods, innate ability, etc. The idea of education production functions was prompted by the Coleman Report, named after the lead sociologist who did the study in 1966 (Coleman et al., 1966). Many argued that this study provided evidence that school funding has little effect on student achievement, while others pointed out the the study reports that student background and socioeconomic status are more important in determining student outcomes. The notion that increased resources, particularly per pupil spending, has little effect on increasing education outcomes of students was somewhat supported by a work by Eric Hanushek thirty years later (Hanushek, 1996). This study also showed many implications regarding race and educational outcomes that stirred up much controversy at the time. Naturally, this study (funded by the U.S. Department of Education) prompted many more studies and economists became increasingly involved.

1.2 Incentives for Academic Performance

Rewards for good grades are prominent in our society. It could be in the form of a pizza party, a sleepover, a new toy, a trip to the fair, or cash. Apparently many parents recognize the idea that some sort of incentive would entice their child to do better in school. What parents may not have explicitly understood was the underpinnings of economics as they were incentivizing their children as students. Some students may have already done well academically and never had incentives like those mentioned

above offered to them. If a student is already making top grades (e.g., all *As*), incentives are likely to have minimal effect. More often, incentives are given to affect marginal behavior. Oftentimes, an incentive is offered for academic performance to push a student from one grade tier to another. For example, a student that is failing math class may be offered an award to reach a passing grade. In this case, the margin is the grading cutoff between a grade of an *F* and a *D* (e.g., attempting to push a student past the 60% grade). As is common, a student is stronger in some subjects in comparison to others. Perhaps parents would use a tiered system to induce students. For example, each *A* is worth \$20, each *B* is worth \$10, each *C* is worth \$5, and each *D* is worth \$1. These incentives are more likely to work for students on the margin. A student with a *B* in English class may be incentivized to break into the *A* range, a student with a *D* in science class may be incentivized into the *C* range, and so on. In other words, these incentives are intended to affect the marginal behavior of students. A student on the fence about trying harder in his or her classes may be incentivized to do so via incentivizing rewards.

This idea was studied in a recent field experiment in Chicago by a group of economists (Levitt et al., 2012). To better understand incentives that best drive youth to do better in school, they explored various incentive schemes to see what worked best. They explored the short-term effects of incentives on student effort and performance, varying both the size and type of the rewards as well as their framing. They offered these awards (both cash and otherwise) both immediately and with a delay. They concluded that incentives do matter, and the impact of these incentives heightens if framed as a loss. They also concluded that broadening the scope of awards to include both financial and non-financial awards can be beneficial. One of the most important takeaways of this study is that the timing of the payoffs matter significantly. Effort is far removed from payoff for these children. They have a hard time connecting the effort and the award in a useful way if the timing between the two is too vast (Levitt et al., 2012). Although this study focused on younger children,

these results are likely to apply more broadly. More specifically, timing of incentives may very well matter for incentives tied to high school graduation.

A study in Israel examined the effect of incentives on matriculation exams. These exams are a requirement to enroll at a postsecondary institution in Israel. The particular program studied provided cash awards for low-achieving high school students. This intervention offered rewards for both exam completion and performance with direct payments to students. These rewards were randomly assigned to different schools in Israel and the students became aware of the award one-third of the way into the school year, right before a “big push” in studying takes place. The researchers found that these direct cash rewards in low-achieving schools generated substantial increases in the matriculation rates of girls. There seemed to be no effect on boys in general or on girls not on the margin (Angrist and Lavy, 2009). Still, this study shows that incentives can affect education outcomes, especially groups on the margin of passing some necessary exam.

College scholarships work the same way in many aspects. College scholarship awards could very well affect the marginal behavior of students in several ways. A high school student on the fence about going to college may be incentivized via a scholarship program. Since they are making a human capital decision, they have to decide whether to go to college or to enter the workforce. The opportunity cost of attending college is foregone wages that could be made while attending college. Most students are aware that attending college leads to higher lifetime earnings and weigh their options accordingly. Students are also aware of the costs of attending college and make decisions based on the costs. A student may very well want to go to college, but have insufficient funds to do so. A scholarship that pays for a student’s costs may certainly incentivize students like this to attend college. It is important to note that scholarships may be given to students who would have attended college regardless of the existence of a scholarship and would therefore not affect their college-going behavior at all (although it may push students with limited resources to more expensive schools depending on the nature of the scholarship). Oftentimes, college

scholarships are based purely on the academic performance of a student. If a student is certain about attending college at the start of high school, their behavior may very well reflect that intention via academic performance while in high school.

1.3 Merit-Based Scholarship programs

The cost of higher education has risen substantially over the last few decades. The college wage premium has risen 27% between 1993 and 2005 (Mishel et al., 2007). Real tuition and fees at public universities has risen 63%, while the same has risen 43% at private universities (College Board, 2005). Returns to a college degree are great, so more and more students in the United States need access to a college education. Because of the rising costs, financial aid of all sorts has become increasingly important. In 1993, 58.7% of full-time undergraduates received financial aid. That number rose to 76.1% in 2004 (Snyder et al., 2006)¹.

It is a common policy and campaign goal for policymakers and politicians to improve access to higher education. Naturally, the proposed solutions for this issue differ. Some argue for financial aid for low-income students, usually dubbed by the moniker “need-based” financial aid. Others argue for aid based on academic outcomes in secondary education like grades, test scores, etc. This type of educational assistance is usually called “merit-based” financial aid. Still others (or those wanting a compromise) favor a hybrid of these two general types of financial educational assistance. Federal programs like Pell Grants and government-guaranteed (and oftentimes interest-free) loans have been implemented to support access to postsecondary across the nation. A myriad of state and local programs exist for financial assistance for education as well. State programs vary greatly from state to state partly because of political and demographic differences. It may also be that each state’s goals vary as to why they create these financial assistance programs. Heller

¹See Table 320 of this work

and Rogers (2003) posits that states have articulated three primary motivations for the creation of such programs:

1. Many states want to improve access to higher education simply to promote college access and attainment. The scholarship program studied in this paper (the Michigan Merit Award) is an example of this. The law in Michigan that established this award program stated as a goal that the program would “increase access to postsecondary education and reward Michigan high school graduates who have demonstrated academic achievement” (MMA, 1999).
2. It is often true that state programs heavily favor students willing to go to college in their home state in order to keep young, talented individuals in the state from which they came. This is an attempt to “staunch the ‘brain drain’ of the best and brightest students.” Alaska’s UA Scholars Program is an example of this. As the University of Alaska website states, “The UA Scholars Program is designed to help reduce the number of Alaska’s high school graduates who leave the state for education and jobs elsewhere” (Hamilton, 2002).
3. The third primary motivation is to simply encourage and/or reward students who work hard academically. The Florida statute creating its program, The Florida Bright Futures Scholarship Program, states that it was created “to reward any Florida high school graduate who merits recognition of high academic achievement” (Flo, 1999). The website for West Virginia’s PROMISE scholarship, meanwhile, cites other states’ experience as evidence that the program has a motivational effect: “Several other states have found that the quickest and most effective way to motivate students to study harder and to achieve in school is to offer good students the opportunity to attend college tuition free” (PROMISE, 2003).

1.3.1 Economics Literature on Merit-Based Scholarships

In the following sections, several different merit-based scholarships will be discussed. Programs from four different states will be discussed in limited detail. Particular attention will be given to the differing criteria for award attainment. Also, research and findings about these scholarships in the economics literature will be discussed.

Like all purely merit-based scholarship programs, West Virginia's PROMISE (Providing Real Opportunities to Maximize In-State Student Excellence) scholarship is awarded entirely on a student's academic record, not financial need. The state began offering this program in 2002 which covers full tuition and fees for eligible first-time freshmen who enroll full-time at a West Virginia public four- or two-year institution. The award could also be used for an "equivalent amount" at an eligible West Virginia private institution. Eligibility rules have changed several times since the programs inception, and in early 2009, awards were limited to a fixed dollar amount that may not cover full tuition at some institutions. To qualify for the award, incoming college freshmen have to meet both a high school grade point average (GPA) cutoff (3.0 on a 4.0 scale) and an ACT/SAT score cutoff (21 for ACT, 1000 for SAT). (It is important to note that both the ACT and SAT are college entrance exams, not exams to track high school progress.)

[Scott-Clayton \(2011\)](#) studied this West Virginia program and found that it had significant impacts on many end-of-college outcomes, with particularly large impacts on time-to-degree. This author utilizes a regression discontinuity approach. Overall, this paper finds that PROMISE increased the overall BA (bachelor of four-year degree) attainment rate by 1.8 to 2.3 percentage points. This paper also makes clear that incentives matter, as do the details of the incentive design. There is evidence to show that PROMISE would not likely have had the same effect on time-to-degree had it been designed with no or different strings attached to the award.

The Helping Outstanding Pupils Educationally (HOPE) program in Georgia is another example of a merit-based scholarship program. It started in 1993 and is

now argued to be the largest state-run merit scholarship program in the country. A Georgia student qualifies for the Georgia HOPE program by attaining of a B average (3.0/4.0 scale) in a selection of core high school subjects (Mumper, 1999). Former Georgia Governor Miller, the designer of the HOPE program, described the program this way: “This is not about family income. Its saying to a kid and student that if you are responsible and keep a B average, you will have the opportunity to go to college” (Miller, 1993). For HOPE scholars in degree-granting public institutions in Georgia, the program covers tuition, approved fees, and a book allowance. HOPE recipients who decide to attend in-state degree-granting private institutions receive a fixed dollar amount per year for tuition.

Dynarski (2000) studied this program. The results suggest that Georgia’s program has had a surprisingly large effect on the college attendance rate of middle- and high-income youth. Using a set of nearby states as a control group and a difference-in-differences approach, she found that Georgia’s program has likely increased the college attendance rate among 18- to 19-year-olds by seven to eight percentage points. She further found that the program’s effect is concentrated among Georgia’s white students, who experienced a 12.3 percentage point rise in their attendance rate relative to whites in comparison states. The black attendance rate in Georgia did not increase relative to that in comparison states after HOPE was introduced. The racial gap in college attendance in Georgia therefore increased relative to its level in the rest of the Southeast U.S. The evidence also suggests that Georgia’s program has widened the gap in college attendance between those from low-income and high-income families. Cornwell et al. (2006) studied the effects of this program on college attendance in Georgia. According to their analysis (where the authors utilize a difference-in-differences empirical strategy), HOPE has raised the first-time-freshmen enrollment rate in Georgia about 6.9 percentage points, or 9 percent, relative to the rest of the SREB (Southern Regional Education Board)². Second, the overall HOPE effect

²Member states include Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

is split between public and private 4-year colleges, while the coefficient estimate for 2-year schools is small and statistically insignificant. The 4-year results imply scholarship-induced enrollment rate increases of roughly 12 percent at public colleges and 20 percent at private colleges. The paper also concludes that seats vacated by students pursuing 4-year degrees were filled by individuals who would have otherwise entered the labor market.

The Adams scholarship, another merit-based financial reward, uses college high school proficiency exams as a qualifier. All high school sophomores in Massachusetts take the Massachusetts Comprehensive Assessment System (MCAS). The test includes both an English portion and a mathematics portion. The idea of this program was proposed in January of 2004 by then-Governor Romney. The Abigail and John Adams Scholarship program would have waived tuition at in-state public college for any student whose MCAS score placed him or her in the top 25% statewide. The idea was to help ward off “brain drain” and keep Massachusetts’s brightest students in the state for college and particularly, public colleges. Concerned that the program would benefit students from affluent, high-performing areas the most, the Department of Education approved a revised version of the Adams Scholarship Program in October 2004. Under the modified version, a student receives a tuition waiver if his or her MCAS score is in the top 25% of the student’s district, scores in the “advanced” category in one subject, and scores in the “proficient” or “advanced” category in the other subject.

Goodman (2008) found several interesting conclusions about the Adams Scholarship Program. This author, like many others studying scholarship programs, utilized a difference-in-differences approach in this analysis. In its first year, the Adams Scholarship spent \$4 million on tuition waivers for over 3000 students attending in-state colleges. Nearly half of the incoming freshmen classes at University of Massachusetts campuses were scholarship winners. This paper suggests that 800 students, largely from the 60-79th percentiles in academic skill (as measured by MCAS scores) would have attended four-year private colleges had the program not existed.

The paper suggests that this translates into roughly \$5,000 per student was spent to induce student switching to the public university system. With more estimation, the paper suggests the scholarship's primary effect was to move students from in-state private institutions to in-state public colleges. The paper further suggests that the original motivation for the scholarship may have been misplaced because the state does not seem to suffer from "brain drain". The analysis suggests that roughly 5,000 more students enter college in Massachusetts than the state loses to its high school graduates in other states. Even if all 800 switching students would have left the state had the program not existed, the benefits would occur only in the long run if students tended to settle where they attend college. A work by [Groen \(2004\)](#) shows that only 10% of students induced to stay in-state by similar financial incentives will remain in the state's labor market 10 to 15 years later. This would roughly translate into the program adding 80 workers to the workforce every year at a cost of \$50,000 per worker. It seems highly implausible that the benefits to the state in additional tax revenue would exceed this amount ([Goodman, 2008](#)). It is also unlikely that the proportion of college-educated workers would raise enough to induce the positive externalities discussed by [Moretti \(2004\)](#).

Before the start of Georgia's HOPE scholarship, Florida had merit-based scholarships in existence that disbursed the largest amount of merit aid of any state until HOPE came into being. In response to Georgia's HOPE program, Florida created the Bright Futures Scholarship program. Bright Futures consolidated all of Florida's existing merit programs into a single program, while the standards needed to meet an award were lowered. Like many other scholarship programs, Bright Futures funding comes from state lottery revenues. It has no income eligibility gap and awards scholarships for up to four years of undergraduate education. The program has three types of awards, two for use at one of the state's degree-granting institutions (public and private), and one for students attending vocational or technical postsecondary programs ([PEPC, 1999](#)). The criteria include high school GPA requirements, ACT/SAT score requirements, and, in some cases, community

service requirements. In the initial year of the Bright Futures program (1997-1998), \$69.6 million was awarded to 43,244 students. In its second year (1998-1999), it expanded and awarded \$93.3 million to 56,281 students. Then, in 1999-2000, \$131.5 million was awarded to over 70,000 students ([Bureau of Student Financial Assistance, 2000](#)).

1.4 Contribution of this Work

Since the scholarship program studied here uses a high school progress exam as its qualification, students could qualify for the award without any intention of going to college. The standard life-cycle model assumes that student debt has only an income effect on career and other post-college decisions, proportional to the ratio of debt to the present discounted value of total lifetime earnings. Though debt may account for just over one percent of lifetime earnings for a typical college graduate, debt may still matter to young people ([Rothstein and Rouse, 2007](#)). It may matter because of debt aversion ([Burdman, 2005](#)), credit constraints,³ or myopia. Therefore, internal, life-cycle benefits may not be enough to push qualified students into college.

This paper contributes to the existing literature in several ways. This paper studies the Michigan Merit Award scholarship program's effect on *high school graduation rates* rather than college matriculation rates or college completion rates. Another important difference is the fact that the scholarship program studied in this paper is based *solely* on high school tests that measure educational progression, and not a college entrance exam. A student who is on the fence about going to college (or even graduating high school) may very well be incentivized by a merit-based scholarship program where long-term in-class effort in high school may not be necessary. Naturally, there are minimum requirements at most postsecondary

³[Cameron and Taber \(2004\)](#) and [Carneiro and Heckman \(2002\)](#) find little evidence that borrowing constraints during the college-going years are not important determinants of college attendance while [Ellwood and Kane \(2000\)](#) finds that differences in college attendance by family income are partly explained by credit constraints.

institutions for matriculation. However, many students may meet these with “normal” amounts of effort (relative to the individual student). These same students may not have the ability to do better than this or are not incentivized to do better. For these students, college may not seem like a viable option because of the costs associated with attending college. Moreover, some of these students may make the same life-cycle choices about graduating from high school. Some students may feel as if they are “disenfranchised” and may not find the benefits of completing high school enough to induce them to stay in school and graduate. This could certainly be the case if a student’s dream of attending college seems fruitless as they try as hard as they can and still not keep up with the academic requirements necessary for college matriculation. It could also be the case for those students whose aspirations of going to college seem dismal if they perceive their grades in high school to be behind the usual standards of traditional, institution-awarded scholarships. If students perceive that going to college is an impossibility, they may very well leave high school. Graduating high school is an obvious intermediate step to attending college.

Students may not put much effort into high school proficiency exams when there is not an incentive tied to it. School administrators have incentives for the students in their schools to do well, but usually the reward to the student is either small or unnoticeable. It could be the case that students miss school or assume the idea of a “free day” when proficiency exams are given. A reward tied to the exams may incentivize students to try harder (or try at all). A program with a reward tied to these exams, like the Michigan Merit Award, may incentivize students to try harder on the exams. This could be especially true for students with intentions to go to college. This effort may be put forth by the “disenfranchised” students described above because they see both a reward and an increased likelihood of their chances of attending college. These same students may see a benefit in not only giving a wholehearted attempt on the proficiency exam, but staying in school and graduating high school in order to attend a postsecondary educational institution. In other words, the Michigan Merit Award may increase *high school* graduation rates if it does, in

fact, make a difference to students who are otherwise on the margin about attending college and therefore move ahead by graduating high school. Even though the stated goal of the award program studied in this paper was to increase access to college education, there may be unintended consequences associated with this program that affect high school graduation rates. The Michigan Merit Award program itself will be explained in detail in the next chapter.

Chapter 2

Michigan Merit Award

2.1 Michigan Educational Assessment Program

The Michigan Educational Assessment Program (MEAP) is a standardized test taken by Michigan students. MEAP tests were first taken in public schools in the school year 1969-70. It was initially started by Michigan's State Board of Education and was supported by then-Governor William G. Millken. Its goal, as with many standardized tests, is to measure student progress at different points in their academic careers in comparison to state-set standards.

The exam is taken by elementary, middle, and high school students. The exam is required for all Michigan public school students¹ and not necessarily required for private school students. The MEAP exam contains four subject areas: English Language Arts (Reading and Writing), Mathematics, Science, and Social Studies. It should be noted that the MEAP exam was replaced by the Michigan Merit Exam (MME) for high school students in 2007 in response to the No Child Left Behind Act (NCLB) federal legislation passed in 2001. This is outside the time frame of this study and does not affect the analysis. The exam is still taken by students in grades

¹Parents may choose to exempt their children from taking the exams in some cases. Exceptions can also be made for special needs students in Michigan public schools.

3-9. For each of the subject areas tested, students are rated at one of the following four levels:

- Level 1: Advanced (exceeded standards)
- Level 2: Proficient (met standards)
- Level 3: Partially proficient (basic)
- Level 4: Not proficient (apprentice)

Ideally, students score at a Level 2 or above to show adequate proficiency. As with many other standardized tests, schools with too many students scoring low could be penalized by the state while schools with a large proportion of high-scorers could receive financial rewards.

The exam has both multiple choice and open ended questions.

SAMPLE 1

A basketball player earned three times as much money this year as last year. If his contract this year was for \$1.5 million, how much did he earn last year?

- A** \$300,000 **B** \$500,000
C \$750,000 **D** \$4,500,000

The correct answer is \$500,000. You should darken oval **B** for Sample 1 on your answer sheet.

Figure 2.1: Sample Multiple Choice Question

An example of each type of question for the math portion of the exam are shown in Figure 2.1 and Figure 2.2.

SAMPLE 2

Jasmine is doing pushups as part of her exercise program. She did 2 the first day, 3 the second day, and 5 the third day. Each day she wants to do as many pushups as she did on the previous two days combined.

- A Based on the information above, how many pushups would she have to do the sixth day? Extend the pattern through day six to support your answer.

Pattern 2, 3, 5, 8, 13, 21

Jasmine would have to do 21 pushups the sixth day.

- B Is it realistic for Jasmine to continue this program for pushups? Explain your answer. You may extend the pattern further to support your explanation.

Pattern 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377

No, because as the days continue, the combining of the previous two days' number of pushups will start to become excessively large for the average person to do.

For example: Day 10 would be 144 pushups and Day 12 would be 377 pushups if the pattern continued.

Figure 2.2: Sample Open Answer Question

2.2 Passage of the Michigan Merit Award Scholarship Act

In his 1999 State of the State Address,² the then-Governor John Engler of Michigan announced he would introduce legislation to create the Michigan Merit Award. He stated that the award was “for all Michigan high school graduates who master reading, writing, math, and science” (Engler, 1999). Governor Engler proposed that

²January 28, 1999

the program be funded from a portion of the state’s share of tobacco settlement funds. The stated goal of the legislation was “to increase access to postsecondary education and reward Michigan high school graduates who have demonstrated academic achievement” (MMA, 1999). Funding for the program was set by the legislation at 30 percent of the tobacco settlement total in fiscal year 2000, 50 percent in 2001, and 75 percent in 2002 and subsequent years.

2.3 Award Qualifications

The Michigan Merit Award Scholarship Act provided scholarships of up to \$2,500 for students who:

1. Took all four subject area tests
2. Scored at Level 1 (“exceeds Michigan standards”) or Level 2 (“meets Michigan standards”) on all four portions of the Michigan Assessment Program High School Test (MEAP HST).³

The MEAP tests are a criterion-referenced test designed to measure knowledge of the state’s designated curricular frameworks. The tests are given in the aforementioned four subject areas: mathematics, reading, science, and writing. Although the vast majority of scholarship recipients qualify through the MEAP HST, the legislation also provides an alternative path for qualifying for the scholarship. (Most years during this study, the number of students qualifying for the Michigan Merit Award via these *alternative* paths were either zero or negligible and will be ignored in this study. The steps are outlined here merely for full understanding of the legislation around this award program.) To qualify under this *alternative* path, students must have:

³Although one may be interested in the changes in the number of students achieving Level 1 or Level 2 on the MEAP exam during the years of study, the MDE does not release extensive data regarding this. Although the data for public schools is made available for some years, some years are excluded and many times private schools are ignored. For these reasons, these breakdowns are not shown in this study.

1. Taken all four subject area tests
2. Received a score of Level 1 or 2 on at least two of the tests
3. Scored in the top 25 percent nationally on the SAT 1, ACT, or ACT WorkKeys tests. ⁴

Students from the graduating class of 2000 were the first cohort eligible for the awards. High school juniors (11th graders) take the exam in the spring. Therefore, the graduating class of 2000 would have taken the exam in the spring of 1999. It may have been anticipated that the award would indeed go into effect before the legislation was officially passed because the Governor and other policymakers made their intentions about this award known prior to the MEAP HST in 1999. Teachers may have been even more aware than students of this anticipated legislation and shared the information with their students. Students from the graduating class of 2001 certainly were aware of the award as it had already been made law by the time those students took the MEAP HST in the spring of 2000.

All students in Michigan, regardless of family income or other characteristics, were eligible for the awards (making this a “merit-based” scholarship). The full \$2,500 yearly scholarship was awarded for students attending college or some other form of postsecondary training in Michigan. Students attending out-of-state institutions were eligible for a \$1,000 award. ⁵

Breakdowns for MEAP HST scores were not made available by the Michigan Department of Education for the class of 1998, but the following five tables present

⁴For the first cohort of students, the qualifying SAT combined score was 1170 and the ACT composite score was 24. The WorkKeys test assesses individuals’ knowledge of workplace skills, and is often taken by students enrolled in vocational programs in secondary school. It tests skills in the areas of applied mathematics, applied technology, listening, locating information, observation, reading for information, teamwork, and writing (ACT WorkKeys Assessments, 2001). Students who qualified for a scholarship via the WorkKeys test can use the funds for postsecondary vocational or technical training only.

⁵In addition to these awards, students achieving certain scores on the 7th and 8th grade MEAP tests were eligible for up to an additional \$500 in scholarship funding. This is ignored in the analysis of this study.

the percentage of students scoring at each Level (1-4) in each subject area for *public* schools only.⁶

Table 2.1: Class of 1999 MEAP HST results

	Math	Reading	Science	Social Studies	Writing
Level 1	22.6	17.1	7.2	N/A	6.8
Level 2	41	50.2	43.8	N/A	45.7
Level 3	17.4	14.9	29.3	N/A	32.9
Level 4	18.9	17.9	19.7	N/A	14.7
Total Number of Students Tested	81,389	81,717	80,834	N/A	78,478

Keep in mind that the MEAP HST results in Table 2.1 correspond to students who took the test in the spring of 1998. Note that the social studies subject exam was not included in the MEAP HST given to this cohort of students. Even without the Michigan Merit Award, over 50% of Michigan public school students scored at Level 2 or above on every subject exam.

Table 2.2: Class of 2000 MEAP HST Results

	Math	Reading	Science	Social Studies	Writing
Level 1	22.0	17.3	7.0	0.5	7.9
Level 2	42.8	52.1	48.6	23.6	50.5
Level 3	15.7	13.1	25.0	34.8	27.5
Level 4	19.5	17.5	19.5	41.1	14.1
Total Number of Students Tested	92,009	92,190	91,256	80,630	88,427

The proportion of students scoring at Level 2 or above increased with the cohort of students taking the exam in spring of 1999 as shown in Table 2.2. At this time, some students may have been aware via teachers or parents that the Michigan Merit Award was likely to be passed in the Michigan legislature that year. Some students may have not been aware, however. Regardless, these students are all considered “treated”, albeit some “treated” by surprise.

⁶All data regarding MEAP scores come from the MDE’s MEAP website which can be found at http://www.michigan.gov/mde/0,4615,7-140-22709_31168---,00.html.

Table 2.3: Class of 2001 MEAP HST Results

	Math	Reading	Science	Social Studies	Writing
Level 1	20.5	20.6	8.9	0.7	7.2
Level 2	47.9	53.6	51.4	25.9	61.3
Level 3	15.4	11.0	22.1	32.1	21.9
Level 4	16.2	14.8	17.5	41.3	9.6
Total Number of Students Tested	89,200	88,499	88,303	84,429	85,141

Percentage of MI public school students exempt or not tested are:
 Math: 6.2%. Reading: 6.3%. Science: 6.6%. Social Studies: 8.2%. Writing: 8.0%.

The Number of students exempted or not tested was only made available for classes of 2001 and 2002. The proportion of students falling into this category is listed in the table notes. The proportion of students scoring Level 2 or above again increased from the previous year as presented in Table 2.3

Table 2.4: Class of 2002 MEAP HST Results

	Math	Reading	Science	Social Studies	Writing
Level 1	21.1	19.3	7.3	0.5	5.2
Level 2	45.9	52.0	51.9	22.5	63.0
Level 3	13.9	10.8	20.1	34.9	20.6
Level 4	19.1	17.8	20.7	42.1	11.3
Total Number of Students Tested	97,006	96,283	95,996	92,207	92,214

Percentage of MI public school students exempt or not tested are:
 Math: 7.7%. Reading: 7.8%. Science: 8.0%. Social Studies: 10.3%. Writing: 10.4%.

Again, the Number of students exempted or not tested was only made available for classes of 2001 and 2002 (those tested in the springs of 2000 and 2001, respectively). While the number of students scoring at Level 2 or above increased in some subject areas as made evident in Table 2.4, this did not occur in all subject exams this year.

From Table 2.5, one can determine students scoring at Level 1 or 2 did not increase across the board in all subject exams for the graduating class of 2003. Although student-level data is not available for use in this study, the preceding tables help to represent those “marginal” students who may be close to scoring a Level 2, but only score a Level 3. As you can see, the proportion of students scoring Level 3 seemed

Table 2.5: Class of 2003 MEAP HST Results

	Math	Reading	Science	Social Studies	Writing
Level 1	16.5	15.0	7.7	0.7	4.6
Level 2	43.3	51.8	53.4	24.8	56.3
Level 3	12.5	12.8	15.6	31.9	24.8
Level 4	27.6	20.5	23.3	42.5	14.3
Total Number of Students Tested	102,928	102,133	102,088	98,056	98,599

to decrease, *on average*, over this period. Since no formal individual-level analysis is possible, this may only be seen as anecdotal evidence that the Michigan Merit Award pushed students into higher scores (i.e., made students try harder on the MEAP exam to score a Level 2 or better to qualify for the award).

Chapter 3

Empirical Study

3.1 Research Question

Although the underlying goal of the Michigan Merit Award, as stated before, was to “increase access to postsecondary education and reward Michigan high school graduates who have demonstrated academic achievement” (MMA, 1999), the focus of this study is not to investigate the effects of the award on college attendance or completion. This study looks to study the effects of this merit-based award on high school graduation rates, a necessary first step to college attendance. This is of interest for several reasons. Proponents of the law in Michigan argued that it would increase access to higher education for *all* Michigan students. Opponents of the law argued that it was discriminatory in nature. The latter group argued that the Michigan Merit Award would give college scholarships to students in well-off districts where MEAP exam scores were already higher than in underperforming districts. Furthermore, many of the underperforming districts had a much higher presence of nonwhite students leading some to the claim of racial discrimination. It was viewed as so discriminatory by some, that a coalition of groups headed by the American Civil Liberties Union of Michigan filed a suit against the State of Michigan in federal court. Initially, the lawyers representing these ACLU-led groups asked for

a preliminary injunction to block the implementation of the Michigan scholarship program (*White et. al v. Engler et al.*). Ultimately, the Michigan Department of Education enacted a revised version of the proposed Michigan Merit Award to be enacted using the criteria and qualification paths described in Section 2.3.

It goes without saying that it is necessary for a student to complete secondary school before matriculating at a college or university. In other words, the student not only has to perform well on the standardized exam, but graduate in order to receive the award. Since students in the state of Michigan could drop out of school at age 16, some students did not take the MEAP exam as a junior nor did they graduate. Perhaps students could be incentivized to not only *try* on the MEAP standardized exam with an award like the Michigan Merit Award, but to stay in school and graduate as well. This could hold especially true for the “disenfranchised” students discussed in Section 1.4. Perhaps it did not have that effect on graduation rates at all. It could be the case that the Michigan Merit Award benefitted students who would have graduated high school and gone to college regardless of the scholarship program. The question remains: Do these financial rewards for *college education* induce high school students in Michigan to perform better while in secondary school and therefore increase *high school* graduation rates in the state? High school graduation rates could also increase while average performance could decrease (e.g., some students could equalize effort across subjects). Regardless of students’ academic performance gains or losses (in terms of high school grades or GPA), it is still feasible to imagine the MMA leading to gains in high school graduation attainment.

3.2 Data

The data used for this empirical research comes from school district-level data collected from the National Center for Education Statistics Common Core of Data (CCD). Data collected regarding the MEAP exam and other data specific to Michigan come from Center for Educational Performance and Information (CEPI) and the

Michigan Department of Education (MDE). Employment data comes from the Bureau of Labor Statistics (BLS). Data is collected at the district level except for yearly unemployment rates, which are collected at the state level.

The time period studied covers the years 1998 to 2003. States used in this study come from the same census region (Midwest) and division (East North Central) as Michigan and include Wisconsin, Illinois, Indiana, Ohio, and, of course, Michigan. All states will be used as control states in one specification, but a subset of these states will be used in the other analysis of this study. Although the total number of districts each year may vary over the six-year study period, a total of 12,657 observations of school districts are used in this study. Missing values of control variables were interpolated and extrapolated prior to regression analysis to increase the statistical power of the estimation.

3.3 Estimation

A difference-in-differences approach is used to study the effects of the Michigan Merit Award on graduation rates in the state of Michigan. As explained in the introduction, this estimation method is of common use when studying college scholarship programs. The model specifications were chosen with some application from education production functions. The “educational output” in this study corresponds to high school graduation rates. There may be many “inputs” that affect graduation rates, but the ones chosen here come from data availability and prior research applications. Some ideal controls (educational “inputs”) could include family background (including family income, education, etc.), prior academic achievement, quality of early education, exposure to educational-enhancing activities outside the classroom, and others. Since much focus is given to “marginal” students—those on the fence about going college *or* completing high school, student-level data would be ideal to more precisely pick up these marginal effects. Data of this sort would also allow for better identification of the mean effect of students on the margin of

proficiency (Level 2 or above) on the MEAP exam. Classroom-level data may also be more ideal in those regards, but again, the Michigan Dept. of Education only makes district-level data available to the public.

This paper uses three different model specifications in the analysis:

1. The first specification is a two-way fixed effects model that also controls for state time trends. The model is formally described by Equation 3.1.
2. The second specification will use year-by-year effects that allow for pre- and post-period time trends. The estimating equation for this specification is Equation 3.2
3. The third specification allows for flexible interactions between the regressor of interest and other control variables. This final model is formally displayed in Equation 3.3

All model specifications will use (in various ways) the following controls¹ :

1. Racial makeup
2. Expenditures per student
3. Low-Income makeup (proxied by those eligible for free or reduced lunch)
4. State-level unemployment rates
5. District size (as measured by number of high school students per district)

Items 1-3 (race, expenditures, and low income) are controlled for because of the common knowledge that variables of this sort have a strong association with educational outcomes as seen in education and economics literature. “Nonwhite” refers to those students who happen to be African-American, Hispanic, Asian or Pacific Islander, or Native American. Item 4 (unemployment rates) are controlled

¹These controls will be the vector \mathbf{X}_{ist} in all three estimating equations

for because graduating high school is human capital decision and there may be substitution occurring. Also, a weakening economy may be reflective of outmigration or other factors affecting district-level graduation rates. Students must weigh the option to stay in school against the opportunity cost of working.² There may also be impacts other than substitution occurring in the labor market that may have an effect on graduation rates. Item 5 (number of students in each district) is controlled for because of the wide range of districts in the panel. District size can be correlated with urbanicity which, in turn, could be correlated with lower graduation rates. This is a problem with many inner-city schools where educational outcomes, like graduation rates, can be low in comparison to their non-urban counterparts. On the other hand, district growth may be reflective of in-migration to the district, which could point to good outcomes. This will be discussed further in the estimation results.

High school graduation rates (*GradRate*) is the outcome variable of interest and will be the regressand in all model specifications that will be spelled out in later sections.³ MMA_{st} is a dummy variable which represents districts in Michigan after the Michigan Merit Award scholarship program was put into place. In other words, this variable will be equal to 1 if district i is in Michigan in the year 2000 and after. This can be thought of as an interaction term of two other dummy variables, MI and $MEAP$. MI would be = 1 if the district is in Michigan and $MEAP$ would be = 1 if the award program was enacted in Michigan in 2000. In other words, $MEAP = 1$ in the year 2000 and onward. MMA is the interaction of these two terms. Therefore, $MMA = MI * MEAP$.

We will use all three specifications in both analyses conducted in this paper. Hausman tests rejected random effects in favor of fixed effects in each specification. Hence, fixed effects estimation will be used in each model. The chi-squared test

²It is important to note that in Michigan, a student can drop out of school at age 16 without parental consent. This law has been changed and will affect the class of 2016. At that time, all students must stay in school until the age of 18. This is out of the time frame of this analysis.

³Graduation rate is defined here as number of students graduating divided by number of enrolled high school seniors. Rates over 100% are rare but feasible because of immigration or early graduation.

statistic for each specification was large enough in each specification to rule in favor of the alternative hypothesis that fixed effects is consistent (but random effects is not) over the null hypothesis that both random and fixed effects are consistent (but only random effects is efficient).

3.4 Broad Set of Control States

We will first conduct this difference-in-differences analysis with all other Midwest East North Central census division states. This includes Michigan (our “treatment” state), Illinois, Indiana, Ohio, and Wisconsin (our “control” states). The districts in these nonexperimental states are also ideal for use as controls because these states did not have a scholarship like the Michigan Merit Award during the study period from 1998 to 2003. The main identifying assumption is that in the absence of the Michigan Merit Award, Michigan districts would have been on the same graduation rate trajectory as control districts, conditional on other covariates. That is, districts in nearby states are adequate counterfactuals for Michigan outcomes.

Table 3.1 shows the means and standard deviations of the outcome variable and each control variable for every state in the study. The last two columns show the mean and standard deviation of *all* control states combined. Before the passage of the Michigan Merit Award in 2000, Michigan had the highest graduation rates of any of the other census division states with a graduation rate of 92.9%. The state with the lowest graduation rate during this period was Ohio, with 87.1%. Before the MMA, Michigan had graduation rates 3.1 points higher than the combined mean of all the school districts in the other census division states. Michigan also had the highest percentage of nonwhite students in its districts, accounting for 11.5% of students, before the MMA. This is 3.9 points higher than the other districts’ combined mean of 7.6%. The state with the lowest percentage of nonwhite students was Indiana with 5.6%. The state that spent the most on instruction expenditures per student prior to MMA was Wisconsin, with an average of \$4,442 spent per student.

Table 3.1: Descriptive Statistics for All States

Variable	Treatment				Control				All Control states					
	MI		IL		IN		OH		WI		Pre-MMA		Post-MMA	
	Pre-MMA	Post-MMA	Pre-MMA	Post-MMA	Pre-MMA	Post-MMA	Pre-MMA	Post-MMA	Pre-MMA	Post-MMA	Pre-MMA	Post-MMA	Pre-MMA	Post-MMA
Graduation Rate (0-1)	0.929 (0.135)	0.932 (0.124)	0.904 (0.182)	0.912 (0.181)	0.915 (0.073)	0.915 (0.072)	0.871 (0.204)	0.888 (0.233)	0.919 (0.088)	0.934 (0.074)	0.898 (0.164)	0.909 (0.175)		
Proportion Nonwhite (0-1)	0.115 (0.184)	0.138 (0.207)	0.111 (0.187)	0.128 (0.198)	0.056 (0.117)	0.068 (0.131)	0.065 (0.131)	0.077 (0.152)	0.058 (0.093)	0.068 (0.099)	0.076 (0.144)	0.089 (0.158)		
Instruction Dollars per Student (in thousands of \$)	3.873 (0.597)	4.552 (0.718)	3.545 (0.942)	4.465 (1.029)	3.633 (0.505)	4.315 (0.601)	3.363 (0.618)	4.144 (0.787)	4.422 (0.545)	5.153 (0.589)	3.683 (0.802)	4.476 (0.884)		
Prop Free or Reduced Lunch (0-1)	0.278 (0.176)	0.301 (0.177)	0.206 (0.242)	0.250 (0.171)	0.222 (0.116)	0.257 (0.126)	0.196 (0.137)	0.215 (0.147)	0.219 (0.133)	0.220 (0.134)	0.207 (0.168)	0.232 (0.149)		
Unemployment rate (1-100)	3.900 (0.100)	6.168 (0.775)	4.500 (0.000)	6.180 (0.576)	2.900 (0.000)	4.901 (0.497)	4.300 (0.000)	5.411 (0.759)	3.200 (0.100)	5.100 (0.510)	3.914 (0.649)	5.493 (0.784)		
Avg High School Enrollment (in hundreds)	30.431 (84.024)	30.196 (77.705)	26.791 (184.248)	27.818 (188.738)	33.638 (43.853)	34.010 (43.754)	29.394 (52.482)	28.215 (49.508)	22.557 (57.923)	22.520 (56.888)	27.893 (109.696)	27.852 (110.774)		
<i>N (district-years):</i>	1095	1654	1108	1640	587	875	1268	1939	760	1132	3723	5586		

Values in parentheses denote standard deviations. “Pre-MMA” occurs prior to the year 2000 when the Michigan Merit Award was made law. “Post-MMA” occurs after the year 2000. (i.e., Pre-MMA covers 1998-1999 and Post-MMA covers 2001-2003.) The heading “All Control States” represents the means of all four control states.

The lowest during this period was Ohio with an average of \$3,363 spent per student on instruction. The average of all control districts was \$3,683 spent per student. Pre-MMA, Michigan had the highest incidence of students eligible for free or reduced lunch with 27.8% of students eligible. Ohio had the lowest incidence pre-MMA with only 19.6% eligible. The control state average pre-MMA was 20.7%. The highest unemployment rate of the census division states occurred in Illinois in 1998-1999 with a rate of 4.5%. The lowest unemployment rate of 2.9% occurred in Indiana. The average of all four control states during this period was approximately 3.9%. Indiana showed the most students per district pre-2000 with approximately 3,364 high school students per district. Wisconsin had the lowest average district size during the pre-MMA years with an average of 2,256 high school students per district. The control state average pre-MMA district size was approximately 2,789 high school students per district.

After the passage of the Michigan Merit Award, the “ranking” of these states in terms of the means of the variables used in this study changed in some cases. The highest average graduation rates occurred in Wisconsin at a rate of 93.4%. This is only 0.2 points higher than the post-MMA graduation rates in Michigan, yet 2.5 points higher than the mean graduation rates of all four control states. Michigan still had the highest percentage of nonwhite students with 13.8%. Once again, Indiana had the lowest percentage of nonwhite students with 6.8%. The average of all control districts was 8.9%. After the MMA was passed, Wisconsin spent the most on instruction dollars spent per student with approximately \$5,153 spent per student. Ohio was once again the lowest with \$4,144 spent per student. The average amount of dollars spent per student on instruction for all control state districts increased \$793 before the passage of the MMA to \$4,476 spent per student. Michigan again saw the highest incidence of students eligible for free or reduced lunch with 30.1% eligible, while Ohio remained the lowest with 21.5% eligible. Unemployment rates rose significantly in the years 2001-2003. Illinois continued to have the highest average unemployment rates of any state in the census division with 6.18%. Indiana remained the lowest

with approximately 4.9%. All states saw nearly a two percentage point increase in unemployment rates in this post-MMA period compared to the pre-MMA period. Indiana continued to have the highest amount of students per district post-MMA with an average of approximately 3,401 high schoolers per district. Wisconsin showed the lowest district size post-2000 once again. The average number of high school students per district actually decreased from the pre-2000 period to approximately 2,252 students on average. All control states as a whole saw a decrease in the average number of high schoolers per district as the post-MMA number of high schoolers per district decreased to approximately 2,785.

Simple Difference in Means Using *All* Control States

Table 3.2: Difference in Means Using *All* Census Division States

	Pre-MMA	Post-MMA	Difference
Michigan	0.929	0.932	0.003
Control States	0.898	0.909	0.011
Diff-in-Diff			-0.008

Table 3.2 shows the simple difference-in-differences of mean graduation rates. The first difference is calculated by taking the difference between the post-treatment (Post-MMA) graduation rate mean and the pre-treatment (Pre-MMA) mean. The difference-in-differences comes from subtracting the difference in the control states from the difference in the experimental state. According to this simple difference in means, a 0.8 percentage point relative *decrease* in graduation rates was seen in the experimental state (Michigan) after the passage of the Michigan Merit Award legislation.

While the difference in means tells us something about the way the outcome variable (graduation rates) changed before and after the program took effect, it says little to nothing about the cause(s) of the relative change. While the award program in Michigan may very well have something to do with the change in graduation

rates, there may be other factors that are moving graduation rates as well. A simple difference in means cannot account for this. We move ahead by running regression analysis with these same four states' school districts as controls. The next section may very well be valid in its difference-in-differences analysis as the number of observations is quite large and includes states in the general geographic area of Michigan.⁴

Estimation Results

Our first estimating equation uses a *two-way fixed effects model*.

$$GradRate_{ist} = \alpha_0 + MMA_{st}\alpha_1 + \mathbf{X}_{ist}\beta + \theta_i + \theta_t + \theta(t)_s + \epsilon_{ist} \quad (3.1)$$

In this equation, $GradRate_{ist}$ represents the outcome variable of interest, high school graduation rates. The parameter α_0 represents the intercept. MMA_{st} is the treatment dummy described in an earlier section. \mathbf{X}_{ist} is a vector of controls spelled out previously. θ_i represents district fixed effects. These effects are those time-invariant characteristics that are unique to the district. The parameter θ_t is used to control for year fixed effects. $\theta(t)_s$ controls for state-specific linear trends in graduation rates due to unobserved factors. Fixed effects, captured by θ_i , will cover time-invariant heterogeneity, but not dynamics affecting Michigan more or less than other states used in the analysis (e.g., population outflows). ϵ_{ist} is the random error term.

Table 3.3 presents the coefficient estimates for the fixed effects estimation. This first specification indicates that there were, on average, approximately 3.3 percentage point gains in mean graduation rates after the introduction of the MMA. Another interesting result pertains to the statistical significance of the coefficient estimate on instructional spending. According to this model, a \$1,000 increase in instruction spending per student corresponds to about a 2.9 percentage point gain in mean graduation rates, on average. Some may find this contrary to the findings of Hanushek

⁴A recent discussion of diff-in-diff estimation can be found in Bertrand et al. (2004).

Table 3.3: Two-Way Fixed Effects Model Using *All* Census Division States

Variable	Coefficient Estimate
MMA	3.282*** (0.942)
Proportion Nonwhite (0-100)	-0.014 (0.155)
Instruction Dollars (in thousands of \$)	2.878* (1.642)
Free or Red Lunch Elig (0-100)	-0.036 (0.084)
Unemployment Rate (0-100)	0.602 (0.562)
District Size (in hundreds)	-0.043 (0.052)

¹ Values in parantheses denote cluster robust standard errors.

² N=12,657 district-years

³ * denotes significance at the 10% level, ** the 5% level, *** the 1% level.

(1996) where it was posited that increases in per-pupil spending do not have much effect on student outcomes. However, this spending corresponds to money spent on instruction *only*. A gain in mean graduation rates of around 2 to 3 percentage points is quite significant with high levels of graduation, say in the 90% range (as is not uncommon in this data set), although it should be noted that a \$1,000 increase in instructional spending is quite large, accounting for more than one standard deviation. All other control variables in this specification are statistically insignificant.

Our second model uses a *year-by-year effects* approach. The estimating equation is described below:

$$GradRate_{ist} = \alpha_0 + \sum_{y=1999}^{2003} (MI_s * YEAR_y) + \mathbf{X}_{ist}\beta + \theta_i + \theta_t + \theta(t)_s + \epsilon_{ist} \quad (3.2)$$

As in Equation 3.1, $GradRate_{ist}$ represents our educational “output”, graduation rates. $\sum_{y=1999}^{2003} (MI_s * YEAR_y)$ disaggregates the “Michigan effect” by year, omitting

1998. $\theta(t)_s$ again controls for linear trends in graduation rates due to unobserved factors, but Michigan's trend was excluded for collinearity. θ_t is used to control for year fixed effects in control states. It is important to note that this model is trying to pick up the gains and/or losses in Michigan district graduation rates year by year. θ_i again represents district fixed effects, \mathbf{X}_{ist} is the same vector of controls, and ϵ_{ist} again represents the error term.

Table 3.4: Year-by-Year Effects Model Using All Census Division States

Variable	Coefficient Estimate
Proportion Nonwhite (0-100)	-0.010 (0.153)
Instruction Dollars (in thousands of \$)	2.992* (1.643)
Free or Red Lunch Elig (0-100)	-0.032 (0.083)
Unemployment Rate (0-100)	-0.469 (0.503)
District Size (in hundreds)	-0.040 (0.052)
MIyear1999	1.648** (0.695)
MIyear2000	1.804** (0.806)
MIyear2001	3.014*** (1.084)
MIyear2002	-2.616 (2.160)
MIyear2003	-0.532 (2.157)

¹ Values in parantheses denote cluster robust standard errors.

² N=12,657 district-years

³ * denotes significance at the 10% level, ** the 5% level, *** the 1% level.

Table 3.4 presents the coefficient estimates for the model specification controlling for year-to-year effects. It appears that gaining trends in graduation rates were

occurring in Michigan before the introduction of the MMA. Although there were gains in graduation rates seen in 2000 and 2001 (relative to 1998), part of these gains were a continuation of trends seen as late as 1999. We could certainly expect gains in mean graduation rates in the years 2000 and 2001 as these two years' cohorts of graduating students were both "treated" by the implementation of the MMA. We see larger gains in graduation rates for the class of 2001, with over a 3 percentage point relative increase to mean graduation rates in 1998. The class of 2000 sees an approximate 1.8 percentage point relative increase in graduation rates compared to rates in 1998. Recall that the class of 2000 may be considered "treated by surprise" as the class of 2001 was fully aware of the MMA when they took the MEAP HST the prior year. This may give some reason as to why gains in 2001 are larger in magnitude than the gains seen in 2000. The lack of statistical significance of the disaggregated Michigan-by-year effects in 2002 and 2003 may point to the idea that graduation rates reverted to 1998 levels after 2001. As in the first specification, the coefficient estimate tied to instructional spending is significant, indicating that a \$1,000 increase in spending per student is correlated with a nearly 3 percentage point increase in mean graduation rates, on average. This is approximately the same magnitude as the coefficient estimate in the first model.

Our final model uses *interaction* terms with the *MMA* dummy to better understand the effects of the award program, along with other controls, on district-level graduation rates. This model will assist in presenting the association between control variables and graduation rates in Michigan school districts after the MMA was implemented. It allows the effect of other Michigan inputs to change after 2000 rather than confound their influence with the Michigan Merit Award. A formal display of the model specification is below⁵:

$$GradRate_{ist} = \alpha_0 + MMA_{st}\alpha_1 + \mathbf{X}_{ist}\beta_1 + MMA_{st} * \tilde{\mathbf{X}}_{ist}\beta_2 + \theta_i + \theta_t + \theta(t)_s + \epsilon_{ist} \quad (3.3)$$

⁵This specification is motivated by the "regression adjustment" approach described by [Wooldridge \(2010\)](#)

The coefficient corresponding to the *MMA* dummy will represent the average treatment effect. All right-hand side variables have been explained in either Equations 3.1 or 3.2, except for one. $\tilde{\mathbf{X}}_{ist}$ is a vector of de-meanded components of \mathbf{X}_{ist} , such that $\tilde{x}_{ist} = x_{ist} - \bar{x}$, where \bar{x} represents the sample mean of the variable x_{ist} .

Table 3.5: Interactions Model Using *All* Census Division States

Variable	Coefficient Estimate
MMA	-3.770** (1.641)
Proportion Nonwhite (0-100)	-0.040 (0.173)
Instruction Dollars (in thousands of \$)	2.105* (1.128)
Free or Red Lunch Elig (0-100)	-0.022 (0.068)
Unemployment Rate (0-100)	1.601** (0.653)
District Size (in hundreds)	-0.061 (0.082)
MMA*Nonwhite	0.042 (0.059)
MMA*Instr	4.188 (3.051)
MMA*LunchStatus	-0.143 (0.163)
MMA*Unemp	-3.734*** (0.932)
MMA*DistrictSize (in hundreds)	-0.006 (0.010)

¹ Values in parantheses denote robust standard errors.

² N=12,657

³ * denotes significance at the 10% level, ** the 5% level, *** the 1% level.

The coefficient estimates of the interactions model are shown above in Table 3.5. Naturally the estimates of interest in this model are the coefficient estimates corresponding to the interaction terms. A Wald test indicated these interactions are

jointly significant. The coefficient estimates from this specification show that after 2000, a marginal increase in unemployment led to an approximate 3.7 percentage point additional loss in mean graduation rates. Each respective association between nonwhite, instructional spending, lunch status, and district size did not significantly change in Michigan district, post-MMA as shown by the statistical insignificance of the corresponding interaction term coefficient estimates. In this third model specification, where we allow other Michigan inputs to change after MMA was enacted, we see that Michigan in 2000 and after, the MMA is actually associated with lower graduation rates. The post-MMA era in Michigan is associated with a 3.77 percentage point decrease in mean graduation rates, on average.

3.5 Limited Control States

The study will now move its focus to a smaller set of control states. These control states were chosen based on the assumptions needed for difference-in-differences models.

The Case for Districts in Indiana and Wisconsin as Controls

The empirical strategy used prior is one approach to a valid difference-in-differences estimation of the treatment effect of the Michigan Merit Award. It does seem to make sense to use school districts from states in a similar geographic region as a control group for this analysis. However, proper difference-in-differences analysis depends on one important underlying assumption: conditional trends would have been the same in the absence of treatment. In this case, that means that trends in graduation rates would have to be the same before the MMA was put into effect. This implies that the trajectory of graduation rates in the treatment school districts (in Michigan) would be (approximately) parallel to the trajectory of graduation rates in the control districts prior to the year 2000. To repeat, the main identifying assumption is that in the absence of the Michigan Merit Award, Michigan districts would have been on the

same graduation rate trajectory as control districts, conditional on other covariates. Although no strict test of this assumption exists for non-experimental applications, trends in graduation rates prior to 2000 will give us an idea of how comparable Michigan and other states were without MMA.

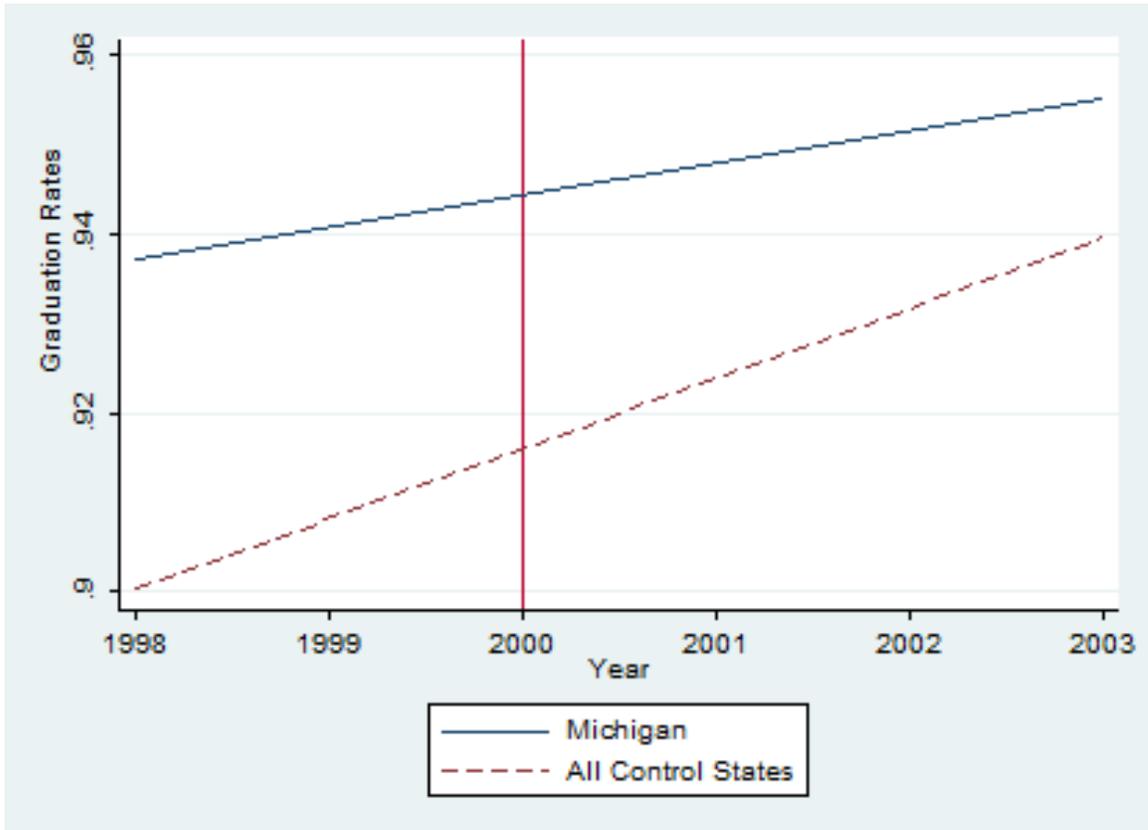


Figure 3.1: Trends in Graduation Rates

Fitted trends in graduation rates in school districts using all four states mentioned before (Illinois, Indiana, Ohio, and Wisconsin) are not parallel to the graduation trends in Michigan plotted over time as shown in Figure 3.1. In fact, graduation gains were steeper outside of Michigan, which could bias difference-in-differences estimates of the MMA effect. While the number of observations will be decreased by omitting some districts, matching Michigan districts with more appropriate counterfactuals may provide more accurate estimates of the effect of the MMA. Every combination was considered. Using districts from Indiana and Wisconsin as controls appears as

if it lends itself as the best fit to the main identifying assumption of difference-in-differences analysis. As illustrated in Figure 3.2, trends in graduation rates are nearly parallel prior to the year 2000 when graduation rates in Indiana and Wisconsin are plotted against those in Michigan over time. For this reason, we will see if Section 3.4 results are robust to limiting the set of control states to Indiana and Wisconsin.

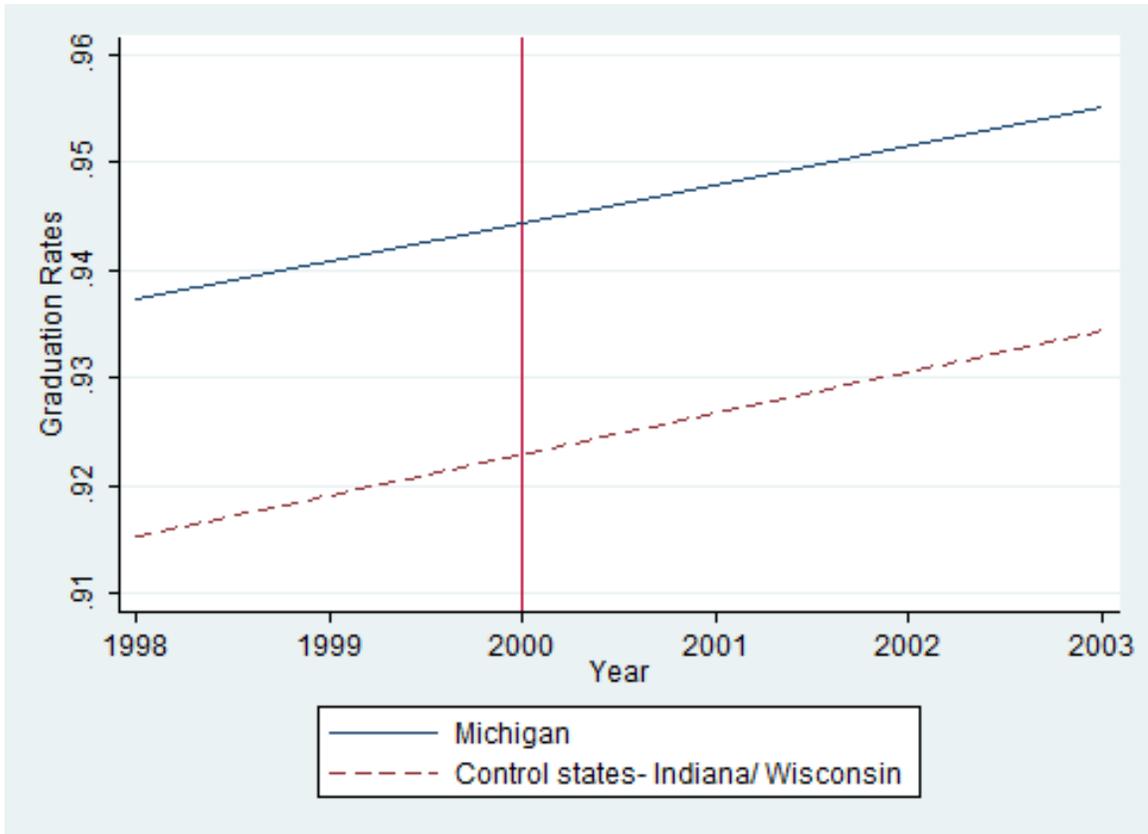


Figure 3.2: Trends in Graduation Rates: Michigan and Indiana/Wisconsin

Descriptive Statistics and Difference in Means

Descriptive statistics from school districts in Indiana and Wisconsin individually can be found in Table 3.1 and will not be repeated here. Descriptive statistics for Michigan school districts will be repeated for comparison to the descriptive statistics of the control districts (in Indiana and Wisconsin) used in this analysis.

Table 3.6: Descriptive Statistics for Experimental and Nonexperimental Districts

Variable	Experimental		Nonexperimental	
	MI		IN and WI	
	Pre-MMA	Post-MMA	Pre-MMA	Post-MMA
Graduation Rate	0.929 (0.135)	0.932 (0.124)	0.917 (0.082)	0.926 (0.074)
Proportion Nonwhite (0-1)	0.115 (0.184)	0.138 (0.207)	0.057 (0.104)	0.068 (0.114)
Instruction Dollars per Student (in thousands of \$)	3.873 (0.597)	4.552 (0.718)	4.079 0.(657)	4.789 (0.725)
Free or reduced lunch (0-1)	0.278 (0.176)	0.301 (0.177)	0.221 (0.123)	0.237 (0.132)
Unemployment rate (0-100)	3.900 (0.100)	6.168 (0.775)	3.070 (0.167)	5.010 (0.514)
Total High School Students (in hundreds)	30.431 (84.024) (0.1)	30.196 (77.705) (0.775)	27.386 (52.529) (0.167)	27.529 (51.877) (0.514)
<i>N (district-years)</i>	1095	1654	1347	2007

We can see that in comparison to the means of graduation rates in control districts in the last analysis (as seen in Table 3.1), graduation rates rates, on average, seem higher using only Indiana and Wisconsin districts as controls. While the average graduation rates in Michigan were once again higher than the average graduation rates in the control states, it was not by a drastic amount. Average graduation rates in Michigan prior to the year 2000 when the MMA was initiated were approximately 93%, while the average rates in the two control states were approximately 92%; this is only a 1 point difference. The average percentage of nonwhite students in Michigan was almost double that of the control states used here before and after the MMA was enacted. The average amount of money spent on instruction pre- and post-MMA was approximately \$200 higher in the control states used here. The percentage of students eligible for free or reduced lunch was about five percentage points higher than in the control states, pre- and post-2000. While the average unemployment rate was higher than Michigan prior to the Michigan Merit Award legislation, it only overtook the average rate in the control states by about 0.8 points. After the passage of the Michigan Merit Award in 2000, unemployment rates in Michigan were approximately 1.2 points higher than the average unemployment rates in Indiana and Wisconsin. The average number of high school students (our measure of district size) was approximately 300 students greater in Michigan in both periods.

Table 3.7: Difference in Means Using IN and WI Districts as Controls

	Pre-MMA	Post-MMA	Difference
Michigan	0.929	0.932	0.003
Control States	0.917	0.926	0.009
Diff-in-Diff			-0.006

Table 3.7 shows the simple difference-in-difference of means of graduation rates. The differences are calculated as in the last analysis. According this simple difference in means, a 0.6 percentage point relative decrease in graduation rates was seen in the experimental state (Michigan) after the passage of the Michigan merit Award

legislation. Again, it is important to remember that the difference in means tells us something about the way the outcome variable (graduation rates) changed before and after the program took effect, it says little to nothing about the cause(s) of the relative change. While the award program in Michigan may very well have something to do with the change in graduation rates, there may be other factors that are moving graduation rates as well. A simple difference in means cannot account for this. We move ahead by running regression analysis with the school districts in Indiana and Wisconsin as controls. The next section is solid in its validity as a true difference-in-differences analysis by meeting the parallel trend assumption of difference-in-differences analysis.

Estimation Results

Table 3.8: Two-Way Fixed Effects Model Using *Limited* Control States

Variable	Coefficient Estimate
MMA	3.821*** (1.291)
Proportion Nonwhite (0-100)	-0.027 (0.173)
Instruction Dollars (in thousands of \$)	3.877 (2.811)
Free or Red Lunch Elig (0-100)	-0.190 (0.237)
Unemployment Rate (0-100)	1.731 (1.369)
District Size (in hundreds)	-0.046** (0.022)

¹ Values in parentheses denote cluster robust standard errors.

² N=6,444 district-years

³ * denotes significance at the 10% level, ** the 5% level, *** the 1% level.

Table 3.8 lists the coefficient estimates from the fixed effects estimating equation using only Wisconsin and Indiana districts as controls. This model indicates that

the introduction of the MMA led to an approximate 3.8 percentage point gain in mean graduation rates, on average. The coefficient estimate associated with district size is statistically significant and indicates that an increase of 100 high school students is associated with about a 0.05 percentage point decrease in mean graduation rates, on average. All other control variables appear insignificant in this particular specification.

Table 3.9: Year-by-Year Effects Model Using *Limited* Control States

Variable	Coefficient Estimate
Proportion Nonwhite (0-100)	-0.024 (0.171)
Instruction Dollars (in thousands of \$)	4.082 (2.841)
Free or Red Lunch Elig (0-100)	-0.184 (0.235)
Unemployment Rate (0-100)	-1.441 (1.763)
District Size (in hundreds)	-0.043* (0.022)
MIyear1999	1.298 (0.830)
MIyear2000	1.130 (1.231)
MIyear2001	3.0552 (2.600)
MIyear2002	-1.004 (4.665)
MIyear2003	2.041 (5.927)

¹ Values in parantheses denote cluster robust standard errors.

² N=6,444 district-years

³ * denotes significance at the 10% level, ** the 5% level, *** the 1% level.

The results in Table 3.9 come from model using Michigan year-by-year effects. Using only a stricter set of control states, all Michigan year-by-year effects appear

statistically insignificant in this specification. If one were using this analysis alone, it may lead one to suggest that there were no significant gains in mean graduation rates in Michigan post-MMA. The same specification using the broader set of control states told a different story as is shown in Table 3.4. This model (using these controls) shows that a marginal additional of 100 high school students corresponds to an approximate 0.04 percentage point decrease in mean graduation rates, on average. This could lead some to support the idea that larger school districts are correlated to urbanicity, which can be correlated with lower educational outcomes like high school graduation.

Table 3.10: Interactions Model Using *Limited* Control States

Variable	Coefficient Estimate
MMA	0.810 (1.680)
Proportion Nonwhite (0-100)	-0.073 (0.206)
Instruction Dollars (in thousands of \$)	2.436 (1.994)
Free or Red Lunch Elig (0-100)	-0.155 (0.195)
Unemployment Rate (0-100)	3.571* (1.838)
District Size (in hundreds)	-0.081 (0.069)
MMA*Nonwhite	0.040 (0.061)
MMA*Instr	3.965 (2.523)
MMA*LunchStatus	-0.123 (0.143)
MMA*Unemp	-3.068*** (1.170)
MMA*DistrictSize (in hundreds)	-0.007 (0.009)

¹ Values in parantheses denote robust standard errors.

² N=6,444 district-years

³ * denotes significance at the 10% level, ** the 5% level, *** the 1% level.

The estimation results from the interactions model using limited control states is presented in Table 3.10. As in the same specification using the broader set of control states, the only interaction term with statistical significance is the interaction term with unemployment rates. According to this analysis, a one percent increase in unemployment is associated with an approximate 3.1 additional loss in mean graduation rates in Michigan after the MMA was enacted. Given the statistical insignificance of all other interaction terms (using both a broader and stricter set of control districts), particularly those terms interacting with lunch status (recall that this is a proxy for economically disadvantaged students) and proportion nonwhite, one may find it hard to argue that the MMA had an undue burden on mean graduation rates for poor and nonwhite students. However, this still does not say it does not have an adverse effect on these groups on college matriculation or completion. Unlike our findings from this model specification using a broader set of control states, this model does not suggest any association between Michigan in the post-MMA and graduation rates. The estimate is insignificant here, suggesting that the MMA had no impact on graduation rates when evaluated against a set of districts with similar trends in pre-2000 graduation rates.

A summary and analysis of all specifications will be discussed in the Conclusion.

Chapter 4

Conclusion

4.1 Conclusions From This Study

With rising costs of college education and the high returns to education, governments are trying to introduce new ways to help citizens, namely young people, obtain a postsecondary education. Scholarships have become a way of giving students the opportunity to go to college without the constraints of debt. One obstacle facing policymakers when creating these scholarships is the perceived “fairness” of scholarships. While some believe need-based scholarships are needed and perceived as “fair”, others believe merit-based scholarships are the best way to award hard-working students with a college education.

Numerous types of merit-based scholarships exist and the qualifications for the awards differ. Some are based on high school grade point average. Others are based on college entrance exams like the ACT or SAT. Still others, like the Michigan Merit Award, are based on test scores from exams that are typically used for measuring educational progress. While the goal of policymakers is to increase college attainment, whether in the form of college matriculation or college completion, there could be other effects. A natural effect could be on an intermediate step between taking a standardized test and attending college: high school graduation.

Simple difference in means analysis, although certainly not the focus of this study, suggests a downward trend in graduation rates after the passage of the MMA. One reason the introduction of the MMA may cause downward pressure on district-level graduation rates is the “give up” factor. Perhaps some students, after not reaching the threshold to receive scholarship money, give up on the idea of finishing high school. Perhaps peer effects lends itself to this outcome as students’ peers reach the minimum requirements and make plans for postsecondary school as those that did not reach the threshold feel disgruntled with the outcome.

This paper further studies the effect of the Michigan Merit Award with regression analysis and posits some interesting results. While some specifications find that the introduction of the Michigan Merit Award had a statistically significant average positive impact on district-level high school graduation rates, the overall results are inconclusive. The simple two-way fixed effects specifications showed positive impacts on graduation rates after the MMA legislation. Some students may have put forth little or no effort on the MEAP exams prior to the award legislation and, when actually trying, surprise themselves with the outcome. Perhaps they did not believe college was an option before, but with the MMA, they can move on to college. These same students may have been prone to dropping out of high school before completion. However, with this thought process, they stay in school to graduate in order to receive the MMA. This could be one explanation for why the MMA is associated with higher graduation levels.

In the analysis using districts from all census division states and allowing for Michigan year-by-year effects, we see that the post-MMA era is associated with higher graduation rates. The largest gains were seen in 2001, but appear to be continuations in existing trends going as far back as 1999. This model, using these broader controls, also seem to point to a drop off in graduation rate gains after 2001. The year-by-year analysis using a stricter set of controls sheds little to no light on these gains given the statistical insignificance of the year-by-year estimates. They do, however, seem to be

somewhat in line with the results from the same model using the larger set of control states.

In the final model specification, the effect of Michigan inputs other than the MMA are allowed to change after 2000 rather than confound their influence with MMA by utilizing interaction terms. In this model where all census division states were used as controls, the introduction of the MMA is associated with *lower* levels of mean district graduation rates. When a stricter set of control districts were used that more closely mirrored Michigan trends prior to 2000, the effect of the MMA on graduation rates is insignificant. This specification, using either the stricter set of broader set of controls, shows a negative effect on graduation rates when unemployment rises in the post-MMA era.

Some other significant estimates are worth mentioning. In certain model specifications carried out in this paper, dollars spent on instruction per student showed positive impacts on district-level graduation rates. Some may conclude that this helps reject the idea that increasing money spent on students in school does little to increase educational outcomes as suggested by Hanushek (1996) and other researchers. As stated before, this money only reflects money spent on instruction, not generalized school funding. Two specifications (utilizing a stricter set of controls) saw negative correlation between district size and graduation rates and could point to fact the district size is correlated with urbanicity which, in turn, is correlated with lower graduation rates. The third specification, using both sets of controls, showed little evidence of disparate impact on nonwhite or economically disadvantaged students in regards to high school graduation in the post-MMA time period.

The first specification in both analyses indicate between approximately 3.3 to 3.8 percentage point gains in mean graduation rates after the introduction of the MMA. The second model specification in the first analysis predicts that part of these gains were continuations in existing trends going as far back as 1999. The third model specification, where the effect of control variables are allowed to change rather than confound their influence with the MMA on graduation rates, indicates lower levels

of graduation after the MMA was introduced. The second and third specifications in the second analysis produce a statistically insignificant estimate of the influence of the MMA on graduation rates. Given all of this, results are inconclusive on net. However, the analysis as a whole tends to rule out the hypothesis that the Michigan Merit Award increased high school graduation rates.

4.2 Suggestions for Further Research

Very little economics research has been conducted studying the Michigan Merit Award. Most of the academic literature surrounding the MMA has been done in the fields of education and law research.¹ It is not surprising that both of these fields have a interest in a program of this nature, but an economist's perspective would help shape the entire research regarding this program.

A great stride forward in studying the impacts of the MMA would be to look into its implications at the classroom, or, better yet, student level. With less aggregated data, economists and other researchers could better ascertain the indirect impact (if any) of the Michigan Merit Award on high school graduation propensity. Student-level data lends itself to the ability to control for more variation. Individual students' background data, past academic history, socioeconomic status, etc. would help with a thorough explanation of *who* this award affects the most and *how* it affects them. This would also be useful for studying the effects of the MMA (or other awards of this type) on students on the margin about attending college. A closer look at the impacts of this scholarship program could give policymakers more knowledge on how to build a successful scholarship program with the intended incentives built into the program correctly and unintended consequences to be examined.

¹See [Heller and Rogers \(2003\)](#) for much of the research done thus far.

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Vita

Brandon Lee Harrison was born in Fort Dodge, IA, to April Harrison and family. He is the oldest of four siblings: Brittany, Brooke, and Trevor. He attended St. Paul Lutheran School and continued on to Fort Dodge Senior High School, both in Fort Dodge. After graduating valedictorian of his class, he headed to Nebraska to Creighton University in Omaha. Although not his original intentions this was where he was introduced to economics, a field unexplored by him at that time. Working several jobs and internships during his undergraduate career and even touring in a heavy metal band, Brandon completed his degree as planned. He obtained a Bachelors of Science in Business Administration with a major in economics in May 2008. He worked as an intern economist for the U.S. Army Corps of Engineers and studied higher mathematics until accepting a graduate assistantship at the University of Tennessee, Knoxville, in the Economics department. Brandon graduated with a Masters of Arts degree in economics in August 2012. He is continuing his career and considering positions in both the public and private sector.