A STUDY OF MINIMUM COMPETENCY EXAMS AND EARNING A SECONDARY SCHOOL CREDENTIAL

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ABSTRACT

For over thirty years, states have been implementing minimum competency exam (MCE) requirements, mandating that high school students demonstrate a basic level of proficiency before they are allowed to graduate. Despite concerns that these exams may have unintended consequences for low-performing students and students with low family income, twenty-five states currently require students to pass a MCE to graduate. This study evaluates the relationship between minimum competency exam requirements and secondary school completion using a nationally representative sample taken from the 1994 data collection of the National Education Longitudinal Study of 1988 and a logistic regression model. The results indicate that MCEs are associated with an increase in the likelihood of dropping out for students with low family income.
This thesis is dedicated to my wife, Amy, whose love and support were unwavering throughout this endeavor. Special thanks Michael Bailey, Eric Gardner, Brandon Soublet, and Andrew Phillips. I would also like to thank my thesis advisor, Laura LoGerfo for her guidance and for the many, many revisions.
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Introduction

Since the 1970s, there has been a growing concern that the quality of public education is waning and that the high school diploma is losing its validity as a credential that certifies a student’s skill and motivation. This concern sparked a movement toward accountability and standards in secondary education systems across the United States. One type of standard that has become increasingly popular, yet also controversial, is the minimum competency exam (MCE) requirement, which mandates that students demonstrate basic proficiency before being awarded a high school diploma. Minimum competency exam requirements differ between states in both content and level of difficulty, however they usually only assess material at the eighth or ninth grade level (Jacob, 2001; Warren, Jenkins, & Kulick, 2006). Students who fail MCEs are generally offered some type of remediation or test preparation course and are allowed to retake the exam. Although the intent of a minimum competency exam requirement is to hold back only students who fall below the required proficiency level, there may be some unintended consequences for low-performing and economically disadvantaged students.

Reactions to MCEs may differ by student ability level. Because of the low level of difficulty of these exams, higher performing students generally have no trouble passing a MCE even if multiple attempts are required to pass. Low-performing students are more likely to have difficulty passing a MCE because they may not have attained that basic level of knowledge. As low-performing students might have trouble scoring well on the exam, they could be more likely to doubt their ability to pass subsequent attempts, which could discourage them from persisting to graduation (Catterall, 1989).
Understanding that they will be denied a diploma if they cannot pass the MCE, low-performing students could be more likely to drop out of high school when facing a minimum competency exam. MCE requirements may be detrimental to these students’ motivation because such exams might be perceived as a hurdle that they cannot overcome. Without the MCE requirement, such marginal students might be allowed to graduate high school (Reback, 2008). Because the minimum competency exam requirement might prevent marginal students from obtaining a diploma, despite the amount of effort that they invest, these students might be less motivated to stay in school.

To examine the potential unintended consequences of MCEs for low-performing and economically disadvantaged students, this study evaluates the following question: do minimum competency exam requirements reduce the likelihood of obtaining a secondary school credential for low-performing and economically disadvantaged students? Using data from the 1994 National Education Longitudinal Study of 1988 (NELS:88), I employ a logistic regression model to compare the probability of obtaining a secondary school credential for students who had a minimum competency exam requirement for graduation with the probability of obtaining a secondary school credential for students with no such requirement.

Since the implementation of MCE requirements, there has been discussion among researchers about their potential benefits and consequences. In an attempt to measure whether minimum competency exam requirements are accomplishing their goal, researchers have evaluated the association of MCE requirements with high school graduation, high school dropout, and GED acquisition. Although the results of this
research are mixed, most suggest that MCE requirements decrease the likelihood of high school graduation, and increase the likelihood of dropping out and GED acquisition. As higher levels of education are linked to better health care, higher incomes, and increased social mobility (Murnane, Willett, & Tyler, 2000; Ross & Wu, 1995), it is important to examine MCE requirements to determine if there are unintended consequences for low-performing and economically disadvantaged students.
Literature Review

Policy makers have long sought to reduce the inequities in the public education system, particularly in the U.S. secondary education system. One possible solution is to implement minimum competency exam (MCE) requirements in secondary schools. MCE requirements mandate that students demonstrate a basic level of skill before being allowed to graduate high school. To evaluate the assertions made by proponents and opponents of MCEs, researchers have examined if and how minimum competency exam requirements are related to high school graduation, likelihood of dropping out of high school, and GED attainment.

Obtaining a GED is a different outcome from obtaining a high school diploma or dropping out of high school in terms of available academic and career opportunities (Bishop & Mane, 2001; Warren & Edwards, 2005). While GEDs and alternative diplomas are not equivalent to traditional high school diplomas, they open academic and professional avenues that are not available to students with neither credential. For example, a high school graduate or GED recipient can attend a community college, an online university, or join the military, while students with neither credential cannot. Many of the existing studies look at the relationship between MCEs and high school completion; however, these studies ignore students who earn alternative secondary school credentials. While MCEs might increase the likelihood of dropping out of high school, they might also increase the likelihood of earning an alternative credential such as a GED (Bishop & Mane, 2001; Warren & Jenkins, 2005; Muller & Schiller, 2000; Jacob, 2001; Dee & Jacob, 2006). Classifying students who earn alternative secondary school
credentials as high school dropouts will overstate the association of MCEs with the likelihood of dropping out.

The existing research evaluating the relationship between minimum competency exam requirements and secondary school completion exhibits mixed results. Some research finds that MCEs are not related to secondary school completion, but explain that the MCEs might be too easy or the relationship could be masked by other exogenous factors. Other research finds that MCEs increase the likelihood of high school completion, suggesting that teachers and students have risen to the challenge of higher accountability. Finally, much of the existing literature finds that MCEs decrease the likelihood of graduating high school for low-performing and low-income students.

**No Significant Relationship Between MCEs and High School Completion**

Economic theory dictates that an increase in graduation requirements, such as a MCE requirement, will decrease the likelihood of high school completion (Bishop & Mane, 2001); however, some researchers find no relationship of MCE requirements to high school graduation, high school dropout, or GED acquisition. There are several potential reasons why these researchers have found no association between minimum competency exam requirements and high school completion. First, the standard set by MCEs could be set too low to achieve their purpose, holding back only those very few extremely low-performing students (Warren & Jenkins, 2005). MCEs are designed to enforce a basic level of learning; setting that level too low will render the MCE ineffective by not holding any students back. Second, the association of MCEs with high school completion may be muted by schools’ misclassification of students who are in
danger of failing the MCE (Warren & Jenkins, 2005; Haney, 2000). School administrators are under pressure to improve graduation rates and have control over which students they can reclassify. This provides an incentive for administrators to exempt at-risk students by classifying them into a category of students, such as special needs, that is not required to pass the MCE.

In an attempt to evaluate the relationship between minimum competency exam requirements and high school completion, one study used a nationally representative sample of 9,000 public school students. It accounted for differences in student background characteristics, educational expectations, teacher expectations, and state testing policy, and found no relationship between MCE requirements and the likelihood of completing high school (Muller & Schiller, 2000). Using the 1992 NELS:88 data collection, Muller and Schiller (2000) only included students whose high school transcripts had been collected, who had data on the math and science teacher survey, and who participated in both the first and second follow-ups of the NELS:88 data. While these restrictions provide detailed information that allows for more precise estimation, it provides a limited view of the full sample. A similar study of over 76,000 Florida high school students who were required to pass a MCE to graduate found no significant difference in the likelihood of dropping out for low-achieving students (Griffin & Heidorn, 1996).

Though the work done by Muller and Schiller (2000) and Griffin and Heidorn (1996) indicates that minimum competency exam requirements are not related to high school completion, there are several flaws in this research. First, Muller and Schiller...
(2000) used the 1992 NELS:88 data collection to create the variable that indicated whether a student completed or dropped out of high school. The students in NELS:88 were scheduled to graduate in 1992. Muller and Schiller classified all students who did not graduate and were not enrolled in high school in 1992 as dropouts. This assumes that students who did not graduate on schedule dropped out of high school and did not earn a GED. Because students who drop out of high school need time to enroll in GED and alternative programs or to re-enroll in high school, the method Muller and Schiller (2000) used to create the dropout variable may overstate the number of dropouts. Griffin and Heidorn (1996) also classified all students who did not earn a traditional diploma and were not enrolled in high school as dropouts, overstating the number of dropouts.

Utilizing the same data set, Warren and Edwards (2005) expand the work done by Muller and Schiller (2000) in two ways. First, Warren and Edwards (2005) did not include GED recipients as high school dropouts, reducing the number of high school dropouts and the bias of the results. Second, Warren and Edwards (2005) used the 1994 NELS:88 data collection to determine whether students had completed high school, earned a GED, or dropped out. Using the 1994 collection from NELS:88, the analysis by Warren and Edwards (2005) relaxed the following two assumptions made by Muller and Schiller (2000), Jacob (2001), and Lillard and DeCicca (2000); (1) that all students enrolled in high school in 1992 went on to earn a diploma, and (2) that no students who were not enrolled in 1992 went on to earn a high school diploma (Warren & Edwards (2005). This analysis accounted for differences in demographics, student performance in high school and 8th grade, school size, and state testing policies and shows that minimum
competency exam requirements are not linked to acquiring a high school diploma or GED (Warren & Edwards, 2005). One key aspect of these analyses that might explain the similar findings is that both use state testing policy and state of residence to determine if students were required to pass a MCE to graduate instead of the student-level measure of MCE policy found in the school administrator file of the 1994 NELS:88 data.

Although academic achievement is an important predictor of completing high school (Tanner, 2003), researchers use different measures of students’ academic achievement. The analysis by Warren and Edwards (2005) accounted for differences in high school performance, and found that secondary school completion did not vary by high school performance and MCE requirements. Other researchers hold that 8th grade performance measures are a more valid predictor of dropping out of high school (Bishop & Mane, 2001). Bishop and Mane (2001) found that the relationship between MCE requirements and high school completion did not vary by 8th grade achievement.

Although the literature reviewed thus far finds no relationship between minimum competency exam requirements and earning a secondary school credential, several exogenous factors may mask the true relationship. Because of the increased accountability and narrowed curriculum that MCEs enforce (Warren & Edwards, 2005), teachers might be inclined to “teach to the test” (Popham, 2001; Posner, 2004). Teaching to the test is not necessarily bad as long as the test reflects what students should know instead of minimum knowledge. Student misclassification can also obscure the relationship between MCEs and high school completion. Principals are held accountable for the graduation rate of their school, but have the ability to determine which students
are eligible for exemption from the MCE, providing an implicit incentive to misclassify at-risk students (Warren & Jenkins, 2005; Haney, 2000).

From the literature reviewed in this section, I have identified several key points that are germane to this study. First, using the 1994 NELS:88 data collection provides an updated measure of whether students obtained a secondary school credential (Warren & Edwards, 2005; Bishop & Mane, 2001). Second, it is important to differentiate between high school dropouts and students who earn GEDs and alternative high school diplomas in order to avoid artificially increasing the number of high school dropouts. While the literature reviewed in this section found no relationship between minimum competency exam requirements and earning a secondary school credential, the following section will review the relatively scant research that suggests that minimum competency exam requirements increase the likelihood of earning a secondary school credential.

**MCEs Increase the Likelihood of High School Completion**

There is very little empirical evidence to support the claim that minimum competency exam requirements increase the likelihood of high school completion. One study using data from the Common Core of Data for over 10,000 Minnesota high school students evaluated the relationship between MCEs and high school completion and found a decreased dropout rate in grades 10 and 11 after MCEs were implemented (Dee and Jacob, 2006). While the study found a decreased dropout rate in grades 10 and 11, the results were concentrated in low-minority, suburban school districts. Another study by the same authors used data from the 2000 Census to evaluate the same question among 3 million Minnesota students who were at least 18 years old between 1980 and 1998. In
this study, Dee and Jacob (2006) found negative repercussions to the MCE policy, specifically that black students are more likely to drop out than white students when required to pass a minimum competency exam. This finding is consistent with the statement by John Robert Warren, “The real pattern in states is that the standards are lowered so much that the exams end up not benefiting students who pass them, while still hurting those who fail them,” (Urbina, 2010).

**MCEs Decrease the Likelihood of High School Completion**

While other studies have found no association between minimum competency exam requirements and high school completion, or that there was a lower dropout rate for school districts with low percentages of minorities and students in poverty when those districts required students to pass a MCE, other literature on this topic finds that minimum competency exams decrease the likelihood of high school completion.

Because MCEs were designed to ensure a minimum level of education for high school graduates, usually at the 8th or 9th grade level, low-performing students may be more likely to fail minimum competency exams (Bishop & Mane, 2001; Jacob, 2001). Focusing on districts with higher percentages of minority students and students in poverty, an analysis of the 2000 Census found an increased dropout rate across all four high school grades, with a particularly large increase in 12th grade dropouts (Dee & Jacob, 2006). Students who fail MCEs initially are more likely to have doubts about completing high school (Catterall, 1989) and are more likely to express feelings of alienation, apprehension, and anxiety (Richman, Brown, & Clark, 1987). Because most students should be able to demonstrate the basic level of knowledge required by MCEs,
Catterall (1987) argues that MCEs may prevent few students from graduating overall. The findings from Jacob in 2001 corroborate this argument. After accounting for differences in student achievement, gender, race, socioeconomic status, school size, and urbanicity, Jacob (2001) found that MCEs are unrelated to the probability of dropping out for the student population as a whole. However, when restricted to low-achieving students, MCEs were associated with a 25% increase in the probability of dropping out of high school (Jacob, 2001). His measure indicating whether or not students dropped out was constructed using data from the year that student was scheduled to graduate high school, which neglects whether or not students earn their diploma or an alternative certification in subsequent years, and might be a source of bias in Jacob’s results.

Considering these findings together, it can be argued that MCEs might only increase the likelihood of dropping out of high school for low-performing students. Therefore, it is crucial not only to account for differences in student achievement, but also to include interaction terms between MCE status and student achievement in order to determine if the relationship between the likelihood of earning a secondary school credential and student achievement varies by whether students are required to pass a MCE to graduate.

Other research suggests that minimum competency exam requirements decrease the likelihood of high school completion, increase the likelihood of earning a GED, and increase the likelihood of dropping out of high school (Amarein & Burliner, 2002; Bishop & Mane, 2001). Warren, Jenkins, and Kulick (2006) also find that MCE requirements decrease the likelihood of high school completion and increase the likelihood that students take a GED test, but that these results were only found after the
class of 1992, the eighth grade cohort followed by NELS:88, should have graduated. A different study that accounts for differences in demographics and school characteristics found that failing a minimum competency exam increased the likelihood of dropping out among learning handicapped and educationally marginal students (MacMillan, Balow, Widaman, & Hemsley, 1990).

**Summary of Literature Review**

Although the findings in the literature are mixed, several points are noteworthy. First, to provide an updated and more comprehensive measure of secondary school completion, it is important to use the 1994 NELS:88 data collection as did Warren, et al. (2006) and Warren and Edwards (2005). Second, using the “treatment on the treated” method instead of the “intention to treat” method used by many of the articles reviewed earlier (Warren & Edwards, 2005; Jacob, 2001; Bishop & Mane, 2001; Muller & Schiller, 2001), my analysis will provide a more accurate measure by analyzing students who took MCEs rather than all students in a state with a MCE requirement. Third, because students who earn GEDs can pursue academic and professional avenues that are not available to students who drop out, I will not classify students who earned GEDs as high school dropouts (Warren & Edwards, 2005).
Purpose of Research

This paper seeks to reconcile the opposing views of minimum competency exam requirements with respect to the likelihood of earning a secondary school credential. Two primary research questions are investigated: 1) is there a relationship between minimum competency exam requirements and the likelihood of earning a secondary school credential, and 2) to what extent does this relationship vary by achievement and income?

Jacob (2001) evaluated public school students who were included in the base year and the first two follow-ups of the NELS:88 data. Using a linear probability model and an external measure of whether students were required to pass a MCE to graduate, Jacob allowed for differences in student achievement, gender, race, socioeconomic status, school size, and urbanicity. In this study, I use the model specified by Jacob (2001) with several differences. First, I use the 1994 NELS:88 data collection, which provides an updated measure of secondary school completion. Second, I use the school-level measure of whether students were required to pass a MCE included in the 1994 NELS:88 data. Third, unlike Jacob (2001), I do not classify all students who were not enrolled in high school and had also not graduated by 1992 as dropouts. This study evaluates the association between minimum competency exams and secondary school completion and does not classify students who earn GEDs and alternative secondary credentials as high school dropouts.

After reviewing the existing literature, I hypothesize that the findings from this thesis will be consistent with the results found by Jacob (2001); minimum competency
exams will not be related to secondary school completion for the full sample, but will
decrease the likelihood of completing high school and increase the likelihood of dropping
out for low-achieving and low-income students.
Data

For this study, I use the 1994 data collection of the National Education Longitudinal Study of 1988, sponsored by and obtained from the U.S. Department of Education’s National Center for Education Statistics. NELS:88 began in the spring of 1988 and followed a nationally representative sample of nearly 25,000 eighth-graders through high school into their post-secondary years. Follow-up surveys were conducted in 1990, 1992, and 1994. NELS:88 was designed to collect data from multiple players in students’ secondary school experience, including administrators, parents, and teachers. Topics surveyed include school and home experiences, educational expectations, parents’ education level, and student achievement.

The NELS:88 employed a two-stage, stratified sample design, with schools as the first stratum and students within schools as the second stratum. Schools were selected from across the nation using probabilities proportional to their eighth grade enrollment. The overall response rate for schools was 98%. The target sample size within each school was 26 randomly selected students (24 regularly sampled students and an average of 2 Hispanic and Asian/Pacific Islander over-sampled students). The average sample size per school was 25 students (23 participating students and 2 over-sampled students), and the overall student response rate was 94%. In total, 1052 schools and nearly 25,000 students participated in the base year survey. The follow up surveys not only included respondents from the base year, but also a freshened sample of students not eligible to participate in the base year. This strategy was used to make the sample representative of
all students 10\textsuperscript{th} grade in 1990 and in 12\textsuperscript{th} grade in 1992. Because of attrition and budget constraints, fewer respondents were surveyed in the follow-up surveys, which ultimately reduced the sample to 14,915 in 1994.

Data for students was collected using questionnaires and cognitive tests in reading comprehension, mathematics, science, and history/citizenship/geography. Surveys and tests were administered at three time points; 8\textsuperscript{th}, 10\textsuperscript{th}, and 12\textsuperscript{th} grade. On the student surveys, topics included student experiences at school and at home, the importance of education for their parents and peers, educational and professional aspirations, and a variety of other student characteristics. School administrators and teachers were also interviewed and data was collected subjects ranging from teacher expectations to minimum competency exam testing policy.

**Analytic Sample**

This paper focuses on public school students who were included in the third follow-up to NELS:88 conducted in 1994. I limit my analysis to 12,565 of the 14,915 students surveyed in the third follow-up by deleting the 2,350 students not enrolled in public high schools because private high schools are not required to administer MCEs even when it is a state mandate. I further narrow my sample by deleting the trivial number of observations missing data on the following variables: race, enrollment, urbanicity, and diploma status. Because the measures I use to construct the MCE, test score, and family income variables are missing between 10\% and 28\% of the observations, missing data analyses determined how excluding these observations will
change the results. My final analytic sample comprises 6,793 public school students who are not missing data on key variables.

Each follow-up of NELS:88 had fewer respondents than the previous data collection. Sampling weights allow researchers to account for non-response, unequal probabilities of selection, and for freshening students into the sample. Several sampling weights are provided in the NELS:88 data that allow for predictions to various populations. As this analysis only includes observations that have data on secondary school status, the sampling weight f3qwt will allow for predictions to the 12th graders who in 1988 were 8th graders.

**Variables**

*Urbanicity:* There is some evidence to suggest that minorities and students in poverty have more difficulty passing MCEs than average students (Dee & Jacob, 2006). As more minorities and low-income families are concentrated in cities (Kahn & Bajari, 2001), failing to include a variable that accounts for the “neighborhood characteristics” could introduce bias into my analysis. This variable describes the area surrounding the school and is coded into three dichotomous measures; urban, suburban, and rural/outside of the metropolitan statistical area. My baseline for this analysis will be suburban schools.

*School Enrollment:* Some evidence suggests that students from larger schools are more likely to drop out of high school (Jacob, 2001; Bishop & Mane, 2005). This measure is also coded into three dichotomous variables by the number of students enrolled; small school (1 to 799), medium school (800 to 1599), and large school
(2500+). The sample is distributed as follows; small school (31.04%), medium school
(42.60%), and large school (26.36%). My comparison group for this analysis is medium
schools (800 to 1599 students).

Family Income: Evidence from the existing literature suggests that MCEs might
be associated with increased likelihood of dropping out for students with low
socioeconomic status (Dee & Jacob, 2006). Socioeconomic status, a composite variable
comprising family income, parent’s highest education level, and parent’s occupational
prestige, is typically included in education policy research. As this paper aims to
determine if MCEs are related to families financial resources, family income is used
instead of socioeconomic status because it provides substantive categories for ease of
interpretation (i.e. low-income = under $25,000 per year). Five indicator variables are
created, separating family income into quintiles. The family income variables are divided
as follows: lowest family income = less than $25,000 per year, medium-low family
income = $25,000 to $49,999 per year, medium-high family income = $50,000 to
$74,999 per year, high family income = $75,000 to $99,999 per year, and highest family
income = more than $100,000 per year. The comparison group is medium-high family
income.

Standardized Test Score: Several studies indicate that low academic achievement
decreases the likelihood of completing high school and that low-achieving students might
be more likely to dropout when facing a MCE requirement (Green & Winters, 2004; Dee
& Jacob, 2006). In an effort to provide an unbiased measure of student achievement, I
use the variable F22XQURT from the 1994 NELS:88 student component data file.
F22XQURT is the students’ composite number of correct responses on the reading
comprehension and mathematics areas of the 10th grade cognitive tests, separated into
quartiles. Although the cognitive tests were similar in subject matter, they differed in
difficulty. Item Response Theory (IRT) was used to calculate the predicted number of
correct responses for a baseline exam. The composite score is adjusted by IRT to provide
a more consistent measure of student achievement that is less subject to spurious
variation than a measure such as GPA. I create a four indicator variables representing the
four quartiles; lowtscore= lowest composite quartile, midlowtscore= medium-low
composite quartile, midhightscore= medium-high composite quartile, hightscore= highest
composite quartile. My comparison group is the medium-high quartile.

**Minimum Competency Exam Requirement:** This variable measures whether a high
school senior was required to pass a minimum competency exam in order to be allowed
to graduate. I create a binary variable (0=No MCE, 1=MCE) from the NELS:88 variable
F2C42. This variable came from the school administrator data file, which traditionally
has a significant number of missing values. For this reason, many other authors use an
external measure of MCE policy (Jacob, 2001; Warren & Edwards, 2005). Using an
external data source to create the MCE variable allowed for these authors to make
inferences about the level at which the MCE policy was implemented (e.g. state, district,
or school). This key idea for this analysis is that students were required to pass a MCE,
not the level at which it was implemented, therefore the school administrator report of
whether seniors were required to pass a MCE to graduate will suffice. The measure I use
to determine whether students were required to pass a MCE to graduate is missing 27.9% of the cases.

Gender: Two binary variables delineate males from females. Males are the baseline for this analysis.

Race: Evidence from the earlier research shows that minorities are more likely to drop out of high school when required to pass a MCE (Dee & Jacob, 2006; Catterall, 1989). For this analysis, I create several indicator variables; White, Black, Hispanic, and Other. The baseline for my analysis is White.

High School Status: This is the outcome variable in my analysis. It indicates the educational status of the respondents in 1994 at the time of the third NELS:88 data collection. I code this measure into several indicator variables. They are as follows: received high school diploma (Diploma=1), received or currently working on a GED (GED=1), did not graduate and not working toward a GED or diploma (Dropout=1).

Method

This section outlines the logistic regression method used to evaluate the relationship between minimum competency exam requirements and secondary school completion and the extent to which that relationship varies by income, adjusting for differences in student gender and race, as well as school size and urbanicity. Ideally, my analysis would meet the methodological conditions necessary to distinguish causal relationships. As the conditions are not met by this analysis, the explanatory variables may predict or relate to the likelihood of dropping out, however they do not necessarily cause these relationships.
Logistic regression suits my analysis for several reasons. First, logistic regressions are designed for outcomes that are dichotomous. My outcome variable, secondary school completion, dichotomous (i.e. students can either graduate or drop out). Unlike a linear probability model, logistic regression will not predict an impossible probability (i.e. a predicted probability that is less than 0 or greater than 1). Additionally, linear regression models assume homoscedasticity of errors, or that the variance between the regression line and all points of the predictor variable is the same. As violating this assumption can lead to decreased accuracy of the estimates, this paper employs a logistic regression model, which does not assume homoscedasticity. I use the same set of independent variables to estimate the association of MCE requirements with the following three dependent variables: 1) Earning a high school diploma, 2) earning a GED, and 3) dropping out of high school. The models are specified as follows:

\[
\text{Outcome} = \beta_0 + \beta_1(\text{MCE}) + \beta_2(\text{Urban}) + \beta_3(\text{Rural}) + \beta_4(\text{Female}) + \beta_5(\text{Black}) + \beta_6(\text{Hispanic}) + \beta_7(\text{Other Race}) + \beta_8(\text{Small School}) + \beta_9(\text{Large School}) + \beta_{10}(\text{Lowest Family Income}) + \beta_{11}(\text{Mid-Low Family Income}) + \beta_{12}(\text{High Family Income}) + \beta_{13}(\text{Highest Family Income}) + \beta_{14}(\text{Low Test Score Quartile}) + \beta_{15}(2^{\text{nd}} \text{Lowest Test Score Quartile}) + \beta_{16}(\text{Highest Test Score Quartile}) + \beta_{17}(\text{Lowest Family Income} \times \text{MCE}) + \beta_{18}(\text{Mid-Low Test Score} \times \text{MCE}) + \epsilon
\]

\text{Missing Data}

Missing data can present problems for quantitative analysis, specifically that there may be significant differences between the observations that have data and those that are
missing. Several methods are commonly used to account for missing data, ranging from testing for significant differences in the missing data and reporting how those differences can bias the results to complex data imputation methods, such as jack-knifing. For this analysis, I determine the differences in the data that are missing and report how these differences can bias my results.

There are three key variables in my analysis that are missing a significant amount of data: test score, family income, and MCE status. The measure capturing students’ composite score on the reading and math cognitive tests administered in 10th grade was missing 26.0% of the observations, 27.9% of the cases were missing data on MCE status, and 13.5% of the observations were missing data on family income. To evaluate potential differences between respondents with data and those who are missing data on these variables, I create an indicator variable indicating whether students were missing data for each variable. I then ran a series of t-tests to evaluate whether the two groups, those with data and those without, were statistically different. I find significant differences between respondents with data on these variables and those who have no data.

Fewer students who are missing data on these three variables earned a diploma than those with data on these variables. Additionally, students missing data on these variables had higher rates of GED attainment and dropping out. Deleting these observations will increase the proportion of students who earned a diploma. This study evaluates whether MCEs are associated with an increased likelihood of dropping out for low-performing and low-income students. Increasing the proportion of students with diplomas to dropouts might hinder the ability of this analysis to find a statistically
significant result. Another significant difference is that more cases without data on test score, family income, and MCE status data attended large schools. The literature shows that students from large schools may be more likely to drop out (Bishop et al, 2001). Excluding these students from the analyses may reduce the variation in the dependent variable. Additionally, fewer students missing data on test score and MCE status had high family income and more students missing data on these variables had low family income. In many of the articles reviewed, low socioeconomic status is associated with a decreased likelihood of completing high school (Warren & Edwards, 2005; Jacob, 2001, Warren, et al., 2006). This study evaluates the association between MCEs and secondary school completion to determine if MCEs have the unintended consequence of dropping out for low-income students. Reducing the number of students with low family income that appear in the sample might weaken the expected relationship between MCEs and dropping out because it reduces the number of low-income students who are expected to drop out. Low academic achievement is also linked to an increased likelihood of dropping out (Jacob, 2001; Dee & Jacob, 2006). Most of the cases missing data on MCE status and family income were in the lowest reading and math composite test score quartile while only a few were in the highest quartile. Increasing the proportion of students with high academic achievement might decrease the variation in the dependent variable associated with student achievement, which could mask the true relationship between student achievement and the likelihood of earning a secondary school credential.

In summary, there are many differences between the students who are missing data on these three key variables and those students with data. Many of these differences
could lead to a decrease in the variation of the dependent variable, which might lead to a small or statistically insignificant result. In addition, the analyses disproportionately lose the students most likely to be adversely affected by MCE requirements, thus possibly weakening the relationships between MCEs and each outcome. While there are several methods that allow researchers to account for missing data, I will only evaluate students with data on these key variables.
Findings

Descriptive statistics revealed several differences that must be accounted for when evaluating the relationship between minimum competency exam requirements, student performance, and socioeconomic status. Thus, a regression model is also required to isolate the relationship between MCEs and the outcomes.
Demographic Characteristics

Table 1: Descriptive Statistics By MCE Requirement

<table>
<thead>
<tr>
<th>n=6,793 Students</th>
<th>Requires MCE</th>
<th>Does Not Require MCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urbanicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Urban</td>
<td>26.11***</td>
<td>11.34</td>
</tr>
<tr>
<td>% Suburban</td>
<td>42.20*</td>
<td>39.10</td>
</tr>
<tr>
<td>% Rural</td>
<td>31.67</td>
<td>49.55***</td>
</tr>
<tr>
<td>School Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Small (1 to 799 )</td>
<td>20.95</td>
<td>46.41***</td>
</tr>
<tr>
<td>% Medium (800-1599)</td>
<td>46.61***</td>
<td>38.92</td>
</tr>
<tr>
<td>% Large (1600 or more)</td>
<td>32.43***</td>
<td>14.66</td>
</tr>
<tr>
<td><strong>Student Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Male</td>
<td>47.89</td>
<td>48.62</td>
</tr>
<tr>
<td>% Female</td>
<td>52.10</td>
<td>51.37</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% White</td>
<td>59.77</td>
<td>85.65***</td>
</tr>
<tr>
<td>% Black</td>
<td>14.63***</td>
<td>3.63</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>16.21***</td>
<td>4.85</td>
</tr>
<tr>
<td>% Other</td>
<td>9.37***</td>
<td>5.85</td>
</tr>
<tr>
<td>Cognitive Test Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Lowest Quartile</td>
<td>21.50***</td>
<td>17.73</td>
</tr>
<tr>
<td>% Low-Middle Quartile</td>
<td>26.69*</td>
<td>24.00</td>
</tr>
<tr>
<td>% High-Middle Quartile</td>
<td>27.09</td>
<td>28.07</td>
</tr>
<tr>
<td>% Top Quartile</td>
<td>24.71</td>
<td>30.18***</td>
</tr>
<tr>
<td>Family Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Below $25,000</td>
<td>39.67***</td>
<td>34.64</td>
</tr>
<tr>
<td>% $25,000 to $49,999</td>
<td>40.82</td>
<td>46.41***</td>
</tr>
<tr>
<td>% $50,000 to $74,999</td>
<td>13.75</td>
<td>12.95</td>
</tr>
<tr>
<td>% $75,000 to $99,999</td>
<td>2.98</td>
<td>3.06</td>
</tr>
<tr>
<td>% Above $100,000</td>
<td>2.75</td>
<td>2.92</td>
</tr>
<tr>
<td>High School Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Diploma</td>
<td>96.39</td>
<td>97.71**</td>
</tr>
<tr>
<td>% GED</td>
<td>2.48*</td>
<td>1.71</td>
</tr>
<tr>
<td>% Dropout</td>
<td>1.12*</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>59.60</td>
<td>40.40</td>
</tr>
</tbody>
</table>

~p< 0.10       *p<0.05       **p<0.01     ***p<0.001

Table 1 presents differences between students who were required to pass a MCE to graduate and those who had no such requirement. I conducted a series of t-tests to determine if students who were required to pass a MCE to graduate and those who had no such requirement differed across select background characteristics. Findings presented in
Table 1 show that a slightly lower percentage of students who were required to pass a MCE graduated high school than students with no such requirement. Second, more students who were required to pass a MCE to graduate scored in the lower 2 quartiles of the composite reading and math cognitive tests administered in 10th grade than students who did not face a MCE requirement. Additionally, a larger percentage of students who had a MCE requirement earned a GED or dropped out of high school than students who were not required to pass a MCE. In terms of background characteristics and context, students who were required to pass a MCE to graduate were in the two lowest family income quintiles, and attended larger schools than those without MCE requirements.

Given the differences in high school completion and socioeconomic status, isolating the relationship of MCEs and secondary school completion requires accounting for variation in socioeconomic status and student performance.
### Table 2

MCEs and the Likelihood of Completing A Secondary School Credential: Logistic Estimates

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diploma</td>
<td>GED</td>
<td>Dropout</td>
</tr>
<tr>
<td>MCE</td>
<td>0.79 (0.21)</td>
<td>0.87 (0.22)</td>
<td>1.03 (0.46)</td>
</tr>
<tr>
<td>Urban</td>
<td>0.90 (0.26)</td>
<td>1.16 (0.35)</td>
<td>0.83 (0.38)</td>
</tr>
<tr>
<td>Rural</td>
<td>0.95 (0.23)</td>
<td>0.87 (0.20)</td>
<td>1.31 (0.55)</td>
</tr>
<tr>
<td>Female</td>
<td>1.68* (0.42)</td>
<td>0.62* (0.13)</td>
<td>0.60 (0.29)</td>
</tr>
<tr>
<td>Black</td>
<td>1.60 (0.59)</td>
<td>1.00 (0.29)</td>
<td>0.35* (0.21)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.97* (0.80)</td>
<td>1.04 (0.30)</td>
<td>0.17** (0.10)</td>
</tr>
<tr>
<td>Other Race</td>
<td>1.66 (0.67)</td>
<td>0.60 (0.29)</td>
<td>0.64 (0.42)</td>
</tr>
<tr>
<td>Small School</td>
<td>0.93 (0.19)</td>
<td>0.58* (0.28)</td>
<td>2.22 (0.88)</td>
</tr>
<tr>
<td>Large School</td>
<td>0.79 (0.32)</td>
<td>0.99 (0.15)</td>
<td>2.16* (1.16)</td>
</tr>
<tr>
<td>Lowest Family Income</td>
<td>0.39** (0.13)</td>
<td>2.34*** (0.91)</td>
<td>2.61 (1.74)</td>
</tr>
<tr>
<td>Mid-Low Family Income</td>
<td>0.76 (0.25)</td>
<td>1.22 (0.43)</td>
<td>1.43 (1.01)</td>
</tr>
<tr>
<td>High Family Income</td>
<td>0.99 (0.72)</td>
<td>1.30 (0.97)</td>
<td>- (7.21)</td>
</tr>
<tr>
<td>Lowest Test Score Quartile</td>
<td>0.26*** (0.07)</td>
<td>2.72*** (0.82)</td>
<td>8.56*** (4.19)</td>
</tr>
<tr>
<td>2nd Lowest Test Score Quartile</td>
<td>0.31*** (0.10)</td>
<td>2.11* (0.68)</td>
<td>1.23 (0.96)</td>
</tr>
<tr>
<td>Highest Quartile</td>
<td>3.09** (1.37)</td>
<td>0.35* (0.16)</td>
<td>0.04** (0.05)</td>
</tr>
<tr>
<td>Lowest Family Income*MCE</td>
<td>0.39** (0.15)</td>
<td>- (2.39)</td>
<td>4.42** (7.31)</td>
</tr>
<tr>
<td>Mid-Low Test Score*MCE</td>
<td>- (1.37)</td>
<td>- (2.39)</td>
<td>8.40* (7.31)</td>
</tr>
</tbody>
</table>

Pseudo R² | 0.13 | 0.08 | 0.25 |
Wald Chi² | 156.74 | 101.70 | 87.70 |
*p<0.10  *p<0.05  **p<0.01  ***p<0.001

^ Other Race includes Asian Pacific Islander and any race not defined by White, Black, or Hispanic

All 192 students in the highest family income bracket (over $100,000 per year) graduated high school, therefore this variable is omitted due to a lack of variation.

Reference categories are suburban, Male, white, medium school, mid-high socioeconomic quintile ($50,000 to $74,999), and mid-high test score quartile.

Interaction terms were excluded from both the Diploma and GED equations due to lack of statistical significance.

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Table 2 presents the results from the three logistic regression models used for this analysis. The first model evaluates the relationship between MCEs and the likelihood of earning a diploma, explains 13% of the variation in high school completion (pseudo R²=...
and is statistically significant (Wald Chi²=156.74). The second model evaluates the relationship between MCEs and the likelihood of earning a GED. It explains 8% of the variation in the likelihood of earning a GED (pseudo R² = 0.08), and is statistically significant (Wald Chi²=101.70). The third model evaluates the relationship between MCEs and the likelihood of dropping out. It explains 25% of the variation in the likelihood of dropping out (pseudo R² = 0.25), and is statistically significant (Wald Chi²=87.70). The next section discusses the results in further detail.

**Primary Finding**

**MCE**

The results from three logistic regression models that evaluate these relationships empirically are presented in Table 2. In my analysis minimum competency exam requirements are not independently associated with the likelihood of graduating high school, earning a GED, or dropping out. Given that minimum competency exams might only prevent a few students from graduating overall (Catterall, 1987), I tested a series of interaction terms. Low-income students (with a family income of less than $25,000) who were required to pass a MCE to graduate are 81% more likely to drop out of high school than low-income students who were not required to pass a MCE. This result is calculated by subtracting the odds ratio from Model 3 for Lowest Family Income (2.61) from the odds-ratio from Model 3 for the interaction between MCE and Lowest Family Income (4.42). The result is 1.81, or that low-income students who were required to pass a MCE were 181% as likely to dropout as low-income students with no such requirement. Subtracting 100% from the 181% results in 81%, meaning that low-income students with
a MCE requirement were 81% more likely to drop out than low-income students who were not required to pass a MCE. In these models, MCEs alone were not related to the likelihood of completing high school.

Secondary Findings

Income

The findings on income from my analysis corroborate those of the existing literature. Students in the lowest family income quintile (less than $25,000) are 60% less likely to graduate than students with mid-high family income ($50,000 to $74,999). In addition, students with low family income (less than $25,000 per year) were 1.34 times more likely to earn a GED than students with a family income of $50,000 to $74,999 per year. Variation in income between $25,000 and $99,999 does not seem to influence the likelihood of dropping out, earning a GED, or graduating high school. Interestingly, all students in the highest income bracket (over $100,000 per year) graduated high school (e.g. highest family income perfectly predicts high school graduation).

Academic Performance

Academic performance, as measured by students’ 10th grade composite reading and math test score, is a statistically significant predictor in all three models. Students scoring in the lowest quartile of the 10th grade composite reading and math were 74% less likely to graduate high school than students in the mid-high quartile. Additionally, students in the mid-low composite test score quartile were 69% less likely to complete high school than students in the mid-high test score quartile. The highest achieving students were 2.09 times more likely to graduate than those who scored in the mid-high
test score quartile. This finding suggests that low-performing students are less likely to complete high school, which leaves these students two options: earn a GED or drop out completely. Students in the lowest test score quartile are 1.72 times more likely to earn a GED than students in the mid-high test score quartile. Additionally, I find that the students in the lowest test score quartile are 7.56 times more likely to drop out than students in the mid-high test score quartile. Conversely, students in the highest cognitive test score quartile are 2.09 times more likely to graduate high school and 65% less likely to earn a GED than students in the mid-high reading and math quartile.

Several other interesting findings emerge from the models. Contrary to the literature, Black students were 65% less likely to drop out and Hispanic students were 83% less likely to drop out than White students. Additionally, Hispanic students were 97% more likely to graduate than White students. Surprisingly, this contradicts the literature in that my analysis shows that minorities are less likely to drop out than White students. Students from large schools were 116% more likely to drop out than students from mid-sized schools, supporting the assertions from the existing literature that large school size is negatively related to the likelihood of dropping out. Perhaps the minority students are more likely to attend large schools, and the impact of school size on dropping out is larger than the relationship between race and the same outcome. A variety of other factors may also cloud the true relationship between race and secondary school completion.

In summary, these results support my hypothesis. Minimum competency exam requirements are not related to secondary school completion for the full sample, but
decrease the likelihood of completing high school and increase the likelihood of dropping out for low-achieving and low-income students.
Discussion

The purpose of this study is to determine if minimum competency exam requirements have unintended consequences for low-achieving and low-income students. The previous research reaches no consensus about the effects of MCEs on the likelihood of secondary school completion. In addition, there was no research that focused solely on public schools using the 1994 NELS:88 data collection and also differentiated between students who earned GEDs and dropouts. This analysis attempts to fill the research gap and to determine if MCE requirements increase the likelihood of dropping out for low-income and low-performing students.

My findings are consistent with much of the existing literature on the relationship between minimum competency exam requirements and secondary school completion. Minimum competency exam requirements are not independently related to any of the outcomes; however, interactions between the MCE variable and both family income and cognitive test score were significant. The interaction between low family income and minimum competency exam in the dropout equation showed that poor students who are required to pass a MCE to graduate are over 80% more likely to drop out than low-income students who are not required to pass a MCE. Jacob (2001) and Dee and Jacob (2001) also find that minimum competency exam requirements were linked to an increase in the dropout rate, particularly when they examined school districts with large proportions of economically disadvantaged students. This thesis provides evidence to support the theory that minimum competency exams are associated with an increased likelihood of dropping out for economically disadvantaged students.
The result in Model 3 from the interaction between MCE and mid-low test score is similar to that found by MacMillan, et al. (1990) for learning handicapped and educationally marginal students. As students in the lowest test score quartile might have already ceded hope of graduating high school, students in the mid-low test score quartile could be educationally marginal students (those students who perform just well enough not to fail). For these students in the mid-low test score category, I found minimum competency exam requirements to be associated with a large increase in the likelihood of dropping out. Minimum competency exam requirements for graduation were designed to hold back educationally marginal students. The results from this study provide evidence to show that MCEs may have the unintended consequence of an increased likelihood of dropping out of high school for low-performing and low-income students.

**Limitations**

There are several limitations to my analysis of the association between MCE requirements and secondary school completion. The data set used for this analysis follows a single cohort of students over time, rather than multiple cohorts of students. Analyzing a nationally representative, panel data set would allow a future analysis to adjust for differences across students, states, and over time. This analysis accounts for differences in students and schools. However, the public-use NELS:88 data used for this paper did not contain students’ state of residence, which would allow for analyses to be made regarding the level of the implementation of the MCE policy. Additionally, several key variables were missing data. I performed missing data analysis on these key variables, and found that deleting the observations missing data on these key variables
would introduce some bias into my results. Finally, a difference-in-difference model
would have allowed for more precise inferences about the relationship between MCEs
and secondary school completion, particularly whether MCEs were associated with
delayed graduation.

**Policy Implications**

While a single measure of students learning is attractive from a policy
perspective, it may not be the best way to evaluate students to determine if they have
attained a basic level of knowledge. Evidence from this analysis suggests that minimum
competency exams exacerbate income stratification in the education system and are
associated with an increase in the likelihood of dropping out for educationally marginal
students. Additionally, MCEs are considered an accountability measure for high schools,
even though schools can intentionally misclassify students into an exempted category.
Looking forward, policy makers at the state level should re-evaluate the MCE policies of
their states. MCEs do not offer a very high minimum level of learning, they do not
measure achievement, and they do not demonstrate the students’ strengths and
weaknesses in specific subjects. Additionally, I have found that they may have the
unintended consequence of an increased likelihood of not completing a secondary school
credential for low-performing and economically disadvantaged students. In order to
significantly improve the effectiveness of MCEs, I would recommend a series of Course
Based Exit Exams (CBEEs), that students must pass before being allowed to graduate
that course in high school. Such exams would be developed by the state Departments of
Education and administered as a cumulative final exam in each course. Testing each
student in each subject would allow administrators and teachers to identify if students need course specific help, would provide a standardized metric by which administrators could measure teacher performance, and would give students a more accurate idea of their strengths and weaknesses academically.
Conclusion

In conclusion, this paper has evaluated the relationship between minimum competency exam requirements for graduation and secondary school completion. Using a logistic regression model, I found that minimum competency exam requirements are not associated with secondary school completion independently, but that interactions between MCEs and family income, and between MCE and low test scores were statistically significant. For economically disadvantaged and educationally marginal students, this study finds that MCEs are associated with decreased likelihood of obtaining a secondary school credential.
References


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