

2012

The Effects of the Minimum Wage and Other Public Policies on High School Graduation

Anna Morris

Wellesley College, amorris3@wellesley.edu

Follow this and additional works at: <https://repository.wellesley.edu/thesiscollection>

Recommended Citation

Morris, Anna, "The Effects of the Minimum Wage and Other Public Policies on High School Graduation" (2012). *Honors Thesis Collection*. 37.

<https://repository.wellesley.edu/thesiscollection/37>

This Dissertation/Thesis is brought to you for free and open access by Wellesley College Digital Scholarship and Archive. It has been accepted for inclusion in Honors Thesis Collection by an authorized administrator of Wellesley College Digital Scholarship and Archive. For more information, please contact ir@wellesley.edu.

**The Effects of the Minimum Wage and Other Public Policies
on High School Graduation**

Anna Morris

April 2012

Submitted in Partial Fulfillment of the
Prerequisite for Honors in Economics

© 2012 Anna Morris

Acknowledgements

I would first and foremost like to thank my fantastic advisor, Phillip Levine, for all of your work on this project and your support throughout my senior year as a whole. Additionally, thanks for your emotional understanding during the low points of NCAA basketball season. I would be remiss not to thank Syracuse University for waiting until after this academic year to join the ACC, so that this partnership was able to exist peacefully. I couldn't have asked for a better advisor and am truly thankful for all of your assistance.

To Professor Butcher and my fellow peers who wrote theses in the economics department, thanks for all of your attention, helpful critiques and comments, and of course moral support throughout the hardest parts of our projects. We did it!

To all of the professors who have influenced and supported me either directly or indirectly throughout my academic career, and especially Professors Coile, Fetter, McEwan, McKnight, Shurchkov, and Weerapana—I certainly couldn't have made it through Wellesley without your guidance. Thanks for your support and accessibility during office hours, and for showing interest in my growth not only as a student but also as a young woman. Wellesley wouldn't be the same without the individualized attention and care provided by its professors.

To my wonderful friends—especially Jordan, Judee, Kelvin, Libby, Mari, and Marissa, thanks for an unbelievable four years, and for providing much-needed entertainment and distractions during the most difficult parts of writing my thesis. Late nights and early mornings in the library are always better with a friend.

To my beautiful younger sister Allyn, thanks for bringing a little piece of home up to Wellesley and always being there for me. Thanks for taking the parental pressure off by being the daughter who aspires to be a doctor, so that I am free to pursue my interest in education and love of numbers. I hope you enjoy your time here as much as I have—promise me you'll visit the economics department at least once!

Last but certainly not least, I would like to thank my loving and incredibly supportive parents, Catherine and Keith, for encouraging me not only in my endeavors at Wellesley but also in everything I have attempted in my life thus far. I am incredibly lucky to have you as parents and certainly wouldn't be here without your support. Mom, I promise I'll end up back at UNC eventually!

Abstract

The state of education in the U.S. is declining. While education spending has skyrocketed for the past three decades, the high school graduation rate has stagnated. Perhaps of more concern, the U.S. high school graduation rate currently ranks 21st among OECD countries. Three potential factors that could affect teenage schooling decisions are the minimum wage, compulsory schooling laws, and minimum competency testing. The education policies would seem to have an obvious relationship to this outcome. The effects of the minimum wage on schooling decisions, however, have not been documented as extensively. A change in the wage could have a direct effect if an increase in the minimum wage causes teenagers to reevaluate their labor market prospects and then choose to leave school if they feel they can find a higher-paying job, or stay in school if they see fewer jobs being made available. This thesis utilizes three decades of American Community Survey data to perform a quasi-natural experimental analysis that examines the effects of the minimum wage, compulsory schooling laws, and minimum competency testing on teenage schooling decisions. I find that an increase in the minimum wage has little effect on the high school dropout rate, but it encourages some students to enter the labor force after graduating from or completing high school rather than going on to tertiary education. Additionally, compulsory schooling laws increase high school graduation rates, but exit examinations, it turns out, have a counterproductive effect, inducing some students to drop out or take the GED rather than submit to the requirement.

I. Introduction

The state of the American education system has been a growing concern in recent years. For most of the 20th century, U.S. students showed dramatic gains in educational attainment—the proportion of students graduating from high school rose from 6 percent in the early 1900s to a peak of almost 80 percent in the 1970s (Goldin and Katz 2008). However, over the past few decades the rate has shown little to no growth. Different methods of measuring the rate show it leveling out at best and falling by several percentage points at worst (Figure 1). In a country that ranks first in the world in terms of the earnings premium for years of additional schooling (OECD 2011), one would expect the U.S. high school graduation rate to exhibit a similar rank over other countries. But, in fact that rate does not measure up to that of our international counterparts: in 2009, the U.S. ranked 21st among OECD countries (Figure 2). The large number of students that are failing to complete high school is a real concern for American society: high school dropouts are less likely to find work, more likely to live in poverty, and their expected lifetime earnings are substantially less than their high school graduate counterparts (Rumberger 2011). The decline of the U.S. high school graduation rate has called into question the state of the American education system, but causal reasons for why the rate is falling are still up for debate.

One area that has received little investigation is how a change in the minimum wage affects a teenager's decision to stay in school. In informing policy, the effects of the minimum wage on employment have been extensively documented, but externalities of the wage on areas of human capital development are equally important to understand. While the nominal minimum wage has been steadily increasing, the real minimum wage has been falling for the past 30 years. One plausible consequence is that students would show more willingness to stay in school, if

facing lower expected earnings in the labor market makes students less likely to leave school to apply for such a job. But, as the real minimum wage has been falling we have seen the percentage of students leaving school early either staying the same or even rising. Thus, an alternative story suggests that with this lower minimum wage teens may have found it easier to find work—even if the job doesn't pay as much—and thus may have chosen to drop out of high school. But, in addition to this decline in the real minimum wage, several other trends have been occurring that affect teen educational decisions, such as an increased availability of the General Educational Development (GED), an increase in high school graduation requirements, and an increase in the focus on standards-based testing. Thus, a systematic econometric approach needs to be taken in order to discern the true effect of the minimum wage on teenage schooling decisions.

Additional public policies that are specifically designed to have an effect on educational outcomes are equally interesting to study to determine if their actual effect is in line with policy makers' goals. For example, raising the minimum dropout age in a state would be expected to keep students in school longer, while requiring students to pass an exit exam to graduate may discourage students from staying in school if they are intimidated by the prospect of passing. Answering these questions will be of significant importance going forward as the country addresses how best to deal with its substandard level of the high school graduation rate.

These true effects are difficult to establish for the usual econometric reasons of difficulty establishing causation. An additional complexity when dealing with the high school graduation rate, however, is that disagreement exists in how precisely to measure the rate. For example, the percentage of graduates can be measured at a single point in time—a status rate—or can be tracked to see who drops out of school over the course of a standard period of time such as a

year—an event rate. The biggest flashpoint in the debate is the inclusion of GED recipients in the percentage of students graduating high school. We will see that the inclusion or exclusion of these recipients can greatly influence the rate.

My analysis focuses on how the real minimum wage, minimum dropout age, and requirement of an exit examination when an individual is 16 years of age affect their ultimate educational attainment—whether they end up as a dropout, graduate, or GED recipient, and ultimately if they decide to enter college. I will provide a critical review of possible causes of the declining U.S. high school graduation rate, and summarize the limited amount of past research that exists on the link between the school enrollment rate and minimum wage rate. I will also explore the effects of changing compulsory schooling laws and exit exam requirements. My paper contributes to a largely underdeveloped field, and also updates existing literature by using data through 2006. Additionally, due to the recent implementation of a new Census-type survey known as the American Community Survey that has more specific questions regarding educational attainment, starting in the survey year 2008 individuals who received the GED can be separated out from those who completed high school in the traditional manner and received a diploma.

I find that a one-dollar increase in the minimum wage has little effect overall on teenage schooling decisions, but is associated with a decrease in the probability that a female drops out of about 3.8 percent relative to the mean, and an increase she will get a high school diploma of 2.1 percent relative to the mean (Table 6, Columns 4 and 7). Additionally, an increase in the minimum wage could be detrimentally affecting a student's decision to enter college, an effect that warrants further investigation.

The effects of a change in the minimum dropout age are strong: a one-year increase in the age is consistently associated with a decrease in the probability that an individual obtains a GED of between 3.6 percent and 8.1 percent relative to the mean, and an increase in the probability of receiving a diploma of around 3 percent. Minimum competency testing (or exit examinations) may be detrimentally affecting student outcomes. Requiring an exit examination to graduate is associated with a decrease in the probability of obtaining a diploma of between 2.7 percent and 8.1 percent, while the probability of obtaining a GED increases. But, the introduction of an exit examination is often accompanied by broad changes in curriculum or teaching methods, and so this coefficient may not be the true effect of simply requiring the exit examination.

I proceed with the rest of the paper as follows. Section II reviews existing work on the topic including previous research on the minimum wage, compulsory schooling laws, and minimum competency testing. Section III introduces the theoretical predictions of economic theory and describes the empirical framework of this paper. Section IV discusses the data and results while Section V concludes.

II. Literature Review

In this section, I review the existing body of research on the topic at hand. I start by documenting the facts regarding the high school graduation rate and also discuss some of the measurement difficulties that go into determining the rate, concentrating on the dilemma raised by the GED. I move on to explore the existing literature on high school dropouts. Next, I summarize the extensive body of research on the minimum wage, starting by documenting the empirical work done on the link between the minimum wage and employment. The section then reviews the much smaller set of papers that examine the link between the minimum wage and

educational attainment. Finally, I discuss the research and existing conclusions surrounding compulsory schooling laws and minimum competency testing.

Documenting the Facts

By all accounts, the U.S. education system is foundering. The high school graduation rate has remained in the range of 75-85 percent for the past four decades, while the dropout rate remains in the 5-10 percent range (Figure 1). This stagnation would not be of as much concern if high school students in the United States were graduating at the same rate as their peers in other countries. Some countries, however, boast a secondary education completion rate higher than 90 percent—showing the United States has room to markedly improve.

Our ranking as compared to other countries makes even less sense when looking at returns to education. The United States has the highest wage premium in the developed world in respect to both high school and college graduation (Figure 3). Since the gap between high school dropout and high school graduate earnings is higher in the U.S. than in any other country, one would expect the U.S. high school graduation to be near the top. Furthermore, high school dropouts are not able to go on to college, additionally hurting their future employment and income prospects.

Of additional concern, the economic costs of America's rising dropout crisis are staggering. High school dropouts pose a particular burden to the economy—it has been estimated that dropouts cost taxpayers between \$320 billion and \$350 billion a year in lost wages, taxable income, health, welfare, and incarceration costs (NPR 2011). Education spending as a percent of GDP has been rising over the past four decades (Figure 4)—but the country has not seen returns in the form of an improvement in the graduation rate. At a time when managing the budget successfully is paramount, any investment by the federal government should be expected to

receive a positive return—especially in an area as crucial to the country’s continued success as education. It is possible that the increase in spending has been just enough to maintain the current state of the rate, so that the rate would have fallen in absence of the additional funding, or that the spending has benefited students in avenues other than helping them graduate from high school. If this is the case, however, it is of even greater importance that the true effect of public policies on educational outcomes is understood, so that a change in a policy such as exit exam requirements does not counteract the desired effect of the increase in education spending. All factors seem to indicate that it would be desirable to see the graduation rate rising—not leveling out or declining.

Measurement Issues

One difficulty in analyzing changes in the high school graduation rate is that a plethora of different rates exists to measure this level of educational attainment. The National Center for Education Statistics (NCES) reports three main rates: the status rate, the event rate, and the averaged freshman graduation ratio. The status rate looks at a snapshot in time and calculates what percent of the population has achieved a certain status, while the event rate looks at how many people achieve a credential over a specified period of time (usually one year). Both of these rates can be measured respective to either high school completers or high school dropouts (a completer is defined as someone who received a standard high school diploma or the GED). A newer measure of graduation reported by the NCES is the averaged freshman graduation ratio (AFGR). From the NCES website, this rate “provides an estimate of the percentage of public high school students who graduate on time—that is, four years after starting ninth grade—with a regular diploma” and attempts to reconcile some of the biggest measurement issues: it excludes students who take longer than usual to graduate, as well as students who do not graduate but

receive the GED instead (NCES 2011). The most recent rates available put the status dropout rate at 8 percent in 2009, the event dropout rate at 3.75 percent in 2006, the AFGR at 75 percent in 2008, and the status completion rate at 88 percent in 2006. The main reason the AFGR is markedly lower than the status completion rate is due to the exclusion of GED recipients.

Equating GED recipients with regular high school graduates has received particular attention in the literature. The GED was originally introduced after World War II as a way for recruits to achieve high school graduation status if they had left school early to serve in the military abroad (Murnane 2011). In 1947, New York was the first state to make the test available to dropouts who had not served in the military, and by 1970 the test had been made available to civilians in all states. From 1970 to 2001 the percentage of new high school credentials awarded through the GED increased from 2 percent to 18 percent (Murnane, 2011). In the early 2000s reforms were put in place to make the test more difficult to pass, but in 2007 that rate was still 12 percent. Thus, including these recipients can greatly inflate the number of individuals that it appears are “graduating” from high school.

If these individuals were thought to be statistically the same as high school graduates, then including them in the graduation rate would not be a problem—it would still measure individuals who are capable of performing at the same level in the labor market. The performance of these recipients has been extensively studied, however, and it is the general consensus that GED recipients actually perform at the same level as high school dropouts in the labor force. For example, Heckman, Humphries, and Mader (2011) compile raw data from the National Longitudinal Study of Youth 1979 and find that the hourly wages, wage income, and hours worked for GED recipients are, for the most part, statistically the same as those of dropouts, and that these differences persist across the life cycle of individuals.

It is possible, however, that GED recipients are still different on some unobservable level from dropouts since they actually had the motivation to take and pass the eight-hour battery of exams that makes up the GED—leading some authors to claim they should be given more credibility than dropouts. For example, a poll by the Society for Human Resource Management found that 96 percent of U.S. employers and training programs answered yes to the question “Does your company accept applications with a GED credential for jobs requiring a high school degree?” (GED Testing Service 2009). Additionally, a 2007 poll by the College Board found that 98 percent of colleges and universities responded yes when given the prompt “High school diploma is required and GED is accepted.” Thus, it seems that institutions for tertiary education as well as prospective employers seem to respond positively to individuals who hold a GED, although it is not clear if they give equal weight to a GED and a high school diploma.

If the GED provided an alternative certification route to students who would otherwise remain dropouts, then it would likely be seen as “better than nothing” for these individuals. Research has shown, however, that some students who would otherwise graduate from high school opt to sit for the GED instead. For example, Heckman *et al.* (2008) found that an increase in availability of the GED actually induced some students to dropout. The authors employed a differences-in-differences strategy utilizing changes in GED passing standards and availability to civilians. When the GED was made available to civilians in California in 1974, the state high school dropout rate increased by 3 percentage points; upon a similar introduction in Oregon that integrated GED study programs directly into high schools, the state high school graduation rate decreased by 4 percentage points. When the GED became more difficult to pass in 1997, however, the national high school dropout rate decreased by 1.3 percentage points. These results conclusively point to detrimental impacts on student outcomes stemming from the availability of

the GED—many students who would graduate otherwise may instead be taking the GED-certification option. Additionally, although the GED is seen as an alternative pathway to higher education, students who opt to take the GED do not often use it as such. Although the GED is widely accepted by colleges and universities as an alternative to earning a high school diploma, in 2006 only 7.2 percent of GED recipients had earned a two-year degree, while only 6.0 percent had earned a four-year degree (Heckman, Humphries, and Mader 2011).

Aside from concerns over the GED, additional measurement issues deal with the population of students included in the calculation of the rate. For example, including or excluding the incarcerated population or military individuals can greatly affect the denominator of how many individuals are eligible to graduate. Since these individuals are less likely to graduate on average, including these populations can deflate the graduation rate. Conversely, including private school students can increase the graduation rate, since these students are more likely to graduate on average.

The different types of statistics that exist to measure levels of educational attainment are influenced by these measurement issues in distinct ways. The status completion rate reported by the NCES includes GED recipients as high school graduates, and is limited to the non-institutionalized civilian population. Thus, this completion rate would be much lower if GED recipients were excluded or a more inclusive sample of the population was used as the denominator. The AFGR, on the other hand, does not count GED recipients as high school completers and thus is usually slightly lower than the status completion rate. This rate provides an estimate of the percentage of public school students who graduate on time—that is, in the standard four-year time frame. This rate excludes private school students—who typically

graduate at higher levels than their public school peers—and so may be slightly biased downward, but does provide a measure of success for the public school system.

Factors Determining the High School Graduation Rate

Extensive research has been conducted on the characteristics of high school dropouts. Minority populations have a higher rate of dropping out, as do teens who live in single parent households, are low income, and/or live with parents that have low levels of educational attainment (Rumberger and Lim 2008). In his book, *Dropping Out* (2011), Russell Rumberger reviews the past 25 years of research on the subject, which covers over 200 published studies. Rumberger summarizes that more than one million students drop out of high school every year—which translates to more than 7,000 each day. He categorizes factors for dropping out into individual or institutional characteristics and summarizes the effect of a wide range of these characteristics on a student's probability of dropping out. He determines that key individual factors are test scores and academic performance, high absenteeism, and English language proficiency, while key institutional factors are single-parent homes, family resources, and sibling's educational attainment. Reasonably, Rumberger concludes that dropping out is a *process* and no single factor can conclusively determine whether or not an individual will exit the education system early. He makes little attempt, though, to address causation, instead simply summarizing trends over time without exploring the effects of holding different factors constant.

Rumberger also documents the later costs of dropping out on individuals. By examining available data, he concludes that dropouts are almost twice as likely to be poor as are high school graduates who do not go on to college: for example, in 2009, 25 percent of high school dropouts had incomes below the poverty line, compared to only 14 percent of terminal high school graduates. The disparity has also been increasing over time—the median annual earnings of full-

time, full-year dropouts were 21 percent less than those of high school completers in 2008, an increase of 6 percentage points from 15 percent in 1980.

Murnane (2011) takes more of an economist's point of view and breaks down the factors determining the graduation rate into costs and benefits. We have already seen that the benefits of a diploma are great in that the wage premium to a high school diploma in the U.S. is extremely high, but also another trend persists: the average real wage of dropouts relative to terminal high school graduates has been falling (Figure 5). All things considered the internal rate of return to receiving a diploma has been rising constantly—but the graduation rate has not. To explain this, Murnane posits that perhaps the average real wage is not the “relevant expected wage” for teens on the margin of dropping out of school. He argues that these teens recognize the same characteristics that may influence their decision to drop out of school—such as their low cognitive skill levels or unproductive behavioral characteristics—and assume that due to these characteristics they would not increase their expected earnings by much if they completed high school rather than if they just dropped out. I hypothesize, by extension, that the minimum wage may be more of a relevant expected wage—it may be easier for the marginal teen to internalize, and also teens would assume they could get a job at the minimum wage. Thus, a change in the minimum wage should have a direct effect on what these teens calculate to be their expected wages.

In addition to the rising benefits to a high school diploma, however, costs have also risen greatly. Upon publication of *A Nation at Risk* in 1983, real steps were taken to improve the education system. The report lambasted the low standards of the American school system and concluded that “a rising tide of mediocrity” was threatening the future of the United States and American society as it then stood. Within the next few decades, high school graduation

requirements increased, exit examinations became common, and schools began to focus more on standards-based testing. For example, by the 2009-2010 school year 75 percent of all public high school students had to pass at least one exit examination in order to successfully graduate from high school and receive a diploma (Center on Education Policy 2010).

In sum, these changes made it more difficult to get a high school diploma. The opportunity cost of an additional year of school increased: some students who may previously have stayed in school for another year may now decide to drop out, thinking that it is pointless to sit for that additional year when they may not even pass the requirements in the end to move to the next grade. Murnane summarizes that these substantial increases in the costs of receiving a high school diploma are a large part of why the graduation rate has stagnated. Another reason he addresses that could explain the stagnation is the influx of immigrants into the country. Minority students, on average, receive lower test scores and graduate at a lower rate, so an increase in these students would pull both test scores and the graduation rate downwards. For example, the high school graduation rate among 20-24 year old Hispanic non-whites who were recent immigrants (defined as an individual who arrived in the United States between 2000 and 2009) was less than 50 percent in 2009 (Murnane 2011).

Impact of the Minimum Wage on Employment

The impact of the minimum wage on the labor market may be one of the most studied questions in economics. A wide body of papers exists documenting the effects of the minimum wage on everything from employment to the distribution of wages to the proportion of individuals living in poverty. With regards to employment, the majority of the research has found that an increase in the minimum wage has a negative but small effect, as summarized by Neumark and Wascher (2008) in their book, *Minimum Wages*. They conclude that about two-

thirds of the approximately one hundred studies they reviewed yield evidence of negative employment effects of the minimum wage—although not all of them are statistically significant or large. Furthermore, they summarize that an increase in the minimum wage leads to a reduction in employment opportunities for low-skilled and directly affected workers (those that were earning at or just above the old minimum wage). They find some evidence that the existence of a minimum wage is actually harmful to poverty-stricken families by reducing the employment opportunities available to them, and virtually no evidence that an increase in the minimum wage helps reduce poverty. Additionally, they find that the minimum wage ultimately lowers adult wages of young workers who encounter it, through channels such as reducing their ultimate level of education—an effect that will be discussed in more detail in the next paragraph. In sum, the authors find negative but small effects of an increase in the minimum wage on a wide range of employment and personal income outcomes.

More specifically, Neumark and Wascher (2008) state that the “consensus” value of the elasticity of teenage employment with respect to the minimum ranges from -0.1 to -0.3, as established after the Minimum Wage Study Commission was launched in 2007.¹ In an earlier paper, Neumark and Wascher (1992) estimated the effects of changes in the minimum wage on the employment-to-population ratio of teenagers, and found that an increase in the minimum wage generally reduced employment opportunities among young workers with employment elasticities ranging from -0.1 to -0.2.

Conversely, there are a few economists in the opposite camp who contend that the minimum wage actually has positive effects on employment. Most notably, David Card and Alan Krueger (1995) look at the effects of changes in minimum wage legislation in New Jersey and

¹ These elasticities were a result of the review of the literature by Charles Brown, Curtis Gilroy, and Andrew Kohen (1982).

California. After taking advantage of the 1992 increase in New Jersey's minimum wage and surveying fast-food restaurants before and after the increase, they find that workers affected by these changes actually saw slight increases in pay, and that there was no decrease in the number of jobs available—overall, the elasticity of the minimum wage increase on employment was 0.7. Overall, however, the effects found on both sides have been small. Whether positive or negative, it appears that the minimum wage only has a small effect on employment as a whole.

Existing Link Between Minimum Wage and Educational Attainment

A smaller set of papers explores the correlation between an increase in the minimum wage and educational outcomes. Economic theory predicts the effect is ambiguous—an increase in the minimum wage may make employment more attractive and schooling less attractive, causing some individuals to drop out of school and seek a job. However, if the unemployment effects of an increase in the minimum wage are strong, students may recognize that they are not having success finding a job in the labor force and decide to stay in school. These individuals may actually be induced to stay in school longer to raise their level of human capital and be more attractive to employers down the line.

Only a few studies have attempted to address the question empirically. For example, Neumark and Wascher (1995) use matched Current Population Survey (CPS) data from the late 1970s through the 1980s to look at the effect of minimum wages on school enrollment. They use simple enrollment regressions relating the fraction of teenagers enrolled to a set of independent variables including the minimum wage, employment status, and controls for race and gender, and find a negative effect of a minimum wage increase on school enrollment. They report statistically significant elasticities of minimum wage effects on enrollment rates ranging from -0.13 to -0.33. Additionally, they use a conditional logit model to estimate the effect of a change in the

minimum wage on the probability that a student falls into one of the four mutually exclusive categories of enrolled and employed, enrolled and not employed, not enrolled and employed, or not enrolled and not employed. They find that overall the proportion of enrolled students declines. Perhaps of more concern, they find that the proportion of students who are not enrolled and not employed rises as well—students who were previously not enrolled and employed lose their jobs to the “new dropouts” who may be more valuable to employers, since they have stayed in school longer than the old dropouts. Evans and Turner (1995) have contested some of these findings, however, and their basic criticism is that the definition of enrollment used by Neumark and Wascher is too narrow. Neumark and Wascher (2000) have updated some of their findings using a broader definition of enrollment and found similar effects, but overall the question of the true effect of the minimum wage on educational attainment remains open for debate.

Impact of Compulsory Schooling on Educational Attainment

Two other key public policies may have a direct effect on students graduating from high school: compulsory schooling laws and state exit exam requirements, both of which are legislated at the state level. The impacts of these policies have been studied in some detail, and this paper will serve to reaffirm existing conclusions about their effects. By design, an increase in the minimum dropout age will lead to more completed years of schooling for individuals on average.² Accordingly, researchers have investigated the impacts of these laws on educational attainment, but also a wide body of research exists on whether students experience further benefits from an increase in the dropout age—that is, we are not so much interested in how many

² The only instance in which this is not the case is if an individual begins school for an additional year, but fails to pass the end-of-grade exam required to continue to the next grade—so they are not credited with another year of additional schooling, even if they actually spent more time in school.

additional years of schooling an individual completes as we are in how that translates into expected earnings and probability of employment.

The minimum dropout age has been rising nationwide over time as individual states have increased their minimum dropout level (Figure 6). In 1980, the average dropout age nationwide was 16.3 years of age, but by 2010 it had risen to 17. To examine the benefits of more schooling in general, Angrist and Krueger (1991) use a natural experiment framework to estimate the impact of compulsory schooling on earnings. They instrument for education using quarter of birth, since individuals that are born at the beginning of the year can drop out earlier than students born later in the year. They find that a one-year increase in completed years of schooling is associated with approximately a 10 percent increase in weekly earnings.

Additionally, Philip Oreopoulos (2009) employs an empirical strategy similar to my work and matches individuals to the minimum dropout age faced at age 16. He finds that raising the dropout age to 17 or greater increases an individual's years of schooling by 0.13 years and decreases the probability of never completing high school by between 1 and 2 percentage points. In a later instrumental variable analysis, he finds that an additional year of completed schooling due to compulsory schooling laws increases average lifetime earnings by 15 percent. Finally, Oreopoulos finds that an additional year of completed schooling is associated with a 2.2 percentage point decrease in the probability of subsequent unemployment. In general, it seems that compulsory schooling laws are beneficial to students, in that not only do they increase their expected years of schooling but also translate into further benefits in terms of expected earnings the employment.

Impact of Minimum Competency Testing on Educational Attainment

The requirement of passing a minimum competency test (more colloquially referred to as an exit examination) to graduate is an area that has received significant consideration in recent years. Over the past three decades the number of states requiring an exit exam has risen drastically: in 1980, only 2 states required such an exam, but in 2010 it was required in 25 states, with several more planning to phase in tests over the next few years (Figure 7). Many of these changes occurred in the early 1990s and were associated with the movement towards standards-based educational reform, also known as test-based accountability (Murnane 2011). The impact of these tests is difficult to measure, however, because of several possible confounding factors. The difficulty of exit examinations varies widely by state, making it difficult to establish a uniform effect, and also additional resources to aid student learning and improve instruction accompanied the introduction of these exit exams in many states. Additionally, incentives were put in place to encourage students and educators to meet loftier academic expectations (Murnane 2011). Thus, it can be difficult to discern whether changes in student outcomes are associated with the introduction of the exit exam or with the broader changes in student learning and teacher instruction.

Several studies have, however, attempted to establish causal consequences of the impact of high school exit exams on ultimate student achievement. Brian Jacob (2001) uses data from the National Educational Longitudinal Survey (NELS) to estimate a cross-sectional model that regresses posttest scores on pretest scores from a single cohort. Jacob finds that low-achieving students in states that required an exit exam were about 6.5 percentage points more likely to drop out of high school than their counterparts in states that did not require an exit exam.

Additionally, Sean Reardon *et al.* (2009) examine the implementation of an exit exam in

California in 2006 on student outcomes. They match California students before and after the implementation of the exam to perform a differences-in-differences estimation strategy, and find that the introduction of the exit examination was associated with a decrease in the high school graduation rate of 3.5 to 4.9 percentage points. Similar to Jacob's work, Reardon *et al.* also find that these effects are concentrated among minority, low-achieving, and English-language-learner students. In a nation where great disparity in educational attainment between races already exists, these effects of the introduction of exit exams that may be concentrated on certain groups of students are particularly worrisome and deserve further consideration.

III. Theoretical Framework & Econometric Approach

Theoretical Predictions

There are several channels through which an increase in the minimum wage could affect an adolescent's educational outcomes, and overall the prediction of economic theory is ambiguous. Conventional wisdom suggests that if a teen sees a higher minimum wage being offered in the labor market, they may be more likely to drop out and apply for said job. We have established, however, that an increase in the minimum wage is also associated with disemployment effects, particularly for teens and directly affected workers who are earning exactly the minimum wage. Thus, if a teen sees fewer jobs being made available in their area, they may be less likely to drop out and instead choose to stay in school to increase their human capital down the line.

Another avenue that deserves consideration is the effect a change in the minimum wage may have on an individual's current earnings. If an adolescent is currently enrolled in school but also working a part-time minimum wage job, an increase in the minimum wage would mean the teen could work the same amount of hours and make more money—thus, that teen could choose

to work fewer hours and devote more time to school, or simply may be able to concentrate on school more if they have to worry about their earnings less. This application is particularly relevant to teens as a disproportionately high number of young workers are earning the minimum wage: while workers under the age of 25 constituted only about 20 percent of hourly-paid workers in 2010, they made up about half of those earning the federal minimum wage or less (BLS 2011).

As aforementioned, the theoretical prediction of an increase in the minimum dropout age on educational attainment seems straightforward in that it should be associated with an increase in the number of completed years of schooling. This effect could be masked, however, if teens enter school for an additional year but do not actually complete that year (if they turn old enough to drop out before the end of the school year), or if they fail to pass an end-of-course exam required to pass on to the next grade. Of particular interest with compulsory schooling laws is whether or not they cause students to actually complete that extra year of school—Card and Krueger (1992) find that the relationship between expected earnings and years of completed schooling is approximately log-linear after 6 years of school, meaning that every additional completed year is important for the student.

The motivation behind requiring minimum competency tests is a bit more convoluted. Proponents of these exams believe that they will provide motivation for low-achieving students by “raising the bar” for graduation and encouraging these students to work harder. By holding schools to stricter standards-based testing, it is also the theory that these schools will, in turn, opt to provide more funding and attention to low-achieving students, so as to improve their performance and so make the school look better overall (Reardon *et al.*, 2009). The implementation of the test, however, significantly increases the costs to continuing schooling,

especially for these low-achieving students who in particular may become discouraged by another barrier to graduation. The prospect of having to pass an end-of-year exam to graduate also significantly increases the opportunity cost of attending that extra year of schooling, since these students may spend the entire in year in school and then fail to pass the exam. Thus, opponents of requiring exit exams argue that they have particularly negative effects for academically and socially disadvantaged students, and consequently increase inequality in academic outcomes among different races and income levels.

Again, the theoretical prediction of the effect of requiring an exit exam on educational outcomes is ambiguous, following any one of the stories listed above. It may be particularly difficult to establish causation with respect to exit exams, as many of them were instituted during a larger overhaul of the school system that increased accountability on standards-based testing. Thus, it may be difficult to determine whether changes in educational outcomes are associated with the exit exam itself or a change in other institutional learning policies.

Empirical Strategy

My empirical approach analyzes the effect of several public policy variables at the time an individual was 16 years of age on their educational outcomes. These policies include the real value of the minimum wage, the minimum dropout age, and the requirement of an exit exam. Individuals were coded with a series of dummy variables for their ultimate level of educational attainment. The levels—high school dropout, high school diploma recipient, GED recipient, and college attendant—are mutually exclusive and not cumulative. Individuals were then matched with a vector of state-level characteristics from the year the individual turned 16. State of residence at age 16 is not directly observed; I use state of birth as a proxy. For example, an

individual born in North Carolina in 1980 was matched with, among other controls, North Carolina's minimum wage, dropout age, and exit exam requirements in 1996.

This matching strategy does not allow for the inclusion of foreign-born individuals who were residing in the U.S. at the time of the survey, so my analysis is limited to individuals born in the United States. This specification also assumes mobility is exogenous, since I am using state of birth as a proxy for state of residence at age 16. Additionally, my regressions are limited to individuals who were 20 years of age or older at the time of the survey, to ensure that most non-traditional-aged students have had sufficient time to make the decision to attend college (since my dummy variables only code through attending any college, I am only concerned about this decision and not further choices to enroll in a master's program or other continuing education).

My regressions utilize a sort of panel data set and are in the form:

$$Y_{ista} = \beta_0 + \beta_1 MinWage_{s,16} + \beta_2 MinDropAge_{s,16} + \beta_3 ExitExam_{s,16} + \beta_4 OthPol_{s,16} + \beta_5 \mathcal{X}_{ista} + \gamma_s + \delta_{t-a} + \phi_a + \varepsilon_{ista}$$

where i indexes individuals, s indexes state of birth, t indexes survey year, and a indexes current age. This quasi-experimental approach utilizes state-level variation in the minimum wage over time. The minimum wage is federally mandated, but individual states can legislate their respective minimum wages to be higher than the federal level (see Figure 8 for the number of states with a minimum wage higher than the federal level, over time). My coefficients of interest are β_1 , β_2 , and β_3 , or the effects of the three separate public policy variables on education outcomes, holding all else constant. When Y measures the high school dropout rate, I expect β_1 to be positive if an increase in the minimum wage increases the probability a student will leave

school to try to find a job, β_2 to be negative if an increase in the minimum dropout age encourages students to stay in school through the end of high school, and β_3 to be positive if the introduction of an exit examination discourages students from staying in high school until graduation.

The left-hand-side dependent variable is a dummy variable denoting a terminal level of ultimate educational attainment. I code a dummy variable for being a high school dropout, GED recipient, diploma recipient, or college attendant. In survey years 2001 through 2007, individuals who received the GED or high school diploma are simply coded as high school graduates, as the ACS did not ask respondents to specify. Consequently, the mean of the dependent variables serves as a status rate of educational attainment, showing the contemporaneous levels of educational attainment of native-born individuals between the ages of 20 and 46. I use these measures of educational attainment rates because it allows for the inclusion of non-traditional age students who may have dropped out initially but could have later returned to school or opted to take the GED. Additionally, one of the main criticisms of the status completion rates reported by the NCES is that it contains GED recipients, but I am able to separate out these individuals in later survey years.

On the right-hand side of the equation, the subscript 16 denotes the variables that were matched to an individual for the year they turned 16 years old. The regression includes fixed effects for state of birth (γ_s), year of birth (δ_{t-a}), and current age (ϕ_a). These fixed effects control for unobservable heterogeneity among states, years, and ages that is constant over time and correlated with my dependent variables. For example, if North Carolina is a more conservative state than Massachusetts and that conservatism somehow influences a teenager's decision to stay in school, the North Carolina and Massachusetts fixed effects capture that

difference and prevent it from biasing my coefficients. Similarly, year of birth fixed effects control for things such as a difference in upbringing for an individual born in 1970 versus 1990, while age fixed effects control for differences such as that a 35-year-old has had more opportunity to complete their degree or get a GED after leaving high school than has a 22-year-old.

Independent variables in my regressions include the real minimum wage in 2010 dollars, the minimum dropout age measured in years (15, 16, etc.), a dummy variable for the requirement of passing an exit exam to graduate (1 if the state has an exit exam in the year of observation), a dummy variable for the difficulty of said exit examination (1 if the exam exists and tests material above the 9th grade level), the percentage of people aged 15-19 in the state, a dummy variable for if the state governor is a democrat (1 if yes), the fractions of the State House and Senate that are Democrat, the ADC/TANF benefit for a family of three in real 2010 dollars, and dummy variables for race and gender where appropriate.

I estimate six different sets of regressions stratified both by gender and by race, so that results are presented for all individuals, males only, females only, white non-Hispanic individuals only, non-white non-Hispanic individuals only, and Hispanic individuals only. Each set of results includes three regressions for survey years 2001-2010 where the dependent variables are high school dropouts, high school graduates, and college attendants, and five regressions limited to survey years 2008-2010 with the dependent variables are high school dropouts, GED recipients, high school diploma recipients, college attendants, and one specification that combines GED recipients with high school dropouts (to compare the outcomes using these data to the full sample). We will see that being able to separate out GED recipients in

this second set of regressions is particularly important in understanding the effects of the explanatory variables. Reported standard errors are robust and clustered by state.

The Data

The data used in my analysis are aggregated from several different sources, including the American Community Survey, the University of Kentucky Center for Poverty Research, the Center on Education Policy, and the National Center for Education Statistics.

Individual-level data were extracted from the American Community Survey (ACS), a monthly survey introduced in 2001 by the U.S. Census Bureau and available through the Integrated Public Use Microdata Series. As the ACS was being phased in from 2001 to 2005, it was approximately a 0.5 percent sample of the population, and by 2005 became a 1 percent sample of the population with about 3 million observations yearly. One limitation with the ACS is that it is self-reported, so respondents may purposefully inflate educational attainment levels for themselves or other household members.

I use the survey years 2001 to 2010 in my analysis, meaning I can include individuals who turned 16 as late as 2006. The year 1980 was chosen as the lower bound for the year an individual turned 16 due to the ease of access of data for state-level characteristics after 1980. Between 1980 and 2006, there were five distinct increases in the federal minimum wage and more than 50 state-mandated increases in state minimum wages (see Figure 8 and also Appendix Table 3). After dropping individuals who were not born in the United States and including only those who turned 16 between 1980 and 2006, I am left with 5,341,254 observations for individuals aged 20-46 born between 1964 and 1990. Ultimately, the regressions that use my full sample include 5,266,608 observations, with the difference being explained by a relative handful of missing values.

The majority of the state-level characteristics were obtained from the state-level data set made publically available by the University of Kentucky Center for Poverty Research. This data set contains yearly information on a state's nominal minimum wage, political characteristics, welfare generosity, and a rich set of other controls. The nominal minimum wages reported in the University of Kentucky data set, along with any other monetary variables used in my analysis, were converted to real 2010 dollars using the Bureau of Labor Statistics' annual CPI data. The first key independent variable in my analysis is this converted real minimum wage that varies yearly by state.

The second and third independent variables of interest are the minimum dropout age and the requirement of passing a year-end test to graduate. Minimum dropout age information was taken from the National Digest of Education Statistics, published yearly by the National Center for Education Statistics. The Digest reports compulsory schooling laws for each state in selected years (usually the even number years, with a few exceptions). For the years not listed in the Digest, the previous year's ages were used. For example, for 2001 the ages reported in 2000 are used. Footnotes of the tables were consulted to ensure no changes were made in the gap years (see Appendix Table 1 for a breakdown of the years reported in different editions of the Digest). My compiled list of yearly state-level minimum dropout ages was verified using figures presented in Oreopoulous (2009, Figures 3.1 and 3.2).

Information on state exit exam requirements was compiled from two sources. First, I used data reported in Dee and Jacob (2006) to gather information for the years 1980 to 2005. Dee and Jacob coded each state with a 0 if the state did not have a high school exit exam for the graduating class in that year, a 1 if the state had a high school exit exam for the graduating class that tested material below the ninth grade level, and a 2 if the exit exam tested material in the

ninth grade level or above. These values were later coded into two separate dummy variables, one denoting if the state had an exit exam in the year of observation and the other marking the difficulty of the exam. Information for the year 2006 was taken from the Center on Education Policy's 2010 report on state high school tests, and I also used that source to verify the data reported by Dee and Jacob. See Appendix Table 2 for a breakdown of this data by year and state.

IV. Results & Discussion

Summary Statistics

In my full data set, 9.7 percent of individuals are high school dropouts, 28.4 percent are high school completers, and 62 percent entered college (Table 1, left panel). The percentages once the sample is restricted to survey years 2008 through 2010 are similar, but we are able to see that of high school completers, 17.2 percent of individuals received the GED and 82.8 percent received a high school diploma (4.6 percent and 22.2 percent of all individuals in survey years 2008 through 2010, respectively, as shown in Table 1, Columns 6 and 7). The rest of Table 1 stratifies individuals by race and gender, with the trends emerging that males and non-whites are more likely to be dropouts while females and white non-Hispanics are more likely to have gone to college. Non-white, non-Hispanics and Hispanics are more likely to obtain the GED than their white, non-Hispanic counterparts, while males are also more likely to sit for the GED.

Tables 2 and 3 reaffirm the conclusions from Table 1 and report characteristics of individuals stratified by ultimate level of educational attainment. The columns are mutually exclusive and do not overlap (college attendants do not include high school graduates, etc.). Table 2 describes the entire data set (survey years 2001-2010), while Table 3 is restricted to survey years 2008 to 2010. In general, as educational attainment increases, the percentage of non-white individuals decreases. For example, 25.3 percent of high school dropouts are non-

white, non-Hispanic (mostly African Americans), while only 15.5 percent of college attendants fall into this category. The percentage of high school dropouts and high school graduates that are black is disproportionately high, as both of these percentages (25.3 percent and 20.3 percent, respectively) are higher than the percentage of blacks in the sample (17.8 percent).

A similar trend holds with Hispanic individuals, where a disproportionately higher number of Hispanics exit the education system before entering college: 9.3 percent of the sample is Hispanic, while 17.2 percent of high school dropouts are Hispanic and 10.4 percent of terminal high school graduates are Hispanic. It should be noted that since my sample excludes foreign-born U.S. residents, the percentage of Hispanic individuals in my sample is considerably lower than the current national population proportion.

Females are more educated on average: 53.8 percent of college attendants are female, while only 50.4 percent of the sample is female. College attendants are also more likely to be employed (80.5 percent as compared to 72.0 percent of high school graduates and only 52.1 percent of high school dropouts) and less likely to be unemployed (4.9 percent of college attendants are unemployed as compared to more than 8 percent of both high school graduates and high school dropouts). Finally, college attendants are more likely to be married than both high school dropouts and high school graduates, and they have higher average personal incomes. Since the sample includes only individuals aged 20 to 46, these incomes are likely slightly lower than the national average.

The statistics reported in Table 3, which is limited to survey years 2008 to 2010, exhibit the same trends as those in Table 2. The key difference between the two tables is the ability to break out GED recipients in Table 3. It is of interest that many of the percentages for GED recipients lie in the middle of high school dropouts and high school diploma recipients: GED

recipients are more likely than high school dropouts but less likely than high school diploma recipients to be unemployed, less likely than high school dropouts but more likely than high school diploma recipients to be unemployed, and their average incomes fall approximately in the middle of the two groups. A disproportionately lower number of GED recipients are female, however, while the percentages of GED and high school diploma recipients who are minority are very similar. Both of these percentages, however, are lower than the percentage of high school dropouts who are a minority. Although these statistics are purely descriptive, it does support the view discussed earlier that a GED is not as valuable as a high school degree.

Impact of Minimum Wage

The results of my empirical analysis are reported in Tables 4 through 9. In each table, the left panel (Columns 1 through 3) reports coefficients measured using the whole sample, while the right panel (Columns 4 through 8) is limited to survey years 2008 to 2010. Table 4 reports the effect of the key independent variables on educational outcomes for all individuals, while Tables 5 and 6 are limited to male and female individuals, respectively. Tables 7, 8, and 9 investigate the effects for white non-Hispanic, non-white non-Hispanic, and Hispanic individuals, respectively.

Overall, the minimum wage has the strongest effect on schooling decisions for females. In the first set of regressions, a one-dollar increase in the minimum wage is associated with 0.39 percentage point increase in the probability that women complete high school (Table 6, Column 2), or an increase of about 1.5 percent relative to the mean of 25.4 percent of females that are high school completers (reported in row 1 of the table). These extra high school completers appear to come from both potential dropouts and college attendants, as both of these coefficients are negative but statistically insignificant. This effect is consistent in both sets of regressions, and

once GED recipients are separated from diploma recipients we see that females are actually substituting away from being a high school dropout (decrease of 0.28 percentage points, or 3.8 percent – Table 6, Column 4) and towards obtaining a high school diploma (increase of 2.1 percent relative to the mean, or 0.42 percentage points – Table 6, Column 7).

For non-Hispanic, non-white individuals an increase in the minimum wage is associated with a 0.56 percentage point increase in the probability that they enter college, although the relative magnitude of this effect is small (less than 1 percent – Table 8, Column 8). Additionally, white, non-Hispanic individuals are more likely to receive a high school diploma, with a one-dollar increase in the minimum wage leading to a 0.49 percentage point increase in this probability (or 2.3 percent – Table 7, Column 7).

While all of these aforementioned results show positive effects of an increase in the minimum wage on a teenager's decision to complete or graduate from high school, it is potentially worrisome that the coefficients for a change in the probability to enter college are consistently negative (the only exception being Table 8, Columns 3 and 8 for non-Hispanic, non-white individuals). These results suggest that an increase in the minimum wage—which is ostensibly designed to aid directly affected workers, many of which are teenagers—could actually be hurting them in the long run as it encourages them to complete high school but then enter the labor market with higher wage prospects. These initial findings warrant further research into the effects of a change in the minimum wage on a teenager's decision to enter college, as it is important for U.S. students to move on to tertiary education both for their own long-term economic benefit and in order to remain an economic competitor internationally.

Impact of Compulsory Schooling Laws

In total, compulsory schooling laws have the hypothesized effect: not only do they increase years of completed schooling, but also it appears they increase the probability that an individual actually completes high school: a one-year increase in the dropout age is associated with a decrease in the probability of dropping out or obtaining a GED and an increase in the probability of obtaining a high school diploma. The results in the left panels of Tables 4 through 9 consistently show an increase in the dropout age is associated with an increase in the probability an individual completes high school (the only exception is Table 8, Column 2 for non-Hispanic non-white individuals where the coefficient is negative but insignificant). These findings are consistent with probabilities presented in the aforementioned work of Oreopoulos (2009), who found that facing a higher dropout age was associated with a decrease in the probability of never completing high school.

In the right panels of the regression tables, we see more specifically that these individuals are substituting away from the GED and towards a high school diploma. For example, for all individuals (Table 4) an increase in the dropout age is associated with a decrease in the probability of obtaining a GED of 6.7 percent (0.306 percentage points, Column 6) and an increase in the probability of obtaining a diploma of 3.1 percent (0.691 percentage points, Column 7). This decrease in the probability of obtaining a GED is largely driven by the behavior of females and Hispanics with decreases of 8.1 percent and 5.9 percent, respectively (Table 6, Column 6 and Table 9, Column 6). Males and females are just as likely to substitute towards a high school diploma, with increases of 3.2 percent and 3.0 percent, respectively (or 0.80 and 0.59 percentage points – Table 5, Column 7 and Table 6, Column 7).

For non-Hispanic, non-white individuals in the whole data set, a change in the minimum dropout age has a further result in that it actually increases college attendance: a one-year

increase in the dropout age is associated with a -0.86 percentage point decrease in the probability of being a high school dropout (decrease of 6.2 percent relative to the mean – Table 8, Column 1), and a 1.16 percentage point increase in the probability of attending college (or 2.2 percent – Table 8 Column 3). These effects are similar when limiting the survey to years 2008 through 2010 (Columns 4 and 8 in Table 8). The substitution towards college attendance—where the majority of students are old enough to exit the education system if they so choose—suggests that the forced extra years in school may have intrinsically changed the students’ approach to school so that once they completed high school they were motivated enough to continue on to college. This is an interesting side effect of a law mostly designed to keep students in high school. Since this results only appears for non-Hispanic, non-white individuals, however, it is possible that something else could be correlated both with having the state of residence having a higher dropout age and a minority student’s decision to enter college.

Impact of Exit Exam Requirements

The effects of requiring an exit examination to graduate are compelling. The impact of requiring an exit exam to graduate from high school is masked when counting GED recipients as high school graduates, but is apparent once GED recipients are broken out in survey years 2008 to 2010. For all individuals, a state requiring an exit exam increases the probability that an individual receives a GED by 0.35 percentage points, or 7.7 percent (Table 4, Column 6). Much of this substitution appears to be coming from the probability that an individual receives a high school diploma—for all individuals, the requirement of an exit exam decreases the probability of receiving the diploma by 0.67 percentage points (or 3.0 percent, Table 4 Column 7). This substitution away from graduating high school and towards the GED is driven by the behavior of males and white non-Hispanics, who are 10.5 percent and 5.7 percent more likely to receive the

GED, respectively (or 0.58 and 0.25 percentage points – Table 5, Column 6 and Table 7, Column 6).

A unique result holds for Hispanic individuals: the introduction of a state exit exam is associated with fewer people exiting the education system after high school graduation and instead an increase in the probability of attending college of 1.17 percentage points (or 2.2 percent, Table 9 Column 8). A few theories could explain this phenomenon. On average, minority students tend to have lower educational performance than other students. Consequently, this result could be attributable to an increase in motivation among these students, which could lead them to attain more education even beyond high school. Alternatively, in states that introduce exit exams or make their test harder, schools could be devoting significant extra resources to these students. It could be that it is not actually taking the test itself that causes these students to go on to college, but rather the extra support and confidence they have received in passing the test. Indeed, when interpreting the impact of a change in exit exam requirements in general, it is important to keep in mind that these coefficients could be biased if the introduction of the exit exam was accompanied by changes in teaching style or increased attention to certain groups of students. Overall, however, the introduction of the exit examination was likely the policy change that had the biggest impact on educational outcomes.

V. Conclusion

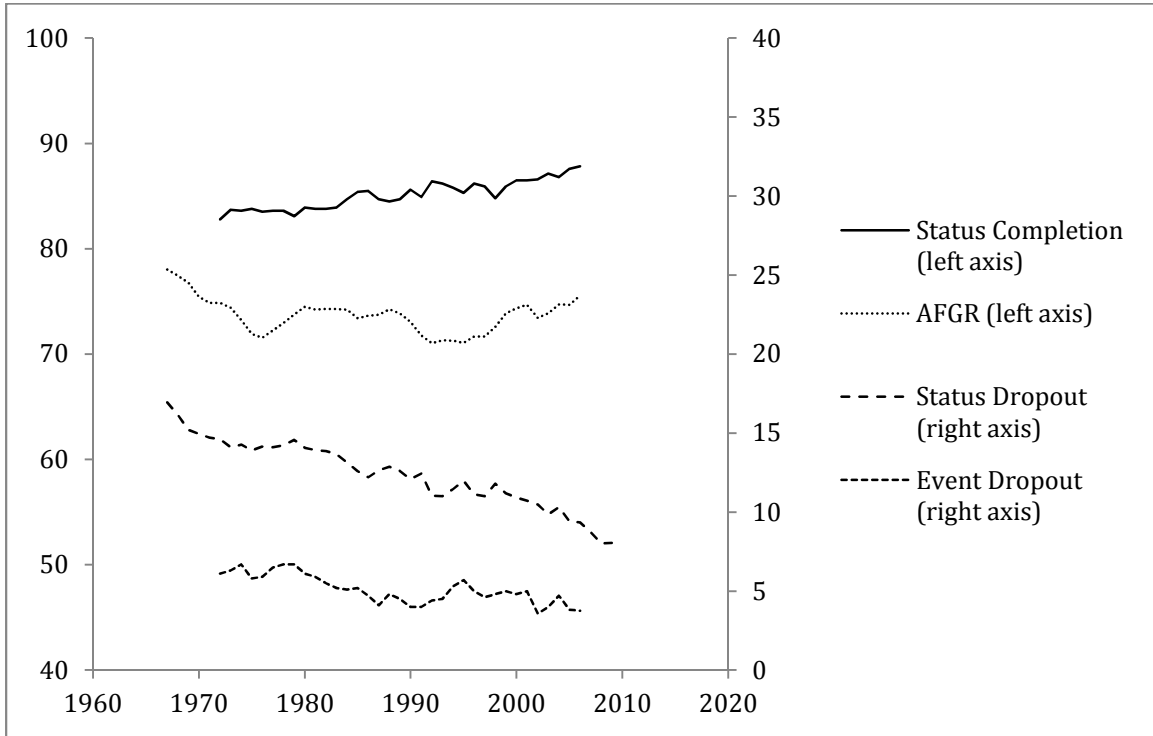
The stagnation of the high school graduation rate in recent decades has led to real concern surrounding the state of the U.S. education system, and this paper has investigated several public policies that may be directly or indirectly influencing the rate. Using ten years of American Community Survey data, I conducted a quasi-experiment using standard panel data methods. I found that being able to separate out GED recipients from high school diploma

recipients was particularly useful in determining effects of the policies, suggesting that individuals who choose to sit for the GED as opposed to taking the traditional route to graduating high school are different on some intrinsic level. This conclusion is supported by evidence that GED recipients are less likely to be employed and have lower incomes, on average, than their counterparts who have high school diplomas.

The results of my analysis suggest that an increase in the minimum wage has little effect on a teenager's decision to drop out of high school but may be encouraging students to exit the education system and enter the labor force after graduating or completing high school.

Additionally, compulsory schooling laws are associated with an increase in educational attainment and may even be encouraging some groups of students to go on to college. Minimum competency testing in states appears to be having a detrimental impact on many groups of students, in that it increases the probability that students will obtain a GED and fail to get a high school diploma. As the number of states requiring an exit examination has been increasing over time, it is important that further research be devoted to determining their true effects so that they are not having unintended negative consequences on students.

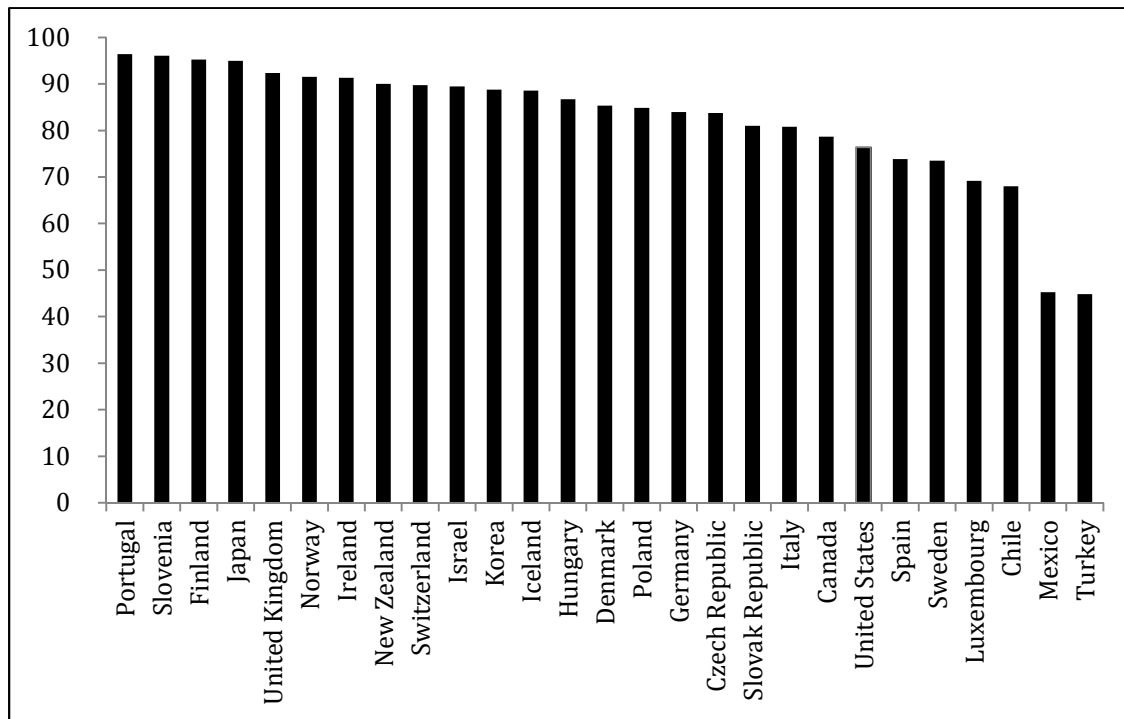
Figure 1. Comparison over time of different rates measuring the U.S. high school graduation rate.



Note: Status completion rate and AFGR are measured on left axis; status dropout and event dropout rates are measured on right axis.

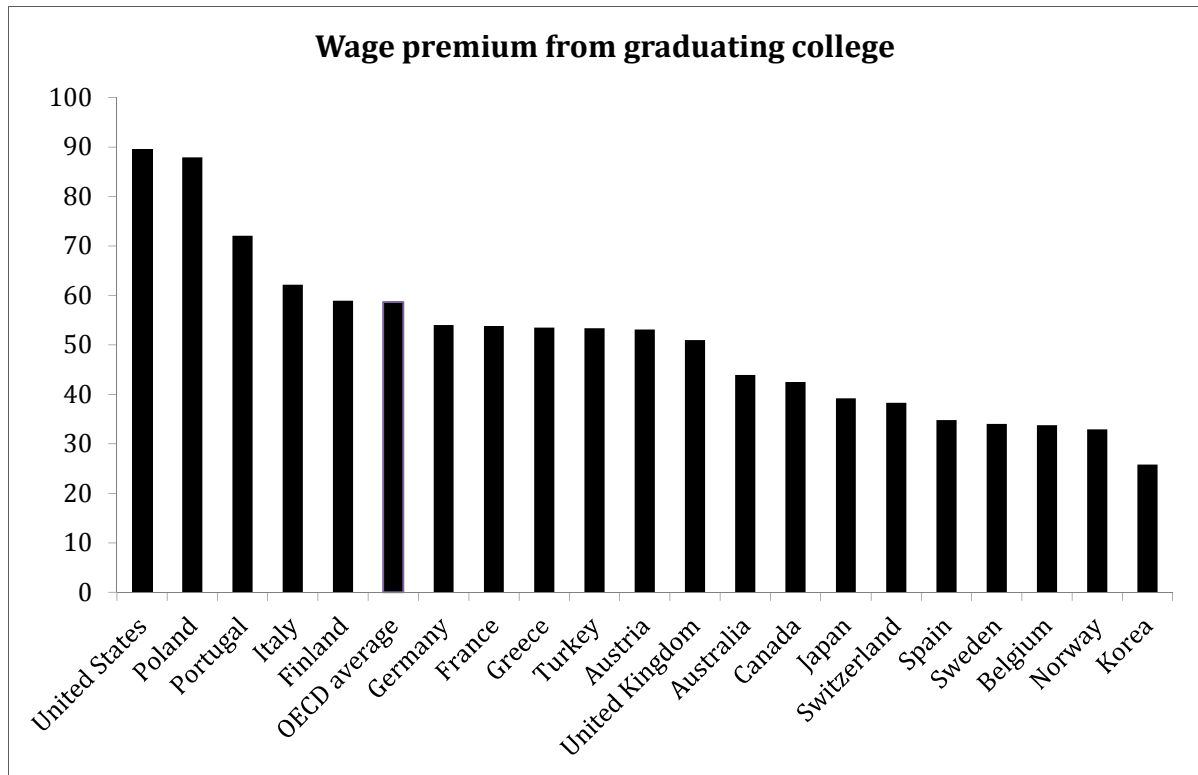
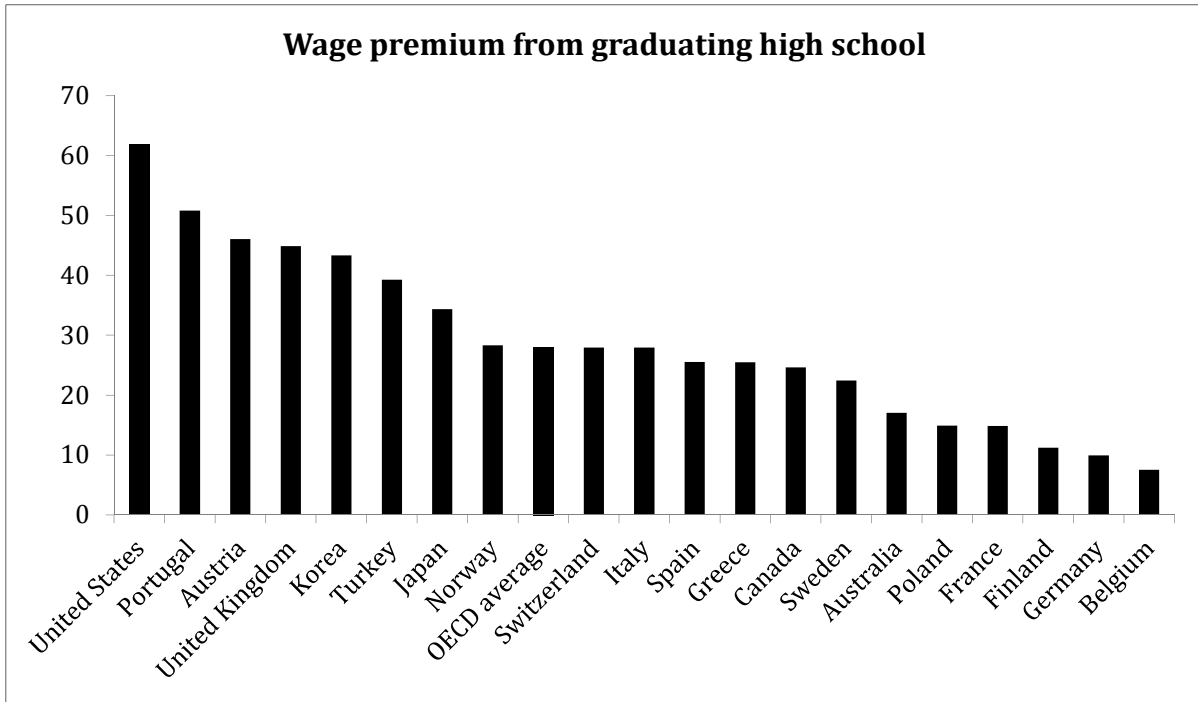
Source: NCES.

Figure 2. International comparison of upper secondary graduation rates, 2009.



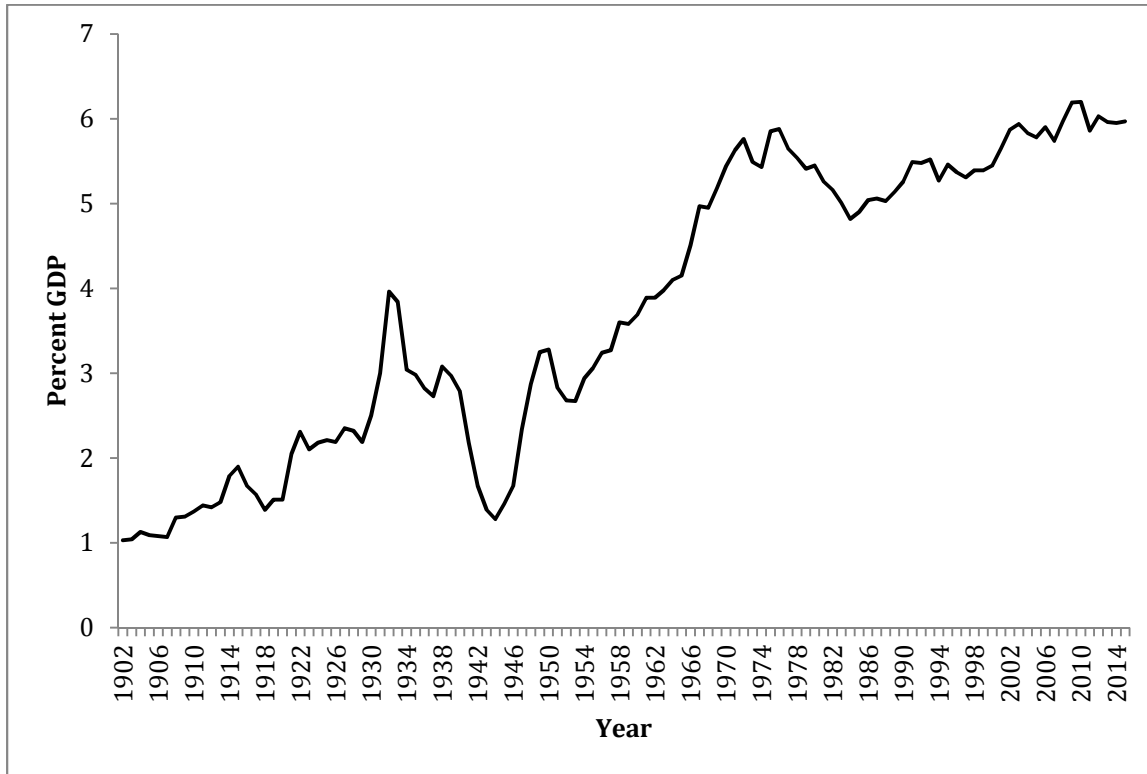
Source: OECD (2010).

Figure 3. International comparison of wage premiums from graduating high school and college, men aged 25-64, 2009 or latest available year.



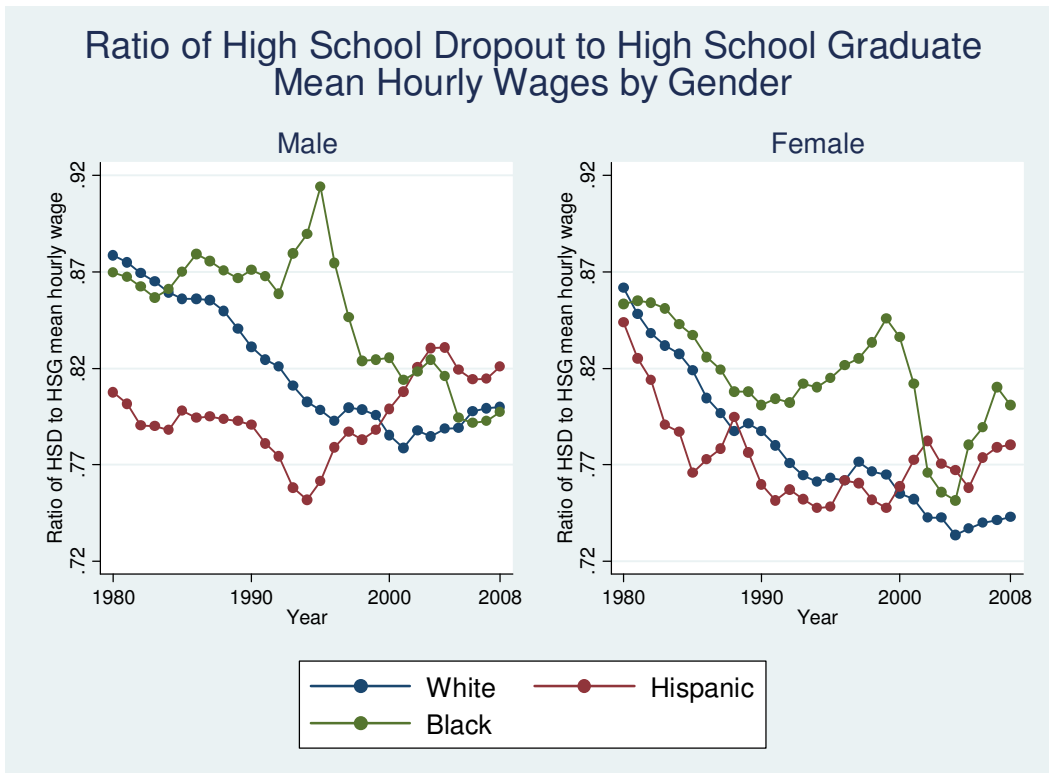
Source: OECD (2010).

Figure 4. Education spending as a total percentage of GDP, fiscal year 1902 to fiscal year 2015.



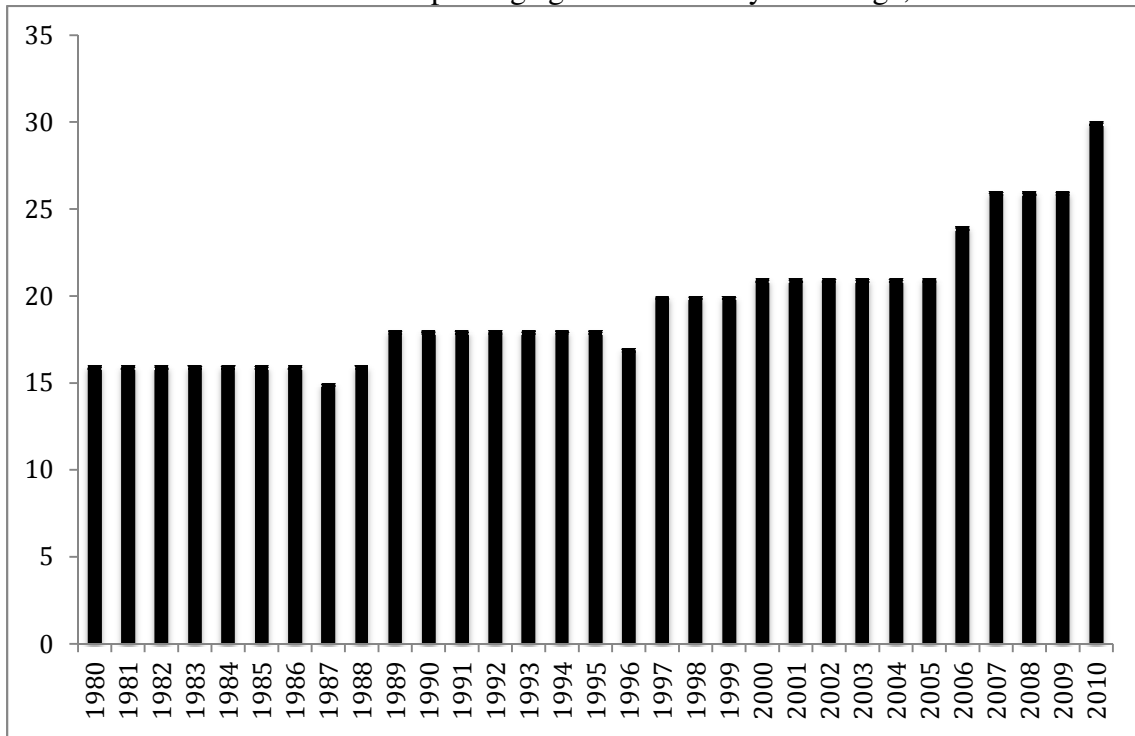
Source: Chart generated using data downloaded from USgovernmentspending.com.

Figure 5. Trend for males and females in the ratio of the average real wage of high school dropouts that that of terminal high school by racial/ethnic group, 1980-2008.



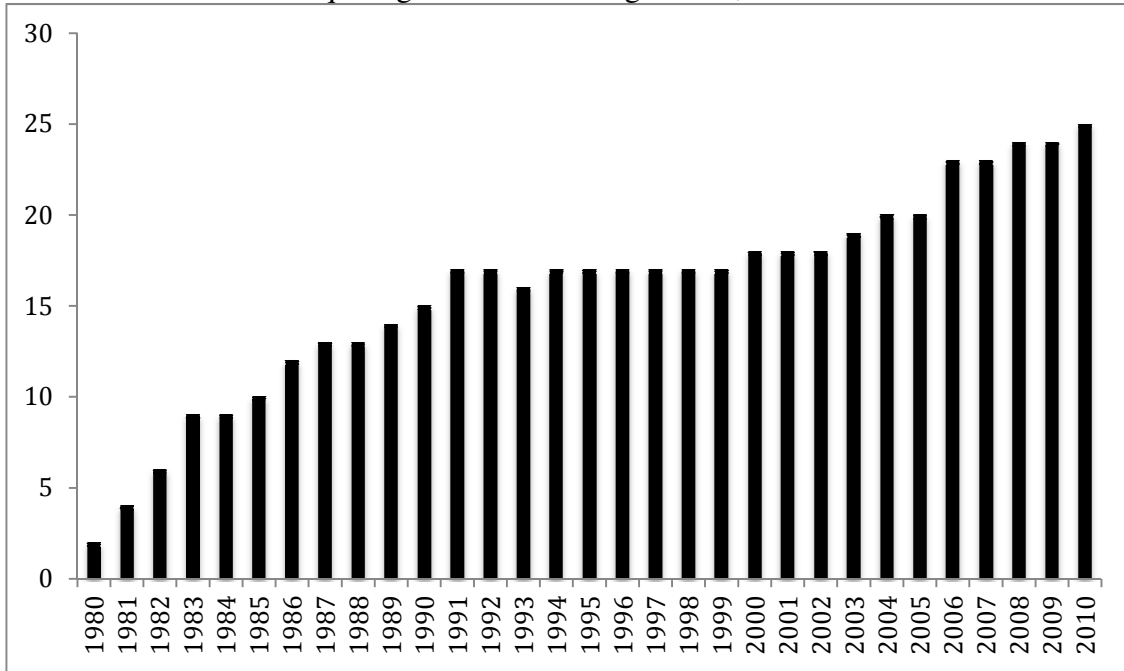
Source: Murnane 2011.

Figure 6. Number of states with a dropout age greater than 16 years of age, over time.



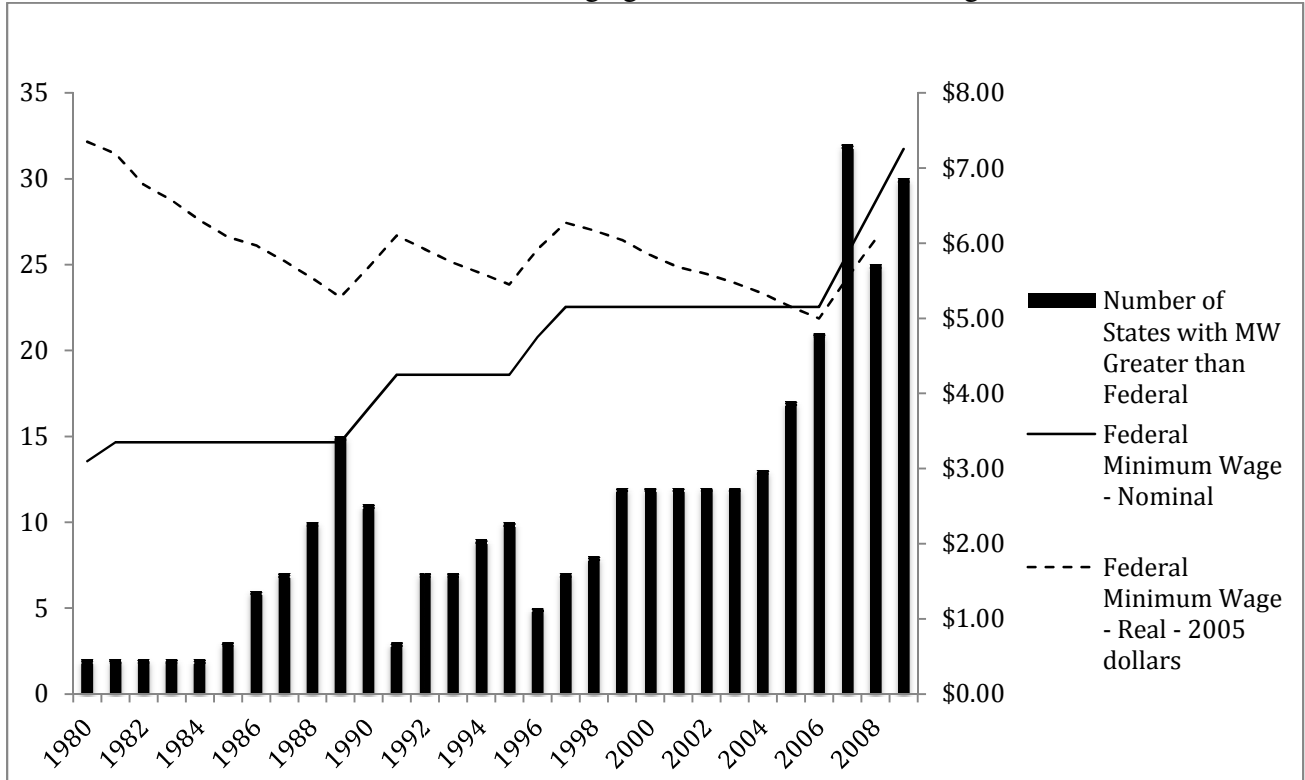
Source: Author's compilation of data from National Digest of Education Statistics (1980-2008) & Gruber (2009).

Figure 7. Number of states requiring an exit exam to graduate, over time.



Source: Author's compilation of data from Center on Education Policy (2010) and Dee & Jacob (2006).

Figure 8. Comparison of the nominal minimum wage and real minimum wage in 2005 dollars, and the number of states with a minimum wage greater than the federal wage over time.



Source: Author's compilation of data from the University of Kentucky Center for Poverty Research.

Table 1. Breakdown of educational attainment by race and gender.

	2001-2010 ACS			2008-2010 ACS				
	(1) High School Dropout	(2) High School Completer	(3) College Attendant	(4) High School Dropout	(5) GED & HS Dropout	(6) GED	(7) High School Diploma	(8) College Attendant
All	9.7	28.4	62	8.9	13.4	4.6	22.2	64.4
Whites	7.6	27	65.4	6.9	11.2	4.4	21.1	67.7
Blacks	13.7	32.3	54	12.8	17.8	5	25.2	57
Hispanics	17.8	31.6	50.6	16.3	21.4	5.1	24.7	53.9
Males	10.9	31.4	57.7	10.4	15.9	5.5	24.6	59.5
// White males	8.7	30	61.3	8	13.2	5.2	23.6	63.2
// Black males	15.6	35.9	48.5	15.3	21.9	6.6	27.7	50.3
// Hispanic males	19.6	34.1	46.3	18.7	24.6	5.9	26.6	48.8
Females	8.4	25.4	66.2	7.4	11	3.6	19.7	69.3
// White females	6.5	23.9	69.5	5.7	9.2	3.6	18.5	72.3
// Black females	12.1	29.2	58.7	10.4	14	3.5	22.7	63.3
// Hispanic females	16	29	55	13.9	18.2	4.3	22.7	59.1

Note: The label “white” refers to white non-Hispanics; the label “black” refers to non-white non-Hispanics.

Table 2. Characteristics of individuals by educational attainment. ACS years 2001-2010.

	All	High School Dropout	High School Completer	College Attendant
White, non-Hispanic	72.9%	57.5%	69.3%	76.9%
Non-white, non-Hispanic	17.8%	25.3%	20.3%	15.5%
Hispanic (non-white)	9.3%	17.2%	10.4%	7.6%
Female	50.4%	44.0%	45.1%	53.8%
Employed	75.3%	52.1%	72.0%	80.5%
Unemployed	6.8%	13.2%	8.8%	4.9%
Married	45.1%	34.0%	42.0%	48.3%
Mean Total Personal Income	\$33,758	\$16,671	\$25,224	\$40,332
Observations	5,341,254	456,056	1,434,409	3,450,789

Note: Percentages are weighted by population size. High school completer includes GED and diploma recipients. Column labels denote terminal educational attainment values and are mutually exclusive. Total personal income is reported in 2010 dollars.

Table 3. Characteristics of individuals by educational attainment. ACS years 2008-2010.

	All	High School Dropout	GED	High School Diploma	College Attendant
White, non-Hispanic	71.7%	55.2%	68.6%	68.1%	75.4%
Non-white, non-Hispanic	18.4%	26.6%	20.2%	20.9%	16.3%
Hispanic (non-white)	9.9%	18.2%	11.1%	11.1%	8.3%
Female	49.9%	41.5%	39.6%	44.3%	53.7%
Employed	74.2%	46.8%	57.5%	71.6%	80.1%
Unemployed	7.8%	14.5%	13.9%	9.7%	5.8%
Married	43.7%	31.0%	35.4%	40.4%	47.2%
Mean Total Personal Income	\$33,749	\$14,885	\$19,135	\$24,975	\$40,411
Observations	2,362,092	194,766	109,580	501,784	1,555,962

Note: Percentages are weighted by population size. Column labels denote terminal educational attainment values and are mutually exclusive. Total personal income is reported in 2010 dollars.

Table 4. Impact of explanatory variables on educational attainment for all individuals.

	2001-2010 ACS				2008-2010 ACS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High School Dropout	High School Completer	College Attendant	High School Dropout	GED & HS Dropout	GED	High School Diploma	College Attendant
Mean of dependent variable	9.67	28.4	62.0	8.89	13.4	4.56	22.2	64.4
Real minimum wage	-0.063 (0.106)	0.159 (0.178)	-0.097 (0.233)	-0.152 (0.126)	-0.162 (0.172)	-0.010 (0.072)	0.294 (0.190)	-0.132 (0.252)
Minimum dropout age	-0.311 (0.225)	0.422 (0.220)	-0.110 (0.131)	-0.287 (0.201)	-0.593 (0.287)	-0.306 (0.099)	0.691 (0.277)	-0.098 (0.179)
State requires exit exam	0.258 (0.173)	-0.477 (0.310)	0.218 (0.286)	0.289 (0.224)	0.641 (0.269)	0.353 (0.124)	-0.666 (0.277)	0.025 (0.317)
Exit exam is "hard"	-0.049 (0.279)	0.017 (0.331)	0.032 (0.330)	-0.376 (0.237)	-0.402 (0.306)	-0.026 (0.135)	-0.087 (0.381)	0.489 (0.405)
Observations	5,266,608	5,266,608	5,266,608	2,331,681	2,331,681	2,331,681	2,331,681	2,331,681
R-squared	0.024	0.014	0.037	0.023	0.024	0.004	0.012	0.035

Note: Bold text denotes significance at the 1%, 5%, or 10% level. Regressions are weighted by population size. Coefficients have been multiplied by 100 in order to be interpreted as a percentage change. All regressions include dummies for race and gender, fixed effects for age, year of birth, and state of birth, as well as controls for having a Democratic governor, the percent of the state's house and senate that is Democratic, the percent of the state's population aged 15-19, and ADC/TANF welfare benefits for a family of three. Robust standard errors are in parentheses and are clustered by state.

Table 5. Impact of explanatory variables on educational attainment for male individuals.

	2001-2010 ACS				2008-2010 ACS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High School Dropout	High School Completer	College Attendant	High School Dropout	GED & HS Dropout	GED	High School Diploma	College Attendant
Mean of dependent variable	10.9	31.4	57.7	10.4	15.9	5.5	24.6	59.5
Real minimum wage	0.060 (0.123)	-0.052 (0.202)	-0.008 (0.253)	-0.029 (0.149)	-0.043 (0.209)	-0.015 (0.096)	0.173 (0.221)	-0.130 (0.281)
Minimum dropout age	-0.205 (0.256)	0.441 (0.227)	-0.236 (0.146)	-0.364 (0.229)	-0.684 (0.315)	-0.320 (0.122)	0.797 (0.293)	-0.113 (0.204)
State requires exit exam	0.246 (0.223)	-0.635 (0.370)	0.389 (0.361)	0.208 (0.293)	0.788 (0.333)	0.580 (0.169)	-0.789 (0.338)	0.001 (0.374)
Exit exam is "hard"	0.038 (0.332)	-0.024 (0.407)	-0.014 (0.358)	-0.381 (0.305)	-0.457 (0.387)	-0.076 (0.196)	-0.090 (0.406)	0.547 (0.391)
Observations	2,577,271	2,577,271	2,577,271	1,151,938	1,151,938	1,151,938	1,151,938	1,151,938
R-squared	0.024	0.009	0.031	0.023	0.023	0.003	0.008	0.028

Note: Bold text denotes significance at the 1%, 5%, or 10% level. Regressions are weighted by population size. Coefficients have been multiplied by 100 in order to be interpreted as a percentage change. All regressions include dummies for race, fixed effects for age, year of birth, and state of birth, as well as controls for having a Democratic governor, the percent of the state's house and senate that is Democratic, the percent of the state's population aged 15-19, and ADC/TANF welfare benefits for a family of three. Robust standard errors are in parentheses and are clustered by state.

Table 6. Impact of explanatory variables on educational attainment for female individuals.

	2001-2010 ACS				2008-2010 ACS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High School Dropout	High School Completer	College Attendant	High School Dropout	GED & HS Dropout	GED	High School Diploma	College Attendant
Mean of dependent variable	8.44	25.4	66.2	7.39	11	3.6	19.7	69.3
Real minimum wage	-0.187 (0.124)	0.385 (0.182)	-0.198 (0.234)	-0.279 (0.140)	-0.285 (0.181)	-0.006 (0.071)	0.422 (0.212)	-0.138 (0.306)
Minimum dropout age	-0.414 (0.200)	0.408 (0.225)	0.006 (0.135)	-0.210 (0.185)	-0.499 (0.263)	-0.290 (0.088)	0.586 (0.279)	-0.087 (0.189)
State requires exit exam	0.274 (0.180)	-0.317 (0.301)	0.044 (0.263)	0.379 (0.195)	0.511 (0.245)	0.133 (0.109)	-0.543 (0.278)	0.031 (0.335)
Exit exam is "hard"	-0.123 (0.275)	0.068 (0.310)	0.056 (0.354)	-0.368 (0.212)	-0.351 (0.262)	0.018 (0.103)	-0.072 (0.404)	0.422 (0.459)
Observations	2,689,337	2,689,337	2,689,337	1,179,743	1,179,743	1,179,743	1,179,743	1,179,743
R-squared	0.021	0.011	0.029	0.017	0.016	0.002	0.010	0.023

Note: Bold text denotes significance at the 1%, 5%, or 10% level. Regressions are weighted by population size. Coefficients have been multiplied by 100 in order to be interpreted as a percentage change. All regressions include dummies for race, fixed effects for age, year of birth, and state of birth as well as controls for having a Democratic governor, the percent of the state's house and senate that is Democratic, the percent of the state's population aged 15-19, and ADC/TANF welfare benefits for a family of three. Robust standard errors are in parentheses and are clustered by state.

Table 7. Impact of explanatory variables on educational attainment for white, non-Hispanic individuals.

	2001-2010 ACS				2008-2010 ACS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High School Dropout	High School Completer	College Attendant	High School Dropout	GED & HS Dropout	GED	High School Diploma	College Attendant
Mean of dependent variable	7.64	27	65.4	6.85	11.2	4.4	21.1	67.7
Real minimum wage	0.037 (0.117)	0.266 (0.235)	-0.303 (0.293)	-0.041 (0.125)	-0.075 (0.186)	-0.035 (0.085)	0.489 (0.211)	-0.414 (0.283)
Minimum dropout age	-0.110 (0.223)	0.467 (0.214)	-0.358 (0.147)	-0.138 (0.204)	-0.297 (0.265)	-0.159 (0.082)	0.549 (0.241)	-0.252 (0.190)
State requires exit exam	0.017 (0.187)	-0.456 (0.356)	0.439 (0.375)	0.150 (0.227)	0.400 (0.240)	0.251 (0.098)	-0.561 (0.292)	0.160 (0.349)
Exit exam is "hard"	0.083 (0.246)	0.138 (0.377)	-0.220 (0.449)	-0.310 (0.204)	-0.296 (0.238)	0.014 (0.120)	0.074 (0.327)	0.223 (0.435)
Observations	4,051,198	4,051,198	4,051,198	1,757,272	1,757,272	1,757,272	1,757,272	1,757,272
R-squared	0.012	0.013	0.024	0.010	0.014	0.005	0.012	0.023

Note: Bold text denotes significance at the 1%, 5%, or 10% level. Regressions are weighted by population size. Coefficients have been multiplied by 100 in order to be interpreted as a percentage change. All regressions include dummies for gender, fixed effects for age, year of birth, and state of birth as well as controls for having a Democratic governor, the percent of the state's house and senate that is Democratic, the percent of the state's population aged 15-19, and ADC/TANF welfare benefits for a family of three. Robust standard errors are in parentheses and are clustered by state.

Table 8. Impact of explanatory variables on educational attainment for non-white, non-Hispanic individuals.

	2001-2010 ACS				2008-2010 ACS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High School Dropout	High School Completer	College Attendant	High School Dropout	GED & HS Dropout	GED	High School Diploma	College Attendant
Mean of dependent variable	13.7	32.3	54.0	12.8	17.8	5.0	25.2	57.0
Real minimum wage	-0.208 (0.215)	-0.205 (0.264)	0.413 (0.380)	-0.236 (0.209)	-0.119 (0.242)	0.117 (0.151)	-0.436 (0.276)	0.555 (0.314)
Minimum dropout age	-0.855 (0.327)	-0.307 (0.228)	1.162 (0.253)	-0.704 (0.259)	-0.932 (0.367)	-0.227 (0.135)	-0.064 (0.353)	0.996 (0.305)
State requires exit exam	0.797 (0.283)	-0.157 (0.391)	-0.640 (0.461)	0.697 (0.376)	0.854 (0.483)	0.158 (0.292)	-0.133 (0.508)	-0.722 (0.642)
Exit exam is "hard"	0.117 (0.479)	-0.778 (0.434)	0.661 (0.505)	-0.311 (0.372)	-0.042 (0.474)	0.268 (0.209)	-1.090 (0.604)	1.133 (0.649)
Observations	780,252	780,252	780,252	364,311	364,311	364,311	364,311	364,311
R-squared	0.013	0.016	0.034	0.014	0.020	0.008	0.016	0.037

Note: Bold text denotes significance at the 1%, 5%, or 10% level. Regressions are weighted by population size. Coefficients have been multiplied by 100 in order to be interpreted as a percentage change. All regressions include dummies for gender, fixed effects for age, year of birth, and state of birth as well as controls for having a Democratic governor, the percent of the state's house and senate that is Democratic, the percent of the state's population aged 15-19, and ADC/TANF welfare benefits for a family of three. Robust standard errors are in parentheses and are clustered by state.

Table 9. Impact of explanatory variables on educational attainment for Hispanic, non-white individuals.

	2001-2010 ACS				2008-2010 ACS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High School Dropout	High School Completer	College Attendant	High School Dropout	GED & HS Dropout	GED	High School Diploma	College Attendant
Mean of dependent variable	17.8	31.6	50.6	16.3	21.4	5.1	24.7	53.9
Real minimum wage	0.117 (0.235)	0.279 (0.213)	-0.396 (0.307)	-0.234 (0.293)	0.012 (0.356)	0.246 (0.202)	0.403 (0.245)	-0.416 (0.304)
Minimum dropout age	-0.478 (0.345)	0.584 (0.261)	-0.106 (0.342)	-0.059 (0.357)	-0.358 (0.429)	-0.299 (0.147)	0.556 (0.239)	-0.198 (0.356)
State requires exit exam	0.568 (0.457)	-1.934 (0.394)	1.365 (0.547)	0.269 (0.576)	0.836 (0.769)	0.567 (0.383)	-2.001 (0.538)	1.165 (0.622)
Exit exam is "hard"	-0.372 (0.625)	-0.211 (0.652)	0.583 (0.577)	-0.128 (0.573)	-0.028 (0.795)	0.101 (0.389)	-1.076 (0.494)	1.104 (0.728)
Observations	435,158	435,158	435,158	210,098	210,098	210,098	210,098	210,098
R-squared	0.020	0.008	0.026	0.017	0.018	0.007	0.008	0.024

Note: Bold text denotes significance at the 1%, 5%, or 10% level. Regressions are weighted by population size. Coefficients have been multiplied by 100 in order to be interpreted as a percentage change. All regressions include dummies for gender, fixed effects for age, year of birth, and state of birth as well as controls for having a Democratic governor, the percent of the state's house and senate that is Democratic, the percent of the state's population aged 15-19, and ADC/TANF welfare benefits for a family of three. Robust standard errors are in parentheses and are clustered by state.

References

- Angrist, Joshua D., and Alan B. Krueger. 1991. "Does compulsory school attendance affect schooling and earnings?" *Quarterly Journal of Economics* 106, (4) (November 1991): 979-1014.
- Bureau of Labor Statistics. 2011. "Characteristics of Minimum Wage Workers: 2010." Last modified February 25, 2011. <<http://www.bls.gov/cps/minwage2010.htm>>.
- Card, David and Alan B. Kreuger. 1992. "Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States." *The Journal of Political Economy*, Vol. 100, No. 1. (Feb., 1992), pp. 1-40.
- , 1995. *Myth and Measurement*. Princeton University Press (September 15, 1997).
- Center on Education Policy. 2010. "State High School Tests: Exit Exams and Other Assessments." Washington, D.C.: Center on Education Policy.
- Evans, William, & M. Turner. (1995). "Minimum Wage Effects on Employment and School Enrollment: Comment." Unpublished manuscript. University of Maryland.
- GED Testing Service. "Technical Manual: 2002 Series GED Tests." GED Testing Service, Washington, DC, March 2009.
- Goldin, Claudia D., and Lawrence F. Katz. 2008. *The Race between Education and Technology*. Cambridge, Mass.: Belknap Press of Harvard University Press.
- Heckman, J. J., J. E. Humphries, and N. Mader (2011). "The GED." In E. A. Hanushek, S. Machin, and L. Womann (Eds.), *Handbook of the Economics of Education*, Volume 3, Chapter 9, pp. 423-484. Amsterdam: North Holland, Elsevier.
- Jacob, Brian A. 2001. "Getting tough? The impact of high school graduation exams." *Educational Evaluation & Policy Analysis* 23, (2) (Summer): 99-121.
- Labor Law Center. "Federal Minimum Wage Increase for 2007, 2008, & 2009." Accessed 7 April 2012. <<http://www.laborlawcenter.com/t-federal-minimum-wage.aspx>>.
- Murnane, Richard J. 2011. "U.S. High School Graduation Rates: Patterns and Explanations." Harvard Graduate School of Education.
- National Center for Education Statistics. "Trends in High School Dropout and Completion Rates in the United States: 1972–2008." Accessed December 12, 2011. <<http://nces.ed.gov/pubs2011/dropout08/findings6.asp>>.

- Neumark, David and William L. Wascher. 1992. "Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws." *Industrial and Labor Relations Review* 46, no. 1 (October): 55-81.
- , 1995. "The Effects of Minimum Wages on Teenage Employment and Enrollment: Evidence from Matched CPS Surveys." *Research in Labor Economics*, 15, 25-63.
- , 1996. "The Effects of Minimum Wages on Teenage Employment and Enrollment: Evidence from Matched CPS Surveys." *Research in Labor Economics* 15.
- , 2000. "Minimum Wages and Skill Acquisition: Another Look at Schooling Effects." *Economics of Education Review* 22 (2003) 1-10.
- , 2008. *Minimum Wages*. The MIT Press (October 31, 2008).
- NPR. "School Dropout Rates Add To Fiscal Burden." 24 July 2011. <<http://www.npr.org/2011/07/24/138653393/school-dropout-rates-adds-to-fiscal-burden>>.
- OECD. 2010. "Education at a Glance 2010: OECD Indicators." OECD Publishing.
- , 2011. "Education at a Glance 2011: OECD Indicators." OECD Publishing. <<http://dx.doi.org/10.1787/eag-2011-en>>.
- Oreopoulos, Philip. 2009. "Would more compulsory schooling help disadvantaged youth? Evidence from recent changes to school-leaving laws." In *The problems of disadvantaged youth: An economics perspective*. ed. Jonathan Gruber, 85-112. Chicago: University of Chicago Press.
- Reardon, Sean F., Allison Atteberry, Nicole Arshan, and Michael Kurlaender. 2009. "Effects of the California High School Exit Exam on Student Persistence, Achievement, and Graduation." Stanford University Institute for Research on Education Policy & Practice.
- Rumberger, Russell. *Dropping Out: Why Students Drop Out of High School and What Can Be Done About It*. December 2011.
- Rumberger, Russell, and Sun Ah Lim. 2008. "Why Students Drop Out of School: A Review of 25 Years of Research." Santa Barbara.
- USgovernmentspending.com. "U.S. Education Spending History from 1900." Accessed December 14, 2011. <http://www.usgovernmentspending.com/education_spending>.

Appendix Table 1. Location of data used for compulsory schooling ages.

National Digest of Education Statistics, selected years		
<i>Digest Year</i>	<i>Table Number</i>	<i>Compulsory Schooling Years</i>
2010	Table 174	2000, 2002, 2004, 2006, 2008, 2009, 2010
2009	Table 166	2007
2000	Table 152	1997
1996	Table 149	1996
1995	Table 148	1994
1994	Table 151	1994
1993	Table 150	1992
1992	Table 142	1992
1991	Table 143	1989
1990	Table 139	1989
1989	Table 131	1988
1988	Table 102	1987
1987	Table 88	1985
1985-86	Table 29	1984
1983-84	Table 27	1978
1982	Table 30	1977
1980	Table 32	1977

Source: NCES.

Appendix Table 2. Matrix of values used to generate minimum competency testing dummy variables.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Alaska	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Alabama	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
Arizona	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
California	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Delaware	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Georgia	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
Hawaii	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
Idaho	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Indiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2
Louisiana	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
Massachusetts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Maryland	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Minnesota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Mississippi	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
North Carolina	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
New Jersey	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
New Mexico	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nevada	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
New York	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
Ohio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2
South Carolina	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Tennessee	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
Texas	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Virginia	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2

Note: 0 denotes a state that did not have an exit examination in the year specified; 1 denotes a state that had an exit exam that tested material below the 9th grade level; 2 denotes a state that had an exit exam that tested material at or above the 9th grade level.

Source: Dee and Jacob (2006) for years 1980 – 2005; Center on Education Policy (2010) for year 2006.

Appendix Table 3. History of federal minimum wage changes, 1980 to present.

Effective Date	Hourly Wage
01/01/1980	\$3.10
01/01/1981	\$3.35
04/01/1990	\$3.80
04/01/1991	\$4.25
10/01/1996	\$4.75
09/01/1997	\$5.15
07/24/2007	\$5.85
07/24/2008	\$6.55
07/24/2009	\$7.25

Source: Labor Law Center.