The Effect of Graduation Requirements on Teenage Birth Rates and Other Birth Outcomes

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May 2012

Abstract

This paper analyzes possible spillover effects of raising high school graduation requirements. Using Natality data, I compare the birth outcomes for states and cohorts with more difficult graduation requirements to those with less difficult requirements. I find evidence that more difficult requirements reduce teenage birth rates, where each additional required course decreases the birth rate by 1% and 0.7% for white and black mothers respectively. This effect is consistent across all ages and focused in counties with low average incomes. I do not find a significant effect of graduation requirements on other birth outcomes, such as birthweight and the fraction of premature births. These results add to the growing evidence that education policies have important spillover effects beyond their effect on earning.

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1 Introduction

High birth rates and low academic performance are among two of the biggest concerns expressed about teenagers in the United States. The teenage birth rate in the United States is one of the highest in developed countries[1]. While this rate has been on a downward trend, as of 2010 it was still 34.3 births per 1,000 female teenagers.[2] That is much larger than the UK's rate of 24 per 1,000 women, the highest in western Europe.[3] At the same time, high school students perform relatively poorly compared to the rest of the developed world. In 2009, the United States ranked 12$^{\text{th}}$ out of 34 OECD countries in reading, and 25$^{\text{th}}$ in mathematics.[4] There are also several complaints by employers and professors that high school graduates do not have the necessary skills for the workforce, and that those that go to college are unprepared for the coursework, leading to high attrition rates (Hart (2005); Kendall et. al. (2007)). In an effort to combat these poor outcomes many states have raised their high school graduation requirements. In this paper I examine whether these increases in graduation requirements affect teenage birth rates and other birth outcomes including infant birthweight.[5] Given the connection between graduation requirements and the probability of dropping out (Greene and Winters (2004); Warren, Jenkins, and Kulick (2006); Jacob and Dee (2006)) we may expect a rise in teenage births and worse birth outcomes for parents with higher graduation requirements. On the other hand the more difficult requirements can improve students' human capital (Goodman (2009)) and may keep students busier and teach them to be more responsible, which may lower birth rates and improve infant health.

Many state laws attempt to raise the quality of high school graduates by raising their graduation

[1] *State of the World Population*, 2011 http://foweb.unfpa.org/SWP2011/reports/EN-SWOP2011-FINAL.pdf

[2] *http://www.guttmacher.org/pubs/USTPtrends.pdf*

[3] *http://news.bbc.co.uk/2/hi/uk_news/education/8531227.stm*

[4] *The Conditions of Education* NCES(2011) - http://nces.ed.gov/programs/coe/. These rankings are for 15 year old students.

[5] Other outcomes of interest include information on if the father is known, the number of prenatal visits, the gestation length, premature births, and births with congenital defects

requirements.[6] The two more commonly used requirements are course requirements, which dictate the minimum number of courses that students have to take, and exit exams which are standardized tests that students must pass in order to graduate. The idea behind these requirements is that they enforce some minimum knowledge that must be acquired before a student is allowed to graduate and receive a diploma. If students are not leaving school with enough knowledge, then raising these requirements can be a way to raise the level of information that a student graduates with. The concern policymakers have with these reforms is that since they make it more difficult to graduate, they may increase the already large high school dropout rate (Jacob and Dee (2006)).

Previous papers have estimated both the beneficial and negative effects of these requirements. Several papers provide evidence that these laws increase future wages, improve job opportunities, and lower crime rates (Bishop and Mane (2001); Goodman (2009); Larsen (2012)). There is also evidence that higher requirements increase the probability of dropping out of high school, GED testing rates, and lower high school completion rates (Greene and Winters (2004); Warren, Jenkins, and Kulick (2006); Jacob and Dee (2006)). The human capital increasing effects associated with high school graduation requirements dictate a decrease in birth rates (Black, Devereux, and Salvanes (2008)). There also may be an incapacitation effect if the requirements keep students busier, leaving less time to engage in sexual activities. However, due to the high probability of dropping out, some students may have more time to engage in these activities which may lead to more births. Similarly, the students that drop out may have less means to take care of themselves while pregnant, resulting in less healthy births. These counteracting effects make it difficult to predict the overall effect on teenage birth rates and infant birth weight The overall effect is an empirical question, which this paper attempts to answer.

[6]Between 1980 and 2000 only Colorado, Illinois, Iowa, Massachusetts, Michigan, Nebraska, North Dakota, Rhode Island, and Wyoming did not change their laws mandating course requirements. 20 states during this period introduced an exit exam.

There is often much concern about teenage pregnancy and childbearing, especially in the United States.[7] While, most of the previous research has shown that teenage childbearing can have negative effects on the child, the mother, and even on society as a whole (Trussel (1976); Francesconi(2008)), there is some debate over the magnitude of these effects once possible confounding background characteristics have been controlled for (Geronimus and Korenman (1992); Hotz, McElroy, and Sanders (2005)).[8] In general, children born to teen moms are more likely to be premature, low-birth weight, and have disabilities. As they grow older they are more likely to suffer neglect, have developmental problems, and perform worse in school.[9] The mothers themselves are likely to have less schooling, lower incomes, increase poverty, and other detrimental effects.[10] Due to the health care, child welfare, and other costs associated with these outcomes as well as lost revenue due to lower taxes it's estimated that the public cost of teenage childbearing in the united states is approximately $10.9 billion annually.[11] With such large costs, any policy that reduces the teenage birth rates can have large benefits to society. On the other hand any policy that may increase crime may be coupled with high costs.

To estimate the effects of graduation requirements on birth rates and other birth outcomes I use the National Center for Health Statistics' natality data. Since this data has information on all births in the United States, I can create a panel dataset of birth counts for each expected high school graduation year and state. When states raised their graduation requirements it meant that some cohorts within a state and year faced different graduation requirements than the cohort directly ahead of them, simply due (exogenously) to the accident of their year of birth (and therefore their expected

[7] *http://www.thenationalcampaign.org/*

[8] Hotz, McElroy, and Sanders (2005) use miscarriages as a "natural experiment" and even some find beneficial effects to teen pregnancy. Their results suggest that later in life, women who had children when teenagers have higher wages and hours worked.

[9] *The Children of Teen Parents* http://www.cpeip.fsu.edu/resourceFiles/resourceFile_78.pdf

[10] Trussel (1976)

[11] NCHS Data Brief, No. 89, April 2012, http://www.cdc.gov/nchs/data/databriefs/db89.pdf

graduation date). I estimate an ordinary least squares (OLS) model that includes controls for state-by-year and cohort-by-year differences. This controls for many potential confounders that could be changing at the same time and in the same state as the change in graduation requirements (such as increased spending on health care social programs). The assumption behind my models is that any two adjacent cohorts, living in the same state, are identical except that one cohort will face higher graduation requirements than the other.

My results demonstrate that each additional required course leads to a 1% decrease in the birth rate for white teenagers and a slightly smaller 0.7% decrease in the birth rate for black teens. The average increase in the number of courses over this period was approximately three courses, implying that the average effect of the policy change was a 3% decrease in the fertility of white teens and 2.1% among black teens. I find no evidence that exit exams significantly effect the birth rate. A simple back-of-the-envelope calculation suggests that each additional required course could decrease annual costs by $6.3 Million.[12] These findings are consistent with other estimates of the relationship between education and teen fertility. For example, Black, Devereux, and Salvanes (2008) find a 4-8% decrease in birth rates due to an increase in the compulsory schooling age.[13]

The estimated effects are similar across ages and tend to be focused in the counties with the lowest incomes. The latter effect is of particular interest because it suggests that the areas most in need of help, benefit the most from these policies. On average poorer counties have lower quality schools and higher teen birth rates. By utilizing policies that raise the level of education, these districts receive large beneficial effects. Given the potentially large spillovers of teen pregnancy, raising graduation requirements can have large welfare implications in these counties.

[12]This is based on the estimated annual cost of $9.1 Billion, due to lost tax revenue, public assistance, healthcare costs, child welfare, and an increase in incarcerations estimated by *The National Campaing* (http://www.thenationalcampaign.org/costs/pdf/report/2-BTN_Summary.pdf). Taking my lower bound estimates of a 0.7% reduction in teen births and multiplying by 9.1 Billion results in approximately 6.3 Million.

[13]A similar paper by McCrary and Royer (2011) find no effects based on birthdates around school start dates. My results on course requirements is somewhere between these estimates and those of Black, Devereux, and Salvanes (2008)

I also attempt to estimate the effect of higher graduation requirements on infant health, proxied by infant birthweight. Since graduation requirements may have longer term income effects (Bishop and Mane (2001); Goodman (2009)) and income has been shown to affect birthweight (Kehrer and Wolin (1979); Almond and Currie (2011)), one may expect an effect through this channel. There is some debate in the literature about the effects of education on infant birthweight. McCrary and Royer (2011) find no effect while Currie and Moretti (2003) and Chou, Grossman, Liu, and Joyce (2007) find that additional education increases birthweight.[14] I do not find strong evidence that graduation requirements affect birthweight. This is consistent with McCrary and Royer (2011) which find no effect of education on infants' health.

The remainder of this paper proceeds as follows: the next section details high school graduation requirements and how they have changed over time. Section 3 describes the relevant literature. Section 4 discusses my empirical strategy and methods. Section 5 gives more information on the data used in this project. Section 6 discusses the results, and section 7 concludes.

2 Graduation Requirements

In order to graduate from high school, every student must meet certain course requirements. The exact nature of the requirement can differ across schools, districts, and states and may include other requirements such as maintaining a certain GPA, passing specific classes, and scoring well enough on standardized exams. I examine two types of requirements in this paper. First, I examine total course graduation requirements which dictate the total number of courses a student must pass before they

[14]McCrary and Royer (2011) use a discontinuity around the mother's birthdate to instrument for educational attainment due to the ability of some mothers to drop out of high school sooner than others. Currie and Moretti (2011) use college openings as an instrument for access to education. The difference in findings may be due to the margin at which the educaiton changes, high school for McCrary and Royer, and College for Currie and Moretti. Chou, et. al. (2007) deals with the jr. high level, but in Taiwan, which may explain why there estimates differ from McCrary and Royer.

are allowed to graduate. Most states set a law mandating the minimum number of courses a student will have to pass in order to graduate,[15] while any given school district may require more of their students, none of them can set their requirements lower than this bar. Often states will set subject specific course requirements in addition to overall course requirements, which will help emphasize the areas of knowledge that the state deems important. Assuming students can only pass each class if they learn the material, course requirements help ensure that each graduate exits high school with at least the minimum level of knowledge that state policymakers deem acceptable.

Prior to 1983, states' course requirements were relatively stable, but The Reagan Administration's release of *A Nation at Risk* led to a series of state level changes that were likely uncorrelated with other requirement and education policies (Lillard and DeCicca (2001), Goodman(2009)). This was because *A Nation at Risk* outlined several methods by which the United States could improve its education system, including a suggested curriculum for all high school graduates: "(a) 4 years of English; (b) 3 years of mathematics; (c) 3 years of science; (d) 3 years of social studies; (e) one-half year of computer science." Given the suggestions in the document, many states began to raise their requirements which resulted in several state requirement reforms from 1983 to 1986. Current high school students were 'grandfathered' under the old requirements, which meant that most of the changes affected cohorts graduating between 1987 and 1990. Table 1 shows the total courses required by state and graduation year from 1980 to 2000.

The second type of graduation requirement that I examine is the use of "exit exams". Exit exams are standardized tests that each student must take, and receive a passing score on, before they are allowed to graduate. The use of these exams has been increasingly popular with the passing of

[15]Some states do not use state mandates and instead leave all the decisions to the local school districts. From 1980 to 2000 thirteen states have exercised this option at least once. These are California, Colorado, Connecticut, Florida, Iowa, Maine, Massachusetts, Michigan, Nebraska, New Jersey, Vermont, Washington, and Wisconsin. By 2000, only five states did not have statewide requirements. During the years that these states have no minimums, I assume the minimum courses are zero.

the *No Child Left Behind Act of 2001* (NCLB). Due to the fact that NCLB required states to use standardized exams to monitor student progress, many states turned those exams into exit exams by requiring a passing score in order to graduate. While the use of exit exams is more common today, in the early 1980's they were rare.[16] Throughout the next two decades, the use of exit exams became more common and by 2000 sixteen states required exit exams be passed in order to graduate.[17]

While the general description of an exit exam is common across states—a test that students must receive a satisfactory score on in order to graduate—the specifics of the requirement can vary from state to state. States may differ on the covered curriculum, grade covered, passing threshold, and number of acceptable attempts; among other characteristics of the exams. In this paper I follow Jacob and Dee (2006) and distinguish between exam difficulty based on the curriculum covered. I separate the use of exit exams into two categories: less difficult, and more difficult, exit exams. The less difficult exit exams are exams that test at eighth grade level or below and are typically given for the first time at the end of middle school, whereas the more difficult exit exams test at a ninth grade or higher and are typically administered in high school. Table 2 shows the use of exit exams by state, graduation year, and difficulty, for classes that graduated between 1980 and 2000. As time moves on, more states have used exit exams and the exams, on average, began to test at a higher grade level.

3 Previous Literature

3.1 Graduation Requirements

The literature examining the various effects of raising graduation requirements is relatively new. The most common outcomes examined are their effects on dropping out of high school and the effects

[16] Only New York and North Carolina used an exam in 1980.

[17] These states are Alabama, Florida, Georgia, Indiana, Louisiana, Maryland, Minnesota, Mississippi, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, South Carolina, Tennessee, Texas, and Vermont

on labor market outcomes later in life. Using individual data, Bishop and Mane (2001), Lillard and DeCicca (2001), and Warren and Edwards (2005) all find no effect of exit exams on dropout rates, however, Bishop and Mane do see an increase in earnings following the use of exit exams. Lillard and DeCicca (2001) and Bishop and Mane (2001) also examine the effect of course requirements and find that more rigorous requirements do lead to a modest increase in the probability of dropping out.

Papers using state-year variation in graduation requirements often see an increase in dropout rate. Greene and Winters (2004), Jacob and Dee (2006), and Warren, Jenkins, and Kulick (2006) all find adverse effects of using exit exams. Depending on the outcome examined these papers find an increase in the dropout rate, a decrease in the high school completion rate, and an increase in GED test taking rates. Martorell (2003) and Ou (2010) also find an increase in the number of dropouts when they use a regression discontinuity strategy to look at the effect of exit exams.

A separate set of papers estimate the effects of course-specific requirements. Levine and Zimmerman (1995) and Rose and Betts (2004) both find that taking more math courses leads to higher earnings later in life. However, the decision to take more math courses is likely endogenous to other choices that may effect future earnings. Goodman (2009) addresses this concern by utilizing a two-sample instrumental variables design. He utilizes state law changes in math courses required to instrument for the number of math courses a student takes. In doing this he finds an increase in earnings for black students, but insignificant effects for white students.

This literature finds both beneficial and adverse effects of raising high school graduation requirements. This suggests that while increasing requirements may have their intended outcomes, there are also unintended consequences to be aware of. With findings that show raising graduation requirements can be both harmful and beneficial, it is important to examine all of the effects these policies may have. In general, I will refer to the beneficial impact of increased graduation requirements as a

"human capital" effect and the adverse impacts as a "dropout" effect.

3.2 Teenage Childbearing

Though there is still debate about the actual causal effects of teenage childbirth, the general belief is that they are associated with poorer outcomes for both the mother and the child, leading to large public costs (Trussell (1976)). Attempts to separate unmeasured family background characteristics from the true causal effects demonstrate modest reductions in education and increases in poverty and the use of welfare for teenage mothers (Geronimus and Korenman (1992); Hoffman, Foster, Furstenberg (1993)). However, this is still an area of some debate as Hotz, McElroy, and Sanders (2005) estimate that many of these effects are short-lived. The children of these mothers are also negatively affected, having lower education attainment, lower earnings, and a higher chance of teenage pregnancy themselves (Francesconi (2008) and Manlove (1997)). Due to these adverse effects it is important to understand the impact of policies that may effect teenage pregnancy.

Several papers have attempted to estimate a causal effect of education and teenage pregnancy. Many of these use compulsory schooling laws in an attempt to estimate the causal effect of education. Black, Devereux, and Salvanes (2008) use data from both the United States and Norway. In the U.S. they use minimum dropout age laws and find that a dropout age of 16 decrease teen births by 4% and a dropout age of 17 decreases the birth rate by 8% relative to a dropout age of 15 or younger. For the Norway reform which raised the dropout rate from 14 to 16, they find approximately a 3.5% decrease in teen births.[18] Ferre (2004) and Leon (2004) find similar effects for the United States and Kenya respectively, however, Lindeboom, Llena-Nozal, and Van-der Klaauw (2009) do not find any effects of compulsory schooling on teenage births in the United Kingdom. A similar, though slightly different strategy, by McCrary and Royer (2011) uses births around school entry ages as an instrument for

[18] A similar separate paper by Monstad, Propper, and Salvanes (2008) reaffirms these effects for Norway.

education, and find no significant effect on teenage fertility.

A few papers have used education reforms in developing countries to estimate the effect of education on teenage pregnancy. Osili and Long (2007) use a universal schooling policy in Nigeria and find that students who were subjected to this policy were less likely to have children at an early age. Breierova and Duflo (2004) use school construction in Indonesia and find that mother and father's education may be a determinant of early fertility.

4 Empirical Strategy

In order to estimate the effects of raising graduation requirements I utilize variation in state policies. Using that variation, I compare the birth rates of cohorts who faced different graduation requirements depending on the state and year in which they were set to graduate from high school. I estimate differences using the following model:

$$BIRTH_{asy} = \alpha + \beta_0 CGR_{gs} + \beta_1 MCE_{gs} + \beta_2 EE_{gs} + \beta_3 SCHOOL_{gs} + \beta_4 ECON_{gs} + \psi_{sy} + \gamma_{gy} + \rho_s * g + \epsilon_{asy}$$

where *BIRTH* is one of several birth outcomes that vary at the age a, state s, and year y level. The first outcome is the birth rate, which is the total number of births divided by the population which varies at the same level—age, state, and year. Another outcome I examine is the average birthweight of the children born to these parents. This varies between the total birthweight (in grams) and indicator variables if the child is "low birthweight" or "very low birthweight".[19] Finally, I will also

[19]Low birthweight and very low birthweight are based on the standard in the literature of below 2,500 and 1,500 grams, respectively.

examine if the father is known, the number of prenatal visits, the gestation length, the fraction of premature births, and the occurance of congenital defects.

CGR is the state mandated minimum number of courses that graduation cohort g would have to pass in order to graduate in state s.[20] These are standardized across states so that each unit is the equivalent to a school yearlong course.[21] In some instances there is not a state mandated minimum requirement because states delegate those decisions entirely to the local school districts. When this occurs the minimum number of courses is set to zero. However, this could cause a bias in the estimates since it is likely that "zero" is not the actual requirement that most schools in this state would face. To deal with this, I include an indicator variable which is set to "1" when the state opts to delegate to the local level and "0" otherwise. I limit my analysis to state level changes and not district level changes for two reasons. First, data at the school district level is difficult to come by. Second, changes in policy at the district level are more likely to be biased by other factors. Districts may choose to change their requirements in an attempt to improve outcomes following years of poor performance. They also could be endogenous to a change in superintendents, which may be coupled with other changes to teachers, class size, or other school policies.

EE and *MCE* are indicator variables for the presence of two mutually exclusive types of exit exams, where *MCE* refers to the "less difficult" exit exams (sometimes referred to as minimum competency exams) which only require knowledge of material learned before the ninth grade and *EE* refers to the "more difficult" exit exams that test at a ninth grade or higher curriculum (Jacob and Dee (2006)). These variables and course graduation requirements vary at the graduation cohort-state level. Since continuing high school students are "grandfathered" in to the requirements that they faced upon

[20] Graduation cohort is defined as year minus age plus 18. Course requirement data are from *Education Commission of the States, Clearinghouse Notes* (1984, 1985, 1989, 1990, 1993, and 1996) and *Digest of Education Statistics* (2000, 2001)

[21] These are standardized by the *Education Commision of the States* and are referred to as Carnegie units.

entering high school, requirements will not change within a given cohort.

To control for other possible concurrent changes in education policy, I include *SCHOOL*, a vector of education characteristics.[22] Similarly, to control for changes in the economic climate, I include a vector of economic controls, *ECON*.[23] All of these variables take on the average value in the state over the four years that a cohort was expected to be in high school. These controls are complemented with a complete set of state-by-year (ψ_{sy}) and year-by-cohort (γ_{yg}) fixed effects, as well as state-specific linear cohort effects.

This strategy will utilize the repeated cross section nature of the data, which will allow me to control for unobserved confounders through the use of fixed effects. The state-by-year fixed effects allow me to control for all common factors within a given state and year. For example, if there were any changes in state medical access at the same time time as the changes in graduation requirements, there would be a bias. However, this will affect all cohorts within a given state and year, and therefore will be controlled for with the state-by-year fixed effects. Similarly, the year-by-cohort fixed effects will control for any shocks common to a cohort within a year. They also simultaneously control for any year-by-age shocks, which will control for the fact that teenage birth rates have been changing differentially by age over time. Inclusion of cohort-by-state fixed effects is not possible because that is the level at which the variation of interest occurs, however, I have included state specific linear cohort effects. These will allow for the birth outcomes to have a different linear trend in each state.

This identification strategy requires that changes in graduation requirements are exogenous to the birth outcomes, and that there are not omitted variables (common shocks) that affect both graduation requirements and the key birth variables. This is likely the case, given that many of these requirement

[22]These include pupil-teacher ratio, teacher salary, per-pupil expenditures, and dropout age. These data are from *The Digest of Education Statistics* and Oreopolous (2006).

[23]These include employment-to-population ratio, income per capita, medical transfer payments, and unemployment payments. These data are from the Bureau of Economic Analysis.

changes were in response to *A Nation at Risk* and not conceived as a tool to combat teen fertility.

5 Data

The birth data come from the Vital Statistics Natality Detail Data from the National Bureau of Economic Research (NBER). This includes information from the birth certificate forms of all births within a calendar year within the United States.[24] This allows me to get an aggregate count of births at the state and year level by the age and race of the mother from 1980 to 2000. I limit the sample to births among 14 to 18 year old mothers since these are the ages of high school attendance.[25] In order to assign a birth rate, I divide total births by the relevant cell population estimates from the Surveillance Epidemiology and End Results (SEER).[26] For birthweight regressions I use cell average birthweights (in grams) as well as the fraction of births "low birthweight" and "very low birthweight". Other birth outcomes are measured as the state-cohort-year average values. I assign graduation year and state to the state in which the birth occurs and the year the mother is expected to be eighteen.

It is important to note that with this administrative data I only observe the birth rate for teenagers who brought their babies to term. The estimates are, therefore, an imprecise measure of teenage pregnancies or teenage sexual activity. However, they are likely a reasonable proxy for these outcomes and given the negative effects of being a teenage mother, (Geronimus and Korenman (1992); Hoffman et al. (1993); Francesconi (2008)) it is an important outcome to examine in its own right. My sample includes all non-multiple births from 1980 to 2000 where birthweight is measured.[27] All of these

[24] Arizona, California, Deleware, Washington DC, Georgia, New Mexico, and North Dakota have a 50% representative sample for 1980 and 1981.

[25] Adding 19 year olds to the analysis yields very similar results.

[26] SEER has, what is often thought of as, the closest approximation to age, race, and gender specific population counts in the intercensal years.

[27] Multiple birth children will have lower birthweights than non multiple births. To deal for this potential bias, these births have been dropped from the sample. These account for less than 1.5% of births in teenagers. If other data is missing, such as the number of prenatal visits, the observation would be included, but not used in calculating an average number of prenatal visits.

statistics are calculated separately for both black and white mothers.

Data on exit exams come from Jacob and Dee (2006). The data are separated into two categories, depending on the grade level of the material covered. "Less difficult" exams test at an eighth grade or lower level, while "more difficult" exams test at a ninth grade or higher level.[28] The course graduation requirements (CGR's) are from the *Education Commission of the States, Clearinghouse Notes* (1984, 1985, 1989, 1990, 1993, 1996) and the *Digest of Education Statistics* (2000,2001). CGR's are defined as the state mandated minimum number of courses a student must take and pass in order to graduate from high school.[29] Other education controls mainly come from the *Digest of Education Statistics*.[30] The economic control variables are from the Bureau of Economic Analysis' Regional Economic Accounts. These controls will help deal with other potential changes in the education system or the economic climate for the same cohorts that face requirement changes.

Summary statistics are available in Table 3, weighted by cell population size. The average birthrate for white teens is approximately 31 per 1,000 teenagers and a little more than twice that for black teens. Birthweight statistics are consistent with other papers and reports.[31] The average number of courses a student had to complete was between 15 and 17 courses. Approximately 23% of white teens faced the "less difficult" exit exams and approximately 9% faced "more difficult" exams. These numbers are higher for black teens mostly due to the geographic distribution of these exams. Most of the southern states adopted these exams early on, and with a large fraction of the black population living in the south, the average black student in the sample was more likely to have an exit exam than the average white student.

[28]Details can be found in Jacob and Dee (2006). If any of the material covered on the exit exam was first presented in high school, the exit exam is referred to as a "more difficult" exit exam. Otherwise, the exam is distinguished as a "less difficult" exit exam.

[29]This total number of courses incorporates both changes in specific subjects as well as a general increase in the number of courses required. While investigation into requirement changes to specific subjects would be interesting it is very difficult to parse out since most states raise several subject requirements simultaneously.

[30]The exception is minimum dropout age which is from Oreopolous (2006).

[31]McCrary and Royer (2011), Black, Devereux, and Salvanes (2008), *State of the World Population* (2011)

6 Results

6.1 Teenage Birth Rate

Table 4 shows results for equation 1, separately for white and black mothers. Results in this table, and all tables, are weighted by cell population size and standard errors are clustered at the state level. Adding the state-by-year fixed effects in specifications 3 and 7 decreases the point estimates of the effect of course requirements, making each statistically indistinguishable from zero. Including state specific linear cohort effects in column 4 decreases the point estimates further, but also lowers the standard errors. These estimates are weakly significant and negative, suggesting that an increase in required courses leads to a decrease in teenage birth rates. For white mothers the decrease in birth rates associated with one additional course required is 0.312 births per 1,000 teens. This is a 1% decrease relative to the mean of 31 births per 1,000 teenage women. Similarly for black mothers there is a 0.7% decrease relative to the average birthrate for black teenagers. Given that the average state raised its number of courses by 3, this is equivalent to a 3% decrease among white teenagers and a 2.1% decrease among black teenagers. For both races and across all but the most basic specifications, both types of exit exams show no significant effects on birth rates.

Different effects at different ages may give some insight into possible mechanisms. For example, a positive effect on fertility at older ages may suggest that the "dropout effect" dominates the "human capital effect" as students reach the end of high school. In Table 5A, I examine the differential effects by the age of the mother. All three columns are based on the same regression, and display the estimated coefficients on the interaction between age dummies and different graduation requirements. Consistent with the estimates in table 4, exit exams do not affect the birth rate at any age. The effects of course requirements are negative and fairly consistent across all ages for both white and

black mothers. The effect for black mothers show larger negative effects as the age of the mother increases and by age 18, the effect is significant at the 5% significance level. Effects at age 14 are not significantly different from zero for either race. This is likely due either to 1) the low birth rate at age 14 and/or 2) that course requirements may not have much of an effect during the early years of high school. The effects by age, therefore, tell a similar story as the main results—incapacitation and human capital effects appear to dominate dropout effects.

In a further attempt to parse out the differential effects of these requirement changes, I examine whether the effects are different for students who are legally able to drop out of high school. In theory students can only drop out of high school once they reach a minimum age as mandated by law in the state and year in which they attend school. Therefore, I interact the course requirements with a variable that indicates whether or not the mother was legally able to drop out of high school.[32] I would expect either a positive effect or a less negative effect for students who are allowed to drop out of school. For these students, the dropout effect should be larger than it is for students who cannot legally drop out due to the non-binding legal constraints. Results of this exercise are presented in table 5B. There is some evidence that this is true. For both races the point estimates are less negative for those students that can legally drop out. For white mothers who may legally drop out, the effect is no longer significantly different from zero, though also not statistically different from the estimate for students who cannot drop out. This suggests that either the dropout effect is relatively small or the minimum dropout age is not a large obstacle to dropping out as is suggested by Oreopolous (2007). The results in Tables 5A and 5B seem somewhat contradictory. The strongest negative results are for eighteen year olds, who are also the most likely able to dropout. However, both results control for individual age and legal dropout age. Table 5A suggests that holding the dropout age constant,

[32]I do not interact the exit exam variables with this indicator because there is not enough states that have both an exit exam and a young dropout age to estimate a valid coefficient.

the effect is strongest on the oldest individuals. Table 5B estimates that holding age constant, being unable to drop out leads to the strongest effect. Taken together, we may expect the effects, therefore, to be strongest for the oldest individuals who reside in states with high dropout ages.

In table 6, I attempt to estimate differential effects of graduation requirements by income. Since there is no information on income in the vital statistics data I utilize variation in average county income. To do this analysis, I change from state level birth counts to county level counts and interact the graduation requirements with county income quartiles. Since the vital statistics data only have county level births available for counties with populations of 100,000 or more, I start by re-estimating the baseline regressions at the county level. These results are presented in columns 1 and 3. For both races, the estimated coefficients do not significantly change relative to the state level regressions.

Columns 2 and 4 show the estimated effects on graduation requirements interacted with county income quartiles. For white mothers, the effects are largest in the poorest counties. This is similar to the finding on arrests documented in Larsen (2012). The poorest counties are the most likely to have districts below the new course mandates and therefore will have the most districts affected by the change. Similarly, students in these counties would likely benefit the most from the new courses. "More difficult" exit exams also have a negative effect in these counties but have a positive effect in the richer counties. Since school districts do not use exit exams unless mandated by the state, the implementation is uniform across all counties. Thus, the differential effects across county income must be due to some other factor. One potential explanation is that, in implementing the exit exam there is a shift in resources that helps the poorer schools but harms the richer schools. Material on the exit exam may be more advanced than the previous curriculum in poorer districts. Learning this material will keep their students busier and may teach them more responsibility. In the richer districts, the material on the exams may be more basic, so focusing on this material may leave students with more

free time and a shift away from other classes like health, which may have been keeping birth rates low. Interestingly, for black mothers there is no significant difference across county income, but these estimates are also quite noisy. One explanation for this is that the black students are, on average, disadvantaged across all county income quartiles. If so, black students in the richest counties will receive similar benefits to those in the poorer counties.

These tables provide evidence that more difficult graduation requirements are associated with a reduction in teenage birth rates. The effects are similar to those on arrest rates seen in my previous paper. The exact mechanisms still need to be investigated further but there is evidence of an effect that reduces birth rates and an effect that increases them. On average mechanisms that reduce the birth rate dominate those that increase it.

6.2 Birthweight and Other Birth Outcomes

Infant birthweight is one of the most important indicators of infant health (Currie (2000)). Infants who are low birthweight experience much higher mortality rates than those with normal birthweights. Low birthweight infants are also much more likely to to have neurodevelopment handicaps, including mental retardation, blindness, and deafness.[33] Due to these important outcomes, estimating the possible connection of graduation requirements to birthweight could potentially be very important.

There are several reasons to think that increasing graduation requirements could have an impact on infant birthweight, for both teen moms and those who have children later in life. First, since an increase in course requirements leads to a reduction in the birth rate, there may be a selection effect. If marginal babies that are not born due to the increase in requirements would have been relatively low birthweight then one may expect to see a mechanical increase in birthweight due to this selection

[33]For a full review of the negative impacts of birthweight see Currie (2000).

effect. The opposite would be true if the marginal babies not born would have had a relatively high birthweight. Another possible explanation is that the additional education received through increased requirements could either directly (through courses like health) or indirectly (through teaching non-cognitive skills like responsibility) lead to better prenatal care and therefore higher birthweights. Finally, there is evidence that increasing graduation requirements raises wages later in life (Bishop and Mane (2001); Goodman(2009)). Given evidence that higher wages are associated with healthier babies (Kehrer and Wolin (1979); Almond and Currie (2011)) we may expect to see that effect here. I will attempt to parse out these effects by looking at the birthweight of children born to high school aged mothers (14 to 18 years old) and those who are older (19 to 25 years old).

Tables 7A and 7B examine the effect of graduation requirements on three different measures of birthweight. Column 1 estimates the effect on birthweight in grams. The other columns are estimates on the fraction of births that are either "low birthweight" or "very low birthweight" in a given cell.[34] These estimates may be of more interest for overall welfare as infants born in these categories are much more likely to suffer health complications (Almond, Chay, and Lee (2005)). Across all specifications there are no statistically significant effects on any measure of birthweight. Thus for the younger age group it is not clear if the selection and direct effects are cancelled out by a dropout effect, or if their are simply no effects. Similarly for the older groups, high school graduation requirements may have no effect at all, or the positive and negative effects may negate one another.

Table 8A and 8B investigates possible effects of graduation requirements on other teen birth outcomes. These include the probability of knowing information about the father, the number of prenatal visits, gestation length, fraction of premature birth and fraction of children born with congenital defects.[35] The only significant effect is the effect of "more difficult" exit exams on congenital defects

[34]Low birthweight are births that are below 2,500 grams whereas very low birthweight are below 1,500 grams.

[35]These are all cell level averages at the state-cohort-year cell level. For premature births I follow McCrary and Royer (2011) and label any birth under 37 weeks of gestation as premature.

for white mothers. The estimated effect is that the implementation of this type of exit exams lowers the congenital defect rate of children born to teen mothers by .267 percentage points. While this is an interesting and significant result, it is worth noting that in a situation with several different regressions run, statistically, one should expect a significant finding 5% of the time.

Overall, there is not much evidence that these policies affect other birth outcomes. This is not necessarily surprising given that these outcomes are somewhat far removed from the original policy. Also, given the mixed evidence of education on infant health and the fact that graduation requirements have several mechanisms that can work to "cancel each other out", there is even more reason to believe that one would not find an effect. These results are consistent with McCrary and Royer (2011) which finds no effect of school entry age (or its effect through education) on birthweight or gestation.

7 Conclusion

Teenage pregnancy has been a concern in the United States for several years. Given the consequences that are associated with teenage childbearing, it is important to understand which policies affect this outcome. Recent research has documented an association between education and teenage birth rates, so it is likely that raising high school graduation requirements may also affect teen fertility. The goal of these policies is to raise the human capital of students, however, they also likely increase the number of high school dropouts.

Utilizing state-cohort variation in graduation requirements, I find that stronger graduation requirements reduce the teenage birth rate. This could be due to the fact that students with more difficult requirements have more work and therefore less time to be sexually active. At the same time, the increase in human capital from these new requirements may help some teens avoid getting preg-

nant. I find that among white teenage mothers each additional required course decreases the arrest rate by 1% and that among black teenage mothers the estimated effect is slightly smaller at 0.7%. This is a modest, though non-negligible decrease in the birth rate, especially when considering the long-term costs that are associated with teenage births. I find no evidence that stronger requirements affect infant health.

It is important to note that the estimate effect is an average effect. It is possible that certain populations are adversely affected by the changes in requirements. A small fraction of students may drop out of high school and have more children, but this effect may be dominated by those that respond positively to the requirement changes. While in this paper I find no adverse effects of these policies, there may be individuals who are adversely affected. Thus, one should be cautious when interpreting these results.

While graduation requirements are not a direct method of combating teenage pregnancy, they do appear to produce such an externality. The benefits associated with such policies are thus likely more far reaching than policymakers likely anticipate, and add to the growing evidence that education policies have important spillover effects beyond their effects on earnings. Understanding the exact mechanisms by which this happens, and which populations are most affected, is next step in determining the benefits and consequences of these policies.

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Table 1: Total Course Graduation Requirements by State and Graduation Year

Graduation Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Alabama	20	20	20	20	20	20	20	20	20	22	22	22	22	22	22	22	22	22	22	22	24
Arizona	16	16	16	16	16	16	16	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Arkansas	16	16	16	16	16	16	16	16	20	20	20	20	20	20	20	20	20	21	21	21	21
California	0	0	0	0	0	0	0	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Colorado	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Connecticut	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20
Delaware	18	18	18	18	18	18	18	19	19	19	19	19	19	19	19	19	19	19	19	20	22
DC	18	18	18	18	18	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	23.5	23.5	23.5	23.5	23.5
Florida	0	0	0	0	0	0	0	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Georgia	20	20	20	20	20	20	20	20	21	21	21	21	21	21	21	21	21	21	21	21	21
Idaho	18	18	18	18	18	18	18	18	18	21	21	21	21	21	21	21	21	21	21	21	21
Illinois	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Indiana	16	16	16	16	16	16	16	16	16	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5
Iowa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kansas	17	17	17	17	17	17	17	17	17	21	21	21	21	21	21	21	21	21	21	21	21
Kentucky	18	18	18	18	18	18	18	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Louisiana	20	20	20	20	20	20	20	20	20	23	23	23	23	23	23	23	23	23	23	23	23
Maine	0	0	0	0	0	0	0	0	0	16	16	16	16	16	16	16	16	16	16	16	16
Maryland	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	21	21	21	21
Massachusetts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Michigan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minnesota	15	15	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mississippi	16	16	16	16	16	16	16	16	16	18	18	18	18	18	18	18	18	18	18	18	18
Missouri	20	20	20	20	20	20	20	20	22	22	22	22	22	22	22	22	22	22	22	22	22
Montana	16	16	16	16	16	19	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Nebraska	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nevada	19	19	19	19	19	19	20	20	20	20	20	20	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
New Hampshire	16	16	16	16	16	16	16	16	16	19.75	19.75	19.75	19.75	19.75	19.75	19.75	19.75	19.75	19.75	19.75	19.75
New Jersey	0	0	0	0	0	0	0	0	0	18.5	18.5	18.5	18.5	18.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5
New Mexico	20	20	20	20	20	20	20	21	21	21	23	23	23	23	23	23	23	23	23	23	23
New York	16	16	16	16	16	16	16	16	16	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
North Carolina	16	16	16	18	18	18	18	20	20	20	20	20	20	20	20	20	20	20	20	20	20
North Dakota	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Ohio	17	17	17	17	17	17	17	17	18	18	18	18	18	18	18	18	18	18	18	18	18
Oklahoma	10.5	10.5	10.5	10.5	10.5	10.5	10.5	20	20	20	20	20	20	20	20	20	20	20	20	20	21
Oregon	21	21	21	21	21	21	21	21	22	22	22	22	22	22	22	22	22	22	22	22	22
Pennsylvania	13	13	13	13	13	13	13	13	13	21	21	21	21	21	21	21	21	21	21	21	21
Rhode Island	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
South Carolina	18	18	18	18	18	18	18	20	20	20	20	20	20	20	20	20	20	20	20	20	20
South Dakota	16	16	16	16	16	16	16	16	19	20	20	20	20	20	20	20	20	20	20	20	20
Tennessee	18	18	18	18	18	18	18	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Texas	18	18	18	18	18	18	18	18	21	21	21	21	21	21	21	21	21	22	22	22	22
Utah	15	15	15	15	15	15	15	15	24	24	24	24	24	24	24	24	24	24	24	24	24
Vermont	0	0	0	0	0	0	0	0	0	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Virginia	18	18	18	18	18	18	18	18	20	21	21	21	21	21	21	21	21	21	21	21	21
Washington	0	0	0	0	0	0	0	0	0	18	18	19	19	19	19	19	19	19	19	19	19
West Virginia	19	19	19	19	19	19	19	19	19	21	21	21	21	21	21	21	21	21	21	21	21
Wisconsin	0	0	0	0	0	0	0	0	0	13	13	13	13	13	13	13	13	13	13	13	13
Wyoming	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18

Source: *Digest of Education Statistics* (2000, 2001) and *The Education Commission of the States* (1984, 1985, 1989, 1990, 1993, 1996)
Notes: Values are in Carnegie units and represent the equivalent of a year's worth of total courses. Requirements are based on the total number of courses that each student faces given their graduating class.

Table 2: Exit Exams by State and Graduation Year

Graduation Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Alabama	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Delaware	0	1	1	1	1	1	1	1	1	1	1	1	1	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
Georgia	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	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
Indiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Louisiana	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Maryland	0	0	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
Mississippi	0	0	0	0	0	0	0	0	0	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
New Jersey	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	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
New York	1	1	1	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
Ohio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
Tennessee	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Texas	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Vermont	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1

Source: Jacob and Dee (2006)

Notes: Values of "0" refer to no exit exams, "1" refer to exit exams that test at below a ninth grade curriculum, and "2" refer to exit exams that test at a ninth grade or higher curriculum. States not listed did not have exit exams for the graduating classes listed.

Table 3: Summary Statistics by Race of the Mother

	White Mothers		Black Mothers	
	Mean	Std Dev	Mean	Std Dev
Birth Variables				
Birth Rate (per 1,000 teen women)	30.99	25.69	73.32	42.59
Birthweight (grams)	3242.90	68.15	3042.47	54.11
Fraction "Low Birthweight" (per 1,000 births)	82.92	25.77	132.18	25.27
Fraction "Very Low Birthweight" (per 1,000 births)	16.23	11.29	26.98	12.34
Father Known	0.826	0.224	0.704	0.381
Number of Prenatal Visits	9.158	2.193	8.477	1.795
Gestation Length (weeks)	39.08	0.43	38.20	0.41
Premature Birth	0.132	0.038	0.208	0.045
Conginitive Defects	0.031	0.152	0.042	0.179
Education Variables				
Teacher Salary (Thousands of Dollars)	23.93	3.70	23.60	4.07
Per Pupil Expenditures (Dollars)	3,587.92	946.86	3,590.89	1,086.29
Pupil Teacher Ratio	17.93	2.51	17.68	2.12
Drop Age	16.50	0.80	16.32	0.75
Economic Variables				
Average Income (Dollars per Capita)	14,308	2,190	14,204	2,446
Average Unemployment Insurance Transfers (Thousands of Dollars)	746,469	704,429	678,208	640,304
Average Medical Transers (Thousands of Dollars)	6,700,132	6,506,493	6,719,828	6,406,602
Employment-Population Ratio	0.54	0.05	0.53	0.08
Graduation Requirements				
Courses Required	15.26	7.70	17.05	6.63
"Less Difficult" Exit Exams	0.235	0.424	0.404	0.491
"More Difficult" Exit Exams	0.087	0.283	0.105	0.306

Notes: All variables are state-cohort-year means and are weighted by state-age-year population size. All dollar values are calculated in real 1982-1984 base year dollars. Low Birthweight are infants born less than 2,500 grams. Very Low Birthweight are infants born less than 1,500 grams. Premature births are births with a gestation length of less than 37 weeks.

Table 4 - Effect of Graduation Requirements on Birth Rates

White Mothers	(1)	(2)	(3)	(4)
Total Courses	-0.8***	-0.803***	-0.142	-0.312*
	(0.236)	(0.238)	(0.330)	(0.184)
"Less Difficult" Exit Exam	-0.487	-0.481	-1.690	0.579
	(1.100)	(1.120)	(2.020)	(1.590)
"More Difficult" Exit Exam	0.595	0.605	-0.444	1.620
	(0.974)	(0.980)	(3.950)	(1.590)
Black Mothers	(1)	(2)	(3)	(5)
Total Courses	-1.45**	-1.45**	-0.847	-0.499*
	(0.561)	(0.565)	(0.530)	(0.281)
"Less Difficult" Exit Exam	-3.45**	-3.46**	0.568	0.074
	(1.580)	(1.590)	(3.630)	(2.670)
"More Difficult" Exit Exam	-3.840	-3.850	1.440	1.230
	(3.100)	(3.120)	(5.040)	(3.250)
State FE	X	X	-	-
Year FE	X	-	-	-
Cohort FE	X	-	-	-
Cohort-by-Year FE		X	X	X
State-by-Year FE			X	X
State Specific Linear Cohort Effects				X

Notes: Each specification represents a different regression where the outcome is the number of births per 1,000 teenage women. The unit of observation is a state-by-graduation cohort-by-year cell. Each regression is weighted by cell size. Robust standard errors in parentheses are clustered at the state level. Education controls consist of state-cohort average pupil-teacher ratio, teacher salary, per-pupil expenditures, and dropout age and are included in all regressions. Economic controls consist of state-cohort average employment-to-population ratio, income, medical transfer payments, and unemployment payments. All specifications also include an indicator variable for cohort-state combinations that face no state mandated minimum course requirements.

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Table 5A - Effect of Graduation Requirements on Birth Rates by Age

	White Mothers			Black Mothers		
Interacted with:	Total Courses	"Less Difficult" Exit Exam	"More Difficult" Exit Exam	Total Courses	"Less Difficult" Exit Exam	"More Difficult" Exit Exam
Age 14	-0.395	1.900	2.640	-0.333	4.920	4.750
	(0.309)	(1.340)	(2.710)	(0.396)	(3.270)	(4.950)
Age 15	-0.439*	1.970	1.530	-0.393	3.470	3.340
	(0.261)	(1.300)	(1.660)	(0.325)	(2.870)	(3.850)
Age 16	-0.385*	1.030	1.050	-0.409	0.344	1.200
	(0.217)	(1.380)	(1.420)	(0.284)	(2.640)	(3.540)
Age 17	-0.288*	-0.200	1.240	-0.518*	-0.701	0.330
	(0.167)	(1.920)	(1.790)	(0.284)	(2.830)	(3.820)
Age 18	-0.234*	-2.100	1.450	-0.785**	-2.270	-0.071
	(0.138)	(2.740)	(2.390)	(0.303)	(3.840)	(4.180)

Table 5B - Effect of Graduation Requirements by ability to Legally Dropout of High School

	White Mothers	Black Mothers
Total Courses	-0.299	-0.499*
* Able to Drop	(0.183)	(0.275)
Total Courses	-0.336*	-0.5*
* Unable to Drop	(0.190)	(0.298)
"Less Difficult" Exit Exam	0.507	0.072
	(1.610)	(2.680)
"More Difficult" Exit Exam	1.580	1.220
	(1.590)	(3.260)

Notes: Each specification represents a different regression where the outcome is the number of births per 1,000 teenage women. The unit of observation is a state-by-graduation cohort-by-year cell. Each regression is weighted by cell size. Robust standard errors in parentheses are clustered at the state level. All specifications include state-by-year and graduation cohort-by-year fixed effects, as well as state-specific linear cohort trends. Education controls consist of state-cohort average pupil-teacher ratio, teacher salary, per-pupil expenditures, and dropout age and are included in all regressions. Economic controls consist of state-cohort average employment-to-population ratio, income, medical transfer payments, and unemployment payments. All specifications also include an indicator variable for cohort-state combinations that face no state mandated minimum course requirements.
*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Table 6 - Effect of Graduation Requirements on Birth Rates by County Income

	White Mothers		Black Mothers	
	(1)	(2)	(3)	(4)
Total Courses	-0.302*	-	-0.488	-
	(0.177)		(0.390)	
Total Courses	-	-0.502***	-	-0.474
* First Quartile		(0.114)		(0.345)
Total Courses	-	-0.239	-	-0.621
* Second Quartile		(0.220)		(0.522)
Total Courses	-	0.115	-	-0.338
* Third Quartile		(0.184)		(0.532)
Total Courses	-	0.177	-	-0.319
* Fourth Quartile		(0.211)		(0.610)
"Less Difficult" Exit Exam	-0.309	-	-0.612	-
	(1.440)		(2.840)	
"Less Difficult" Exit Exam	-	-2.180	-	-0.833
* First Quartile		(1.310)		(4.410)
"Less Difficult" Exit Exam	-	-0.867	-	0.404
* Second Quartile		(2.480)		(3.610)
"Less Difficult" Exit Exam	-	1.690	-	0.747
* Third Quartile		(1.440)		(4.460)
"Less Difficult" Exit Exam	-	1.540	-	-0.244
* Fourth Quartile		(2.440)		(3.030)
"More Difficult" Exit Exam	1.980	-	2.240	-
	(1.390)		(3.990)	
"More Difficult" Exit Exam	-	-4.78**	-	2.760
* First Quartile		(1.990)		(6.790)
"More Difficult" Exit Exam	-	1.130	-	-2.280
* Second Quartile		(3.130)		(5.990)
"More Difficult" Exit Exam	-	6.76***	-	3.500
* Third Quartile		(1.590)		(3.130)
"More Difficult" Exit Exam	-	8.99*	-	6.380
* Fourth Quartile		(4.530)		(6.950)

Notes: Each specification represents a different regression where the outcome is the number of births per 1,000 teenage women. The unit of observation is a state-by-graduation cohort-by-year cell. Each regression is weighted by cell size. Robust standard errors in parentheses are clustered at the state level. All specifications include state-by-year and graduation cohort-by-year fixed effects, as well as state-specific linear cohort trends. Education controls consist of state-cohort average pupil-teacher ratio, teacher salary, per-pupil expenditures, and dropout age and are included in all regressions. Economic controls consist of state-cohort average employment-to-population ratio, income, medical transfer payments, and unemployment payments. All specifications also include an indicator variable for cohort-state combinations that face no state mandated minimum course requirements.

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Table 7A - The Effect of Graduation Requirements on Birthweight for White Mothers

	Ages 14 to 18			Ages 19 to 25		
	Birthweight (grams)	"Low" Birthweight	"Very Low" Birthweight	Birthweight (grams)	"Low" Birthweight	"Very Low" Birthweight
	(1)	(2)	(3)	(4)	(5)	(6)
Total Courses	0.819	-0.227	-0.018	0.231	-0.041	0.018
	(1.246)	(0.569)	(0.218)	(0.173)	(0.072)	(0.025)
"Less Difficult" Exit Exam	3.561	-1.540	-0.107	0.598	0.476	0.218
	(5.565)	(3.080)	(0.980)	(1.156)	(0.382)	(0.172)
"More Difficult" Exit Exam	5.018	-3.870	-0.482	0.686	0.181	0.287
	(9.546)	(3.960)	(1.180)	(2.605)	(0.873)	(0.299)

Table 7B - The Effect of Graduation Requirements on Birhtweight for Black Mothers

	Ages 14 to 18			Ages 19 to 25		
	Birthweight (grams)	"Low" Birthweight	"Very Low" Birthweight	Birthweight (grams)	"Low" Birthweight	"Very Low" Birthweight
	(1)	(2)	(4)	(4)	(5)	(6)
Total Courses	0.084	-0.616	0.006	-0.213	0.101	0.068
	(1.808)	(1.060)	(0.567)	(0.392)	(0.228)	(0.125)
"Less Difficult" Exit Exam	5.617	-3.900	-1.670	-3.556	2.050	0.266
	(6.271)	(3.420)	(2.720)	(2.992)	(1.450)	(0.489)
"More Difficult" Exit Exam	7.108	-5.740	0.158	0.194	0.828	-0.194
	(6.266)	(3.600)	(2.540)	(4.820)	(2.660)	(1.270)

Notes: Each specification represents a different regression where the outcome is labeled. "Low" Birthweight is defined as an infant born below 2,500 grams and "Very Low" Birthweight is an infant born below 1,500 grams. The unit of observation is the number of "Low" or "Very Low' birthweights in a state-by-graduation cohort-by-year cell per 1,000 live births. Each regression is weighted by cell size. Robust standard errors in parentheses are clustered at the state level. All specifications include state-by-year and graduation cohort-by-year fixed effects, as well as state-specific linear cohort trends. Education controls consist of state-cohort average pupil-teacher ratio, teacher salary, per-pupil expenditures, and dropout age and are included in all regressions. Economic controls consist of state-cohort average employment-to-population ratio, income, medical transfer payments, and unemployment payments. All specifications also include an indicator variable for cohort-state combinations that face no state mandated minimum course requirements.

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Table 8A - The Effect of Graduation Requirements on Teen Childbirth Outcomes for White Mothers

	Father Present (1)	# of Prenatal Visits (2)	Gestation Length (3)	Premature (4)	Congenital Defects (5)
Total Courses	0.001	-0.010	-0.007	0.000	0.000
	(0.003)	(0.010)	(0.005)	(0.000)	(0.000)
"Less Difficult" Exit Exam	0.004	0.071	0.043	-0.005	0.001
	(0.008)	(0.047)	(0.037)	(0.003)	(0.001)
"More Difficult" Exit Exam	0.011	0.047	0.011	-0.002	-0.003**
	(0.010)	(0.041)	(0.039)	(0.004)	(0.001)

Table 8B - The Effect of Graduation Requirements on Teen Childbirth Outcomes for Black Mothers

	Father Present (1)	# of Prenatal Visits (2)	Gestation Length (3)	Premature (4)	Congenital Defects (5)
Total Courses	-0.001	-0.008	0.008	0.000	0.001
	(0.001)	(0.009)	(0.012)	(0.001)	(0.003)
"Less Difficult" Exit Exam	-0.004	0.002	-0.010	0.000	0.001
	(0.007)	(0.045)	(0.048)	(0.005)	(0.003)
"More Difficult" Exit Exam	0.011	-0.012	0.004	-0.006	0.001
	(0.007)	(0.058)	(0.054)	(0.006)	(0.003)

Notes: Each specification represents a different regression where the outcome is labeled. Father Present is the fraction of mothers who have information on the father's identity. Number of prenatal visits is the avearage number of visits, gestation length is the average gestation length in weeks. Premature is the fraction of children born under 37 weeks of gestation and congenital defects is the average number of children born with defects. The unit of observation is a state-by-graduation cohort-by-year cell. Each regression is weighted by cell size. Robust standard errors in parentheses are clustered at the state level. All specifications include state-by-year and graduation cohort-by-year fixed effects, as well as state-specific linear cohort trends. Education controls consist of state-cohort average pupil-teacher ratio, teacher salary, per-pupil expenditures, and dropout age and are included in all regressions. Economic controls consist of state-cohort average employment-to-population ratio, income, medical transfer payments, and unemployment payments. All specifications also include an indicator variable for cohort-state combinations that face no state mandated minimum course requirements.

*** Significant at 1%, ** Significant at 5%, * Significant at 10%