

The Effect of State Sexual Education Mandates on Teen Fertility Rates in the U.S. South

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Despite several decades of declines (Pew Research Center 2016), the United States' teen pregnancy and birth rates remain highest among developed countries (Kearney and Levine 2012). Proposals to reduce teenage pregnancy rates typically focus on two elements: access to contraceptives and sexual education in public schools. Proponents of comprehensive sexual education mandates emphasize the importance of informing students about birth control methods and healthy relationships to reduce the risk of pregnancy or sexually transmitted diseases (UNESCO 2018). Critics warn of moral hazard: by reducing the perceived risk of sex, students may have more or riskier sexual encounters and teen pregnancy could actually increase (Paton and Wright 2017).

Concerns about moral hazard have gained leverage in policy decisions. In April of 2018, the United States' Department of Health and Human Services announced that "the Teen Pregnancy Prevention Program...will provide funding only to organizations promoting abstinence-only approaches" (Belluck 2018). These programs typically encourage the delay of sex until marriage, and some states forbid them from teaching students contraceptive methods at all (Guttmacher Institute 2017). Beyond questions about the specific content of publicly funded sexual education, many states have no mandate at all (Guttmacher Institute 2017).

Most research on sexual education mandates focuses on the difference between abstinence-based and comprehensive content. The results of these studies have been inconsistent, sometimes finding no effect of abstinence only education (Kirby 2008) and sometimes finding that abstinence only mandates have similar effects to comprehensive ones (Bass 2016). However, the Guttmacher Institute (2001) provides a potential explanation for these inconclusive results: "Adolescent childbearing is more likely among women with low levels of income... than among their better-off peers." Sexual education mandates may have very different effects on the fertility of poor and non-poor young women if these groups have access to a different amount or quality of sexual

education outside of school. Shartzter, Courtot, McMorrow, Benatar, and Kenney (2016) find 44% of women at or below 138% of the federal poverty line have significant gaps in knowledge regarding long-acting reversible contraceptives (LARCs), compared to only an 18% gap in knowledge for individuals above 400% of the federal poverty line. With the difference in behavior and information regarding sexual activity for poor and non-poor teenagers, sexual education policy will elicit different fertility outcomes and effects for the two groups.

This paper estimates the effect of sexual education mandates on teen birth rates separately by socio-economic status. I focus on the South, a region with significant income inequality and little public sexual education in many areas. I use a two-way fixed effects difference-in-differences design that compares teenage birth rates before and after state sexual education mandate implementation between states with and without a mandate. My sample includes 10 southern states,¹ five of which introduced sexual education mandates between 1989 and 2012. I calculate teen fertility rates by state, year, and poverty status using data from the 1979-2016 Current Population Survey March Supplements and the 1979-2016 Censuses and American Community Surveys. I use a flexible event-study specification to analyze pre-trends 10 years before mandate implementation, and treatment effects up to 6 years after the mandate.

The results inform debates about sexual education mandate policies by showing how required curriculum decisions influence teens of different socio-economic status in different ways. Due to difference in access to resources regarding specific subjects, such as sexual health, teens of low socio-economic status will inherently have different outcomes when information is provided in public schools, which is exceptionally important to consider in policy decisions. Further, if poor

¹ I include Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

teen girls have less information about pregnancy, less access to contraception, and fewer resources to take care of a child, implementing sex education mandates in public schools will affect them more than non-poor teen girls.

II. Teen Fertility and Sexual Education Mandates

A. The Implications of Teen Pregnancy

According to economic arguments in favor of policy implementation to reduce teenage fertility, teen pregnancy is an important consideration for policy due to the cost implications of teen childbearing. These costs include costs to the community and, further, costs to teens themselves. As teens may not necessarily be equipped with the time and financial stability it takes to raise a child, early childbearing can create costs for individuals connected to the teenager, as well as welfare programs. Early childbearing imposes externalities on the “future selves” of teen mothers. Without cognition of the future costs, teens are willing to engage in activities that have consequences later in life. For this reason, policies that aid in the reduction of teen pregnancy can improve both teen welfare and the negative externalities associated with early childbearing (Lindo and Packham 2017). Since the 1980s, the historical decline in teen fertility reduced these costs and externalities. The solid black line in Figure 1 demonstrates teen fertility for poor teens, and the solid red line in Figure 1 presents teen fertility for non-poor teens. Although there appears to be a decline in the birth rates of both groups, there also appears to be a convergence among the two groups. However, the specific reason for the decline has yet to be determined with certainty. Potential contributors to the decline include contraception and abortion access, welfare reform, and sexual education mandates. With empirical evidence to understand the significance of each of these factors in the decline, policy makers can gain more information about the most effective measure to reduce teen fertility.

B. Contraception Access

A wide range of empirical evidence suggests that access to contraception contributed to the decline in teen birth rates. Peipert, Madden, Allsworth, Secura (2014) find that subsidized contraception reduced teen births rates. Linberg, Santelli, and Desai (2016) conclude contraception was a primary determinant of declines in adolescent pregnancy by decomposing pregnancy risk into a sexual activity component and a contraception component. Lindo and Packham (2017) study the effects of long-acting reversible contraceptives, considering the implementation of the Colorado Family Planning Initiative. This Colorado initiative expanded access to contraceptives, specifically the IUD, for the economically disadvantaged by providing funds to Title X clinics. Kelly, Lindo, and Packham (2019) found the Colorado initiative reduced teen childbearing by 20%.

C. Welfare Reform

Welfare reform can de incentivize pregnancy for teens, as expected future welfare benefits of childbearing may be insufficient compared to the costs. The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 created Temporary Assistance for Needy Families (TANF), which required work for time-limited assistance (United States Department of Health and Human Services). The policy had provisions which affected teen parents as well: they were required to live with a responsible adult, and often did not receive additional payments for additional children (United States Department of Health and Human Services). The evidence suggests welfare reform reduces the incidence of teenage pregnancy and birth rates, likely due to increasing incentives to use contraceptive methods in order to avoid teenage pregnancy (Kaestner, Korenman, and O'Neill (2003) and Offner (2003)). Therefore, welfare reforms can also account for some of the historical decline in teen birth rates.

D. Sexual Education Mandates

Whereas contraception access and welfare reform research consistently suggest a consequent reduction in fertility, results remain inconsistent on whether or not sexual education mandates reduce teen fertility. Kirby (2008) suggests all sex education programs showed “encouraging effects on reducing teen pregnancy, childbearing, and STDs,” but Bass (2016) shows sex education programs have no significant effect on the teenage birth rate. These inconsistencies can largely be attributed to the difficulty in measurement of “learning” in these programs, the differing curriculum and quality of the programs themselves, and the heterogeneity by socioeconomic status that can mitigate results. To resolve this, I stratify the micro-samples by poverty status, to measure and ensure accurate results for the two distinct groups. The study, therefore, offers new information regarding the effect of sexual education mandates on teen birth-rate outcomes, for poor individuals and non-poor individuals.

Several literatures highlight the short-comings of sexual education mandates in the United States. Particularly, the short-comings are a result of arbitrary language used in the mandate, as well as the distinction between abstinence-only and comprehensive sexual education (Guttmacher 1998). For this reason, states that have mandates are not necessarily equivalent in the amount of sexual education offered, or even the content within the education. In addition, some states have curriculum requirements that teach sexual education but are not necessarily sexual education mandates. For example, in the state of New Jersey, there exists a requirement of “Health and Family Life Education” to graduate high school, but the requirement can be fulfilled through multiple courses, some relating to sex education and others not (State of New Jersey Department of Education). In this way, requirements such as these create difficulty in understanding the effects of sex education at a state-wide level, as some teens receive sex education and others do not.

Further, while the states with mandates typically include information regarding the risks and prevention of sexually transmitted diseases, not all states require information regarding condom use to be taught within their sex education classes (Guttmacher 1998). This nuance in content is just one of the distinctions between abstinence-based and comprehensive sexual education mandates. Several literatures suggest comprehensive sexual education is more effective in reducing teenage pregnancy rates (Carter 2012).

Because of differing levels of effectiveness, it is necessary to acknowledge the distinction between the two very different types of sexual education mandates, which could potentially alter birth-rate outcomes as well as the interpretation of results. If abstinence-based education encourages the delay of sexual behavior as a means to prevent STDs and unwanted pregnancies, then the primary source of a decline in teen birth rates would be a result of abstaining from engaging in sex, whereas, if comprehensive education is taught in schools, the resulting declines in birth rates may be a product of both teens refraining from sex as well as their use of contraceptive methods to prevent pregnancy. The mandates among the Southern states selected for this study, though there is no distinction between comprehensive and abstinence-based at their origin of implementation, have similar language when describing the initial mandate. Thus, the study assumes the parallel trends assumption among schools within states that mandate sexual education as a part of curriculum and accounts for variability in sex education curriculum.

III. Data

To estimate the effect of state sexual education mandates, I combine data from multiple sources on the year of sexual education implementation for each state, with survey data on teen family structure.

A. Sexual Education Implementation Year

To measure not only when sexual education mandates were passed but when they actually took effect, I use Lexis Nexis to identify the statutes and legislation for each of the ten states. States can pass several different kinds of laws about sexual education. Some enact “sexual education standards” which refers to expected curriculum in schools that decide to teach sexual education. I do not code these standards as a mandate because they leave discretion about whether to provide sexual education up to schools. In contrast, a “sexual education mandate” requires every public school to teach sexual education. Mandates typically include specified content that schools must cover to be in compliance. As Table 1 shows, I observe 5 mandates in the South: South Carolina in 1988, Georgia in 1989, Virginia in 1997, North Carolina in 2009, and Mississippi in 2012.

B. Teen Fertility

To measure teen fertility by state, year, and poverty status, I use microdata from the March Supplement of the 1979-2017 Current Population Surveys. My sample includes 165,600 women ages 13-19 living in the South. I consider a respondent to be a teen mother if she reports living with her own child. I collapse these data to average yearly birth rates by state, year, and poverty status. This does not strictly measure birth rates, it measures teen motherhood rates, but I use the two terms interchangeably. I also use a sample of teens who live at home, which ensures that the poverty status measure reflects her family characteristics. The use of the Current Population Survey allows for sufficient pre-period evidence for states that were early adopters of sexual education mandates. Further, to test whether the CPS, though a smaller sample, is an accurate depiction of the declining birth rates, I compare the CPS data with the large samples available in the Census/American Community Survey (1990 and 2000-2017).

C. Covariates

The CPS data include individual characteristics like age, race, employment status, and education but I also add information on another potential determinant of teen fertility: the 1996 welfare reform. I use information from the U.S. Department of Health and Human Services for yearly information on the existence of pre-reform welfare waivers and a formal TANF program, as well as specific welfare policies including: family caps, TANF full initial sanctions, and TANF time limits. As the 1996 welfare reform affected the living situation of teen mothers, estimates are presented by teen mothers who “live at home” and “all teen mothers.”

IV. Research Design: Difference-in-Differences

To identify the effects of sex education mandates on teen fertility I use a difference-in-difference model that compares teen birth rates before and after the implementation of a sexual education mandate, in southern states that passed a mandate versus those that did not. To estimate heterogeneous effects by SES, I split the sample into poor and non-poor teens and run separate models.

Equation (1) presents a simple difference-in-difference specification:

$$TBR_{st}(k) = \beta_0^k + \beta_1^k Z_s + \beta_2^k W_t + \boldsymbol{\gamma}^k \mathbf{X}_{st} + \beta^k D_{st} + \varepsilon_{st}^k \quad (1)$$

$TBR_{st}(k)$ is the teen birth rate in state s in year t for SES group k (poor or not poor), Z_s are state fixed effects, and W_t are year fixed effects, \mathbf{X}_{st} are other covariates, and D_{st} is a dummy that equals one after a sex education mandate is in place. The pre-period for each state with a mandate before implementation is 10 years, this is due to the fact that the state that implements the earliest mandate takes place in 1988. As *Roe v. Wade* occurred in 1973, making the pre-period 10 years for each state gives an opportunity for stabilization in birth rates among teenagers before using birth rates in the pre-period (Planned Parenthood 2014). The post-period for each state is at least

6 years, as the most recent mandate takes place in 2012. The estimate of β^k from equation (1) is an average of the difference-in-difference effect for each state with a mandate, or the “weighted average of all possible two-group/two-period estimators in the data” (Goodman-Bacon 2018).

The principal assumption of this difference-in-difference model is that without the implementation of sexual education mandates, the birth rates in states that chose to include a mandate would have paralleled those that did not. This assumption likely holds for multiple reasons. First, Southern states are likely experiencing similar social change that may affect teen birth rates during this time frame. Second, any federal changes, such as welfare reform, that affect teen birth rates that take place during this period are not simultaneous with the years in which some states implemented sexual education mandates in the South. If the years of welfare reform, for example, coincided with sexual education mandates, welfare reform would bias results. Further, controlling for welfare reform mitigates concerns that welfare reform caused change in sexual behavior for teenagers due to lack of government financial support. Third, stratifying the results by poverty status provides a falsification test. If high-income teens do not respond to sexual education mandates, then differences in fertility for low-income teens cannot be due to “unobservables” common to all teens.

To provide additional evidence on the parallel trends assumption and test for differences in the effects over time, I use a flexible event-study model, shown in equation (2). The pre/post treatment is described by dummy variables that measure time relative to a sexual education mandate implementation for each state, $1\{t - t_s^* = y\}$. The treatment group includes states that implement a sexual education mandate, and the control group includes states that never implement a mandate.

$$TBR_{st}(k) = \beta_0^k + \beta_1^k Z_s + \beta_2^k W_t + \gamma^k X_{st} + \sum_{y=-11}^{-2} \Pi_y^k 1\{t - t_s^* = y\} + \sum_{y=0}^7 \Lambda_y^k 1\{t - t_s^* = y\} + \varepsilon_{st}^k \quad (2)$$

I omit the dummy for the year before a sexual education to normalize the estimates of Π_y^k and Λ_y^k to zero in that event-year. I also group event-times before -10 or after 6 into groups and do not report their coefficients because not all states are observed at those times. The Π_y^k are falsification tests that show whether teen birth rate were changing differentially in treated states in the 10 years before sexual education mandates went into place. The Λ_y^k are the effects of a sexual education mandate on the teen birth rate in each of the six years after mandates took effect.

V. Estimates of Sexual Education Mandates' Effect on Teenage Birth Rates

Figure 2A presents an event-study estimates from equation (2) for poor teenagers who live at home. The pre-trend fluctuates around zero (or rises slightly), but birth rates drop in every year after mandates are fully in place. Estimates from the DD model in equation (1) for teens living at home show that after sexual education mandate implementation, birth rates fell by 2 percentage points for poor young women (see Table 2, -0.021, s.e. = 0.007).

Figure 2B presents event-study estimates for non-poor teens living at home, who are likely to have been less affected by sexual education mandates. In the 10 years before a mandate, birth rates were low, and after the mandate, I find no significant changes in birth rates for non-poor teens (see Table 2, -0.0004, s.e. = 0.003). While this an important finding to note, it additionally reinforces the design of this study, as it suggests declines are not a result of external factors that are irrelevant to sex education mandates.

Figures 3A and 3B present similar evidence for the larger sample of all poor and non-poor teens. For poor teens, the pre-trends are close to zero, but birth rates fall after mandates take effect.

The DD estimate is a 2.5 percentage point drop in birth rates (see Table 2, -0.025 , $s.e. = 0.005$). Non-poor teen birth rates again fail to show any decline after sexual education mandates. The DD estimate is just 0.2 percentage points (see Table 2, 0.002 , $s.e. = 0.005$). Furthermore, for both non-poor teens who live at home and all non-poor teens, the difference any mandate made is indistinguishable. These results suggest that mandate implementation affected poor teens and poor teens who live at home very similarly.

Column 3 of Table 4 displays estimates that control for grade completed to account for changes in sexual behavior due to age, or education. Estimates with the control still indicate large magnitudes of significance with a reduction of 1.8 percentage points for poor teens who live at home, and a reduction of 1.5 percentage points for all poor teens (see Table 4). Although only the estimate for poor teens who live at home is statistically significant, both estimates indicate magnitudes that are larger than that of the non-poor estimates.

An additional concern is that changing economic conditions affect teen's plans for the future and states' willingness to pass sex education mandates. Columns 4 and 5 of Table 4 control for individual employment status and state unemployment rates that indicate these do not change the main effects.

Controlling for variables simultaneously such as age, race, grade completed, employment status, unemployment rate, and welfare reform reduces the estimate for poor teens who live at home, but not the estimate for the all poor teen population (see Table 4, Column 7, -0.018 , $s.e. = 0.008$). This shows that demographic, economic, or policy factors cannot explain the post-mandate reduction in birth rates for poor teens.

TANF welfare reform predominantly affected two aspects of welfare: the maximum amount of time a teenage mother can receive cash welfare (time limits), and no supplementary

cash welfare for additional children (family caps). With controls for TANF time limits, or, the estimates for the effect of sex education mandates on poor teens who live at home and all poor teens, remain large and are both statistically significant (see Column 1, Table 5). For TANF full initial sanction controls, meaning immediate reform to policy, estimates still provide evidence for a decline in birth rates for poor teens who live at home, and all poor teens. Again, both estimates are of high magnitude and are statistically significant (see Column 2, Table 5). After controlling for family caps, the estimate for poor teens who live at home remains of high magnitude but is no longer statistically significant. Estimates for all poor teens remains high in magnitude and statistically significant (see Column 3, Table 5).

Column 8 of Table 4 presents estimates while controlling for the relationship between religion and year dummies. Results with controls for religion do not change estimates significantly and therefore suggest that the relationship between religion and teen birth rates for low-income individuals remained fairly stable over time, as during period from 1980-2018, the relationship between religion and year dummies changed less than .5 percentage points. Therefore, religion cannot be a source of bias for results (see Column 8, Table 4).

A. Results for Teen Birth Rates by Race and Socioeconomic Status

Table 6 displays the difference-in-difference estimates by race. Non-white poor teens who live at home experience a statistically significant decline of 2 percentage points after sexual education mandates (see Table 6, -0.020, s.e. = 0.006). White poor teens who live at home also experienced a 1.7 percentage point decrease in birth rates, however the estimate was not statistically significant (see Table 6, -0.017, s.e. = 0.012). The results are larger for samples of all poor teens. Birth rates fall by 2.4 percentage point for non-white, poor teens, (Table 6, -0.024, s.e. = 0.005) and 2.9 percentage points for white poor teens (see Table 6, -0.029, s.e. = 0.011).

Neither sample provides any evidence that non-poor teens, white or non-white, experience lower birth rates after sex education mandates (see Table 6). This distinct difference in estimates among the poor and non-poor teenage population demonstrates the effects of sexual education mandates as greater in magnitude and statistical significance for the poor population.

B. Results for Teen Birth Rates by Age and Socioeconomic Status

When estimating the effects of sexual education mandates on teen birth rates by age, the greatest decline in teen birth rates by magnitude and statistical significance was by individuals ages 18 and 19. Poor 18-year-olds who live at home experienced a birth rate decline of 7.2 percentage points (see Table 7, -0.072, s.e. = 0.034). The estimates for the sample of all poor teenagers suggest a 4.8 percentage point decline in birth rates due to sexual education mandates (see Table 7, -0.048, s.e. = 0.027).

Poor 19-year-olds living at home experienced declines of 12.4 percentage points (see Table 7, -0.124, s.e. = 0.042). Similarly, there was a drop in birth rates by 10.5 percentage points for all poor teens age 19 (see Table 7, -0.105, s.e. = 0.026).

In contrast to the 18 and 19-year old poor teen birth rate estimates, which had the greatest and most statistically significant magnitude of declines, the sample of all poor teens age 16 experienced a statistically significant increase in teen birth rates after the implementation of the sexual education mandates. For poor teens age 16, teen birth rates increased by 2.3 percentage points at the 5% significance level (see Table 7, 0.023, s.e. = 0.010). Similarly, for the sample of all non-poor teens, ages 16, there was a statistically significant increase in birth rates by .4 percentage points at the 10% significance level, (see Table 7, 0.004, s.e. = 0.002). Though there is clearly greater magnitude and significance for estimates of birth rate declines due to sexual

education mandates for 18 and 19-year-old poor teenagers, it is important to note the increase in birth rates for the 16-year-old sample.

VI. Additional Considerations

In most cases, the results so far show that after Southern states adopted sex education mandates, the probability that low-income teens had a child fell, while there was no change in the probability that higher-income teens had a child. These effects did not come from pre-mandate trends and cannot be explained by demographic trends, economic conditions, or policy changes like welfare reform. One challenge in this context is to understand how these mandates affect the information or resources available to teens.

This kind of first-stage effect is difficult to measure for two reasons. First, it is necessary to understand what material each specific student learned, in what capacity, and how that altered their sexual decisions. In principle, this would require information on knowledge and resources available to individual teens outside of school-based sexual education curricula. Though data sets exist regarding knowledge and behaviors of teens, many have a sample size that is insufficient to represent the teen population over time. For example, when using the General Social Survey, after constructing the data set to represent poor and non-poor teens over time, the data set only provides approximately 80 observations for poor teens and approximately 300 observations for non-poor teens over a more than 40-year time period.

Second, this learning is even more difficult to measure due to the arbitrary nature of sexual education mandates at the time of implementation. Because of the lack of specific language or requirements in each mandate, both schools and districts could interpret a mandate differently and therefore incorporate different information regarding sexual education in their curriculum.

Although results suggest that sexual education mandates contributed to the decline in teen birth rates, the indefinite first stage makes it difficult to recognize why the effects arise. There are many explanations as to the ways in which sex education mandates may aid in the decline of birth rates, such as teens learning about contraception methods through sex education and thereby increased contraception use, or teens delaying their first sexual encounter due to the perceived risks taught in school. Brittany Bass (2016) analyzes the effect of sex education on increasing contraception use, however, makes no distinction by socioeconomic status.

VII. Discussion: Interpreting Teen Birth Rate Declines due to Sexual Education Mandates

The estimates presented in this paper suggest that sexual education mandates reduced teen birth rates, specifically among poor teens. How does this contribute to the historic decline in birth rates among teens over the last couple of decades?

A. The Counterfactual Decline

The United States experiences the highest teen birth rates compared to any other developed nation (The Guttmacher Institute 2015). However, teen births have experienced an historic decline. Between 1989 and 2018, CPS data indicate that the gap in birth rates between poor and non-poor teens in the South converged by 7.93 percentage points, from 10.97 to 3.04 percentage points (see Figure 4). The estimated effect of sex education mandates is -2.5 percentage points, and sex education mandates can account for approximately 30% of the convergence among these groups in those 29 years in the treated states, or the states that implemented a mandate. Similarly, the level of fertility for poor Southern teenagers fell from approximately 14 percent to 4 percent, so my results suggest that sexual education mandates can account for about one quarter of this decline within the treated states.

The solid black line of Figure 4 demonstrates the teen birth rate decline for poor individuals, and the solid red line demonstrates the teen birth rate decline for non-poor individuals. The dotted lines in Figure 4 help to quantify how much sex education mandates mattered. They present counterfactual estimates of teen birth rate declines by poverty status calculated by subtracting the negative estimated sex education effects from observed birth rates. As seen in the figure, the declines in birth rates occur less rapidly. Further, we see the implications of the absence of sexual education mandates. These results suggest that although declines in birth rates would have occurred without sexual education mandates, the declines may have not happened as rapidly. Additionally, because there is a greater effect for poor individuals, the convergence that took place may have not occurred to the degree that it did without the aid of sexual education mandates.

After calculating the contribution of the percentage point estimates to the overall decline in teen birth rates for poor individuals, overall trends for states both with and without sexual education mandate implementation suggest there has been a 13.5% decline in teen birth rates in the South from the years 1980-2018. The contribution of sex education mandates to these overall declining was approximately 18.6%.

B. Contraception Access and Sexual Education Mandates: Magnitudes

As magnitudes for the results of this paper suggest sexual education mandates had a large effect on reducing teen birthrates for poor teens, it is important to note that this large reduction may be, in some cases, attributed to contraception use. However, it is possible that sex education mandates aid in the use of contraception, thus reducing teen birth rates and encompassing the effects of contraception, as well. Martha Bailey suggests legal access to contraceptives resulted in a 10% decline of ill-timed or unplanned births, and following the initial 10% decline, proceeded to fall by an additional 40% (Bailey 2013). The initial legalization of contraception accounts for

approximately 20% of the decline of births. Similarly, the overall effects of sex education are approximately 20%. One open question, is the extent to which sex education mandates increase contraceptive use. The relationship between contraception, sex education, and knowledge is vastly important to understanding the magnitudes of results.

VIII. Conclusion

This paper provides new evidence for understanding the effect of sexual education mandates on teenage birth rates, stratified by poverty status. Results suggest that there exists a greater and more statistically significant impact for poor teens versus non-poor teens. Though much of the convergence in teen birth rates among low socioeconomic teenagers and upper socioeconomic teenagers can be attributed to contraception access and welfare reform, this paper suggests that some of the convergence may be a result of sexual education mandates, which provides poor teens information regarding sexual health, despite the potential lack of other sources of information and formal education on the topic.

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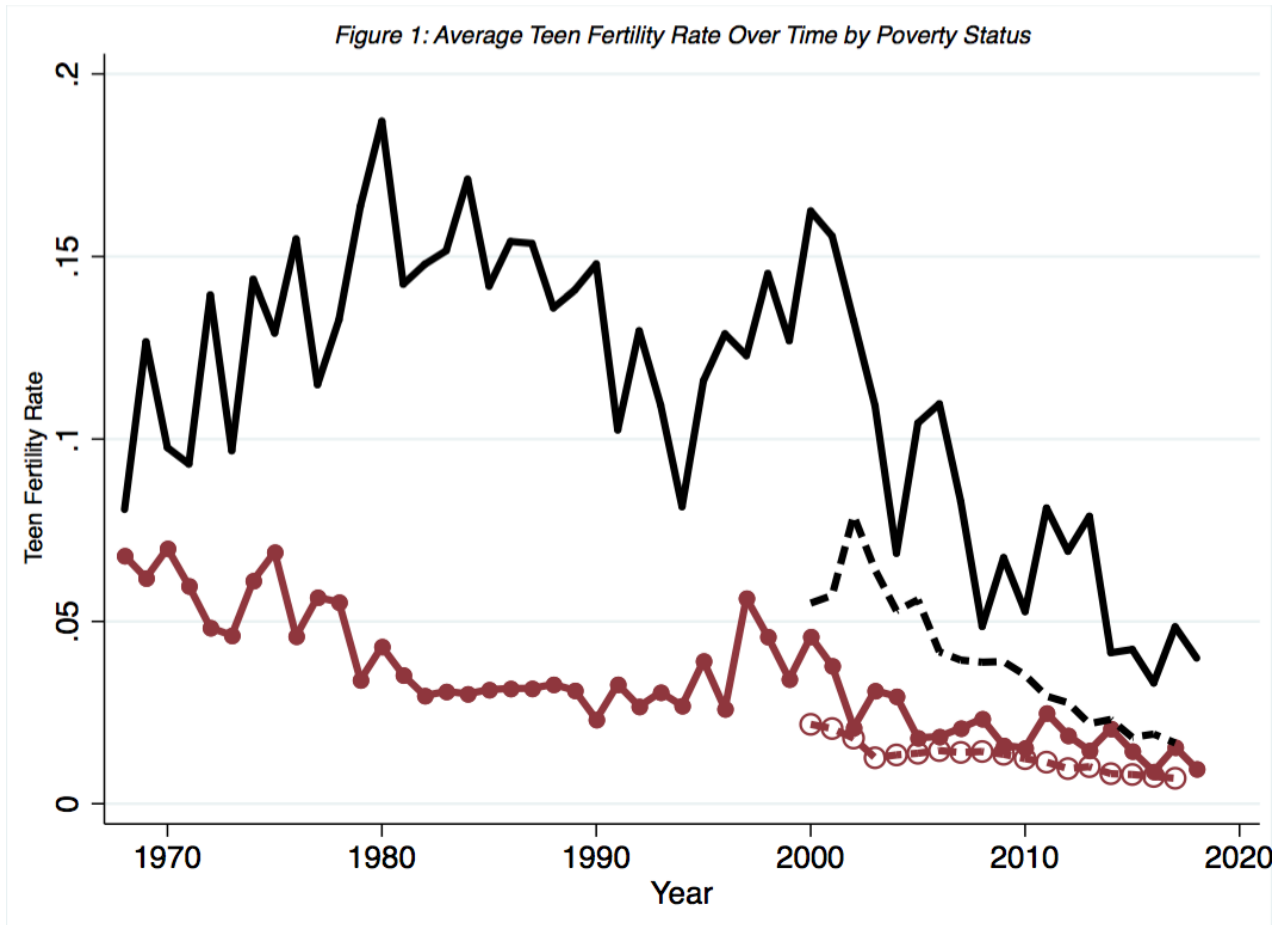
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X. Tables and Figures

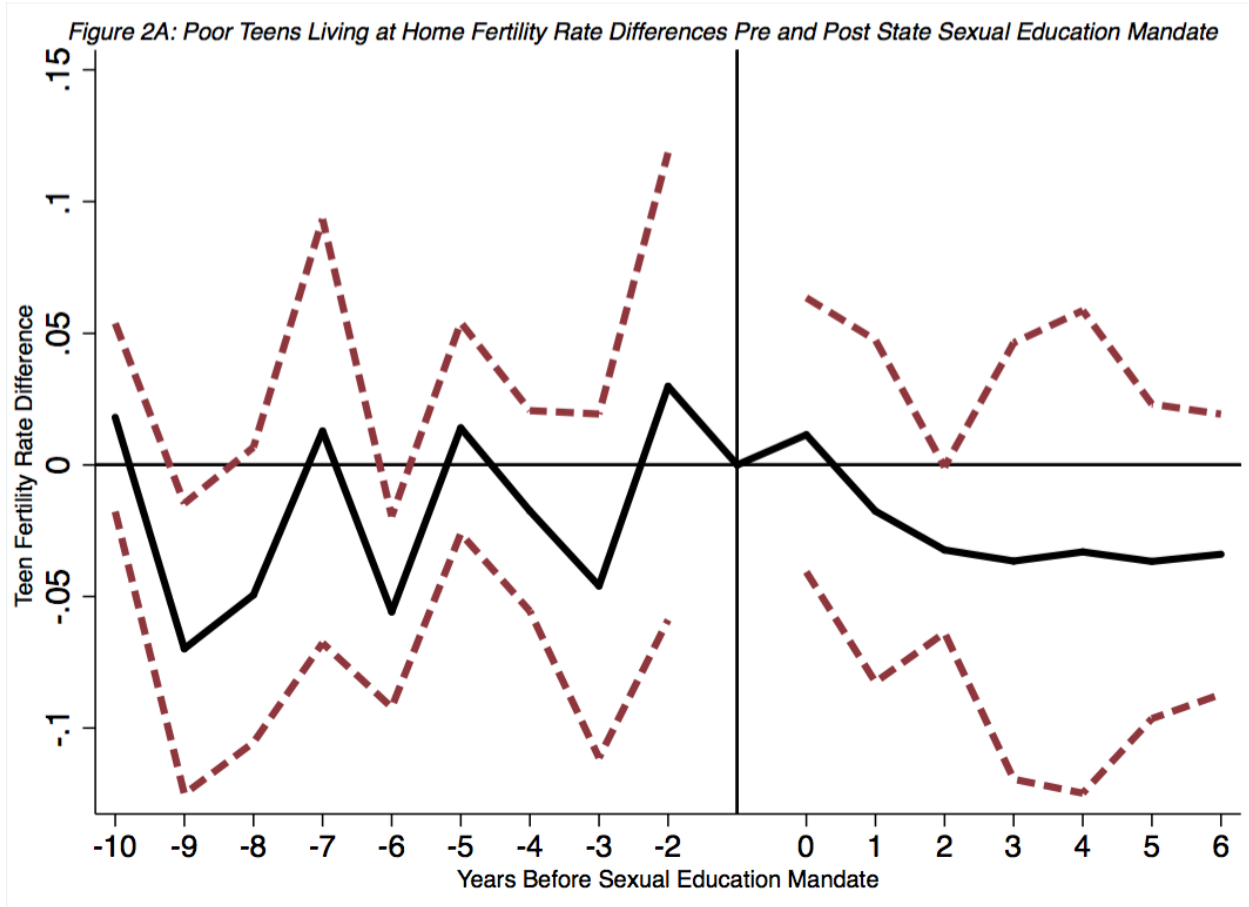
Figure 1: Average Teen Fertility Rate Over Time by Poverty Status



Notes: The figure plots estimates for the average teen birth rate over time for the 10 southern states included in the study. The black solid line presents estimates for poor teens, and the red solid line plots estimates for non-poor teens using CPS data. The dashed lines display ACS estimates for average teen birth rate over time for the same 10 states, again with the poor group represented through black the black dashed line, and non-poor represented through red dashed line.

Source: Current Population Survey (1970-2018), American Community Survey (2000-2018).

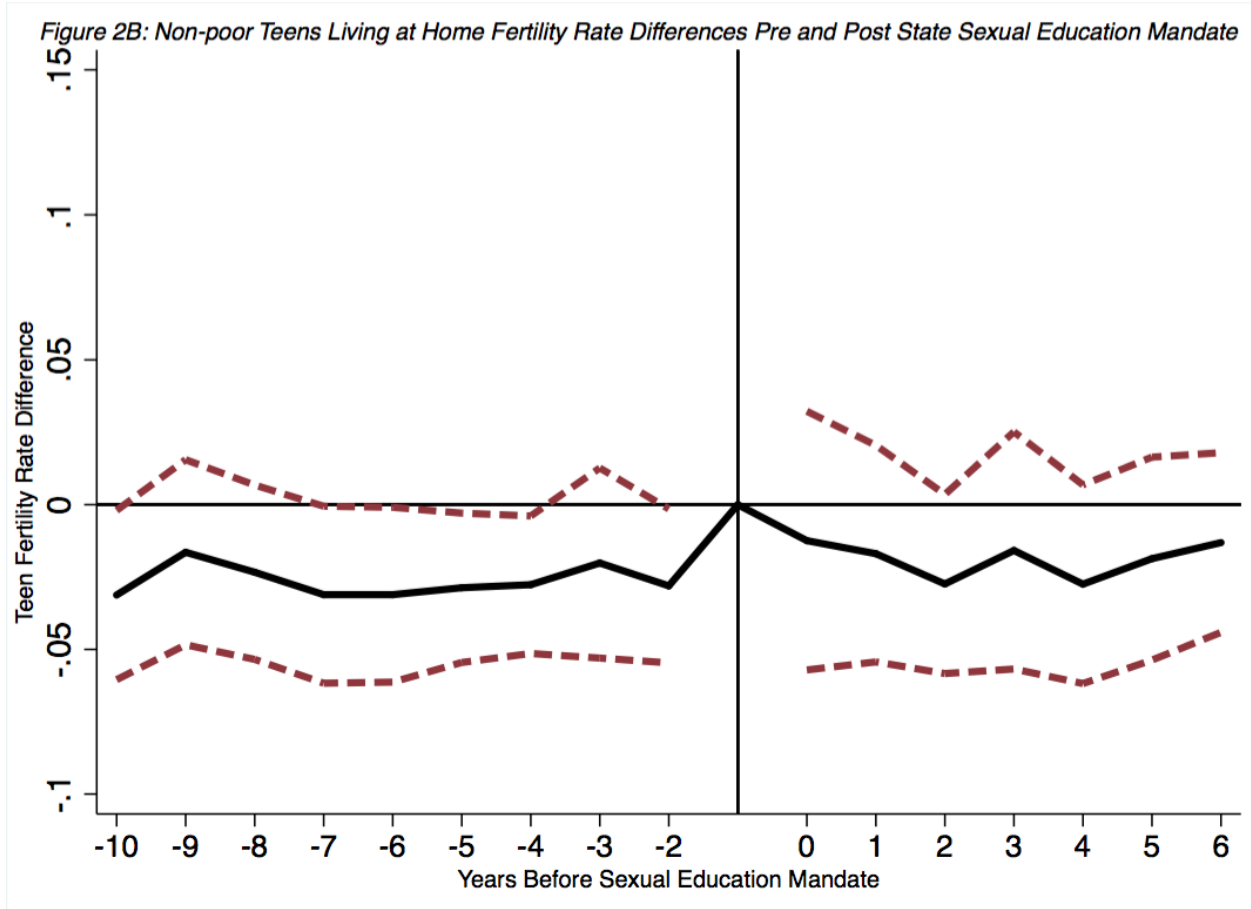
Figure 2A: Poor Teens Living at Home Fertility Rate Differences Pre and Post State Sexual Education Mandate



Notes: The figure plots an event study for poor teens who live at home 10 years prior to mandate implementation, and 6 years post mandate implementation.

Source: Current Population Survey (1979-2018)

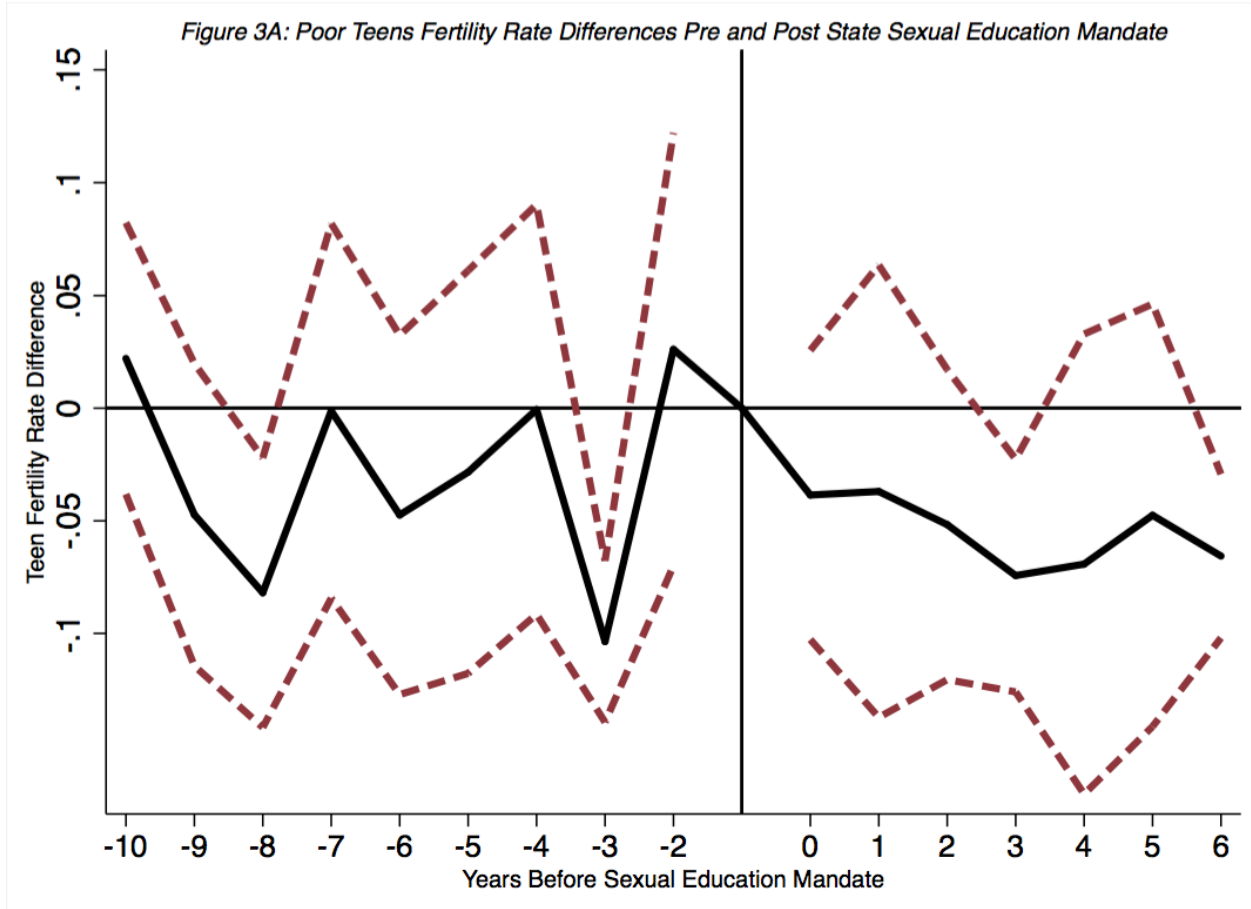
Figure 2B: Non-poor Teens Living at Home Fertility Rate Differences Pre and Post State Sexual Education Mandate



Notes: The figure plots an event study for non-poor teens who live at home 10 years prior to mandate implementation, and 6 years post mandate implementation.

Source: Current Population Survey (1979-2018)

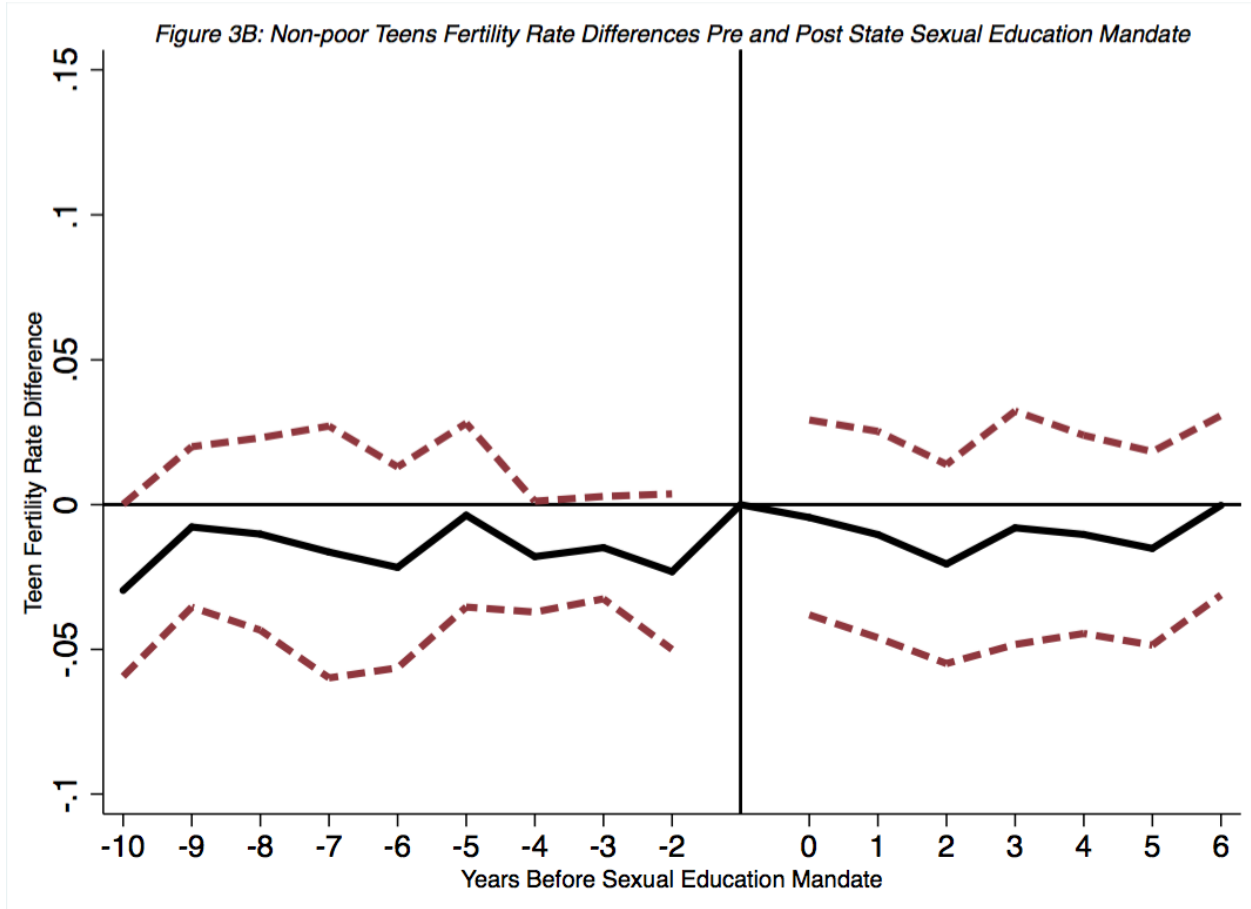
Figure 3A: Poor Teens Fertility Rate Differences Pre and Post State Sexual Education Mandate



Notes: The figure plots an event study for poor teens 10 years prior to mandate implementation, and 6 years post mandate implementation.

Source: Current Population Survey (1979-2018)

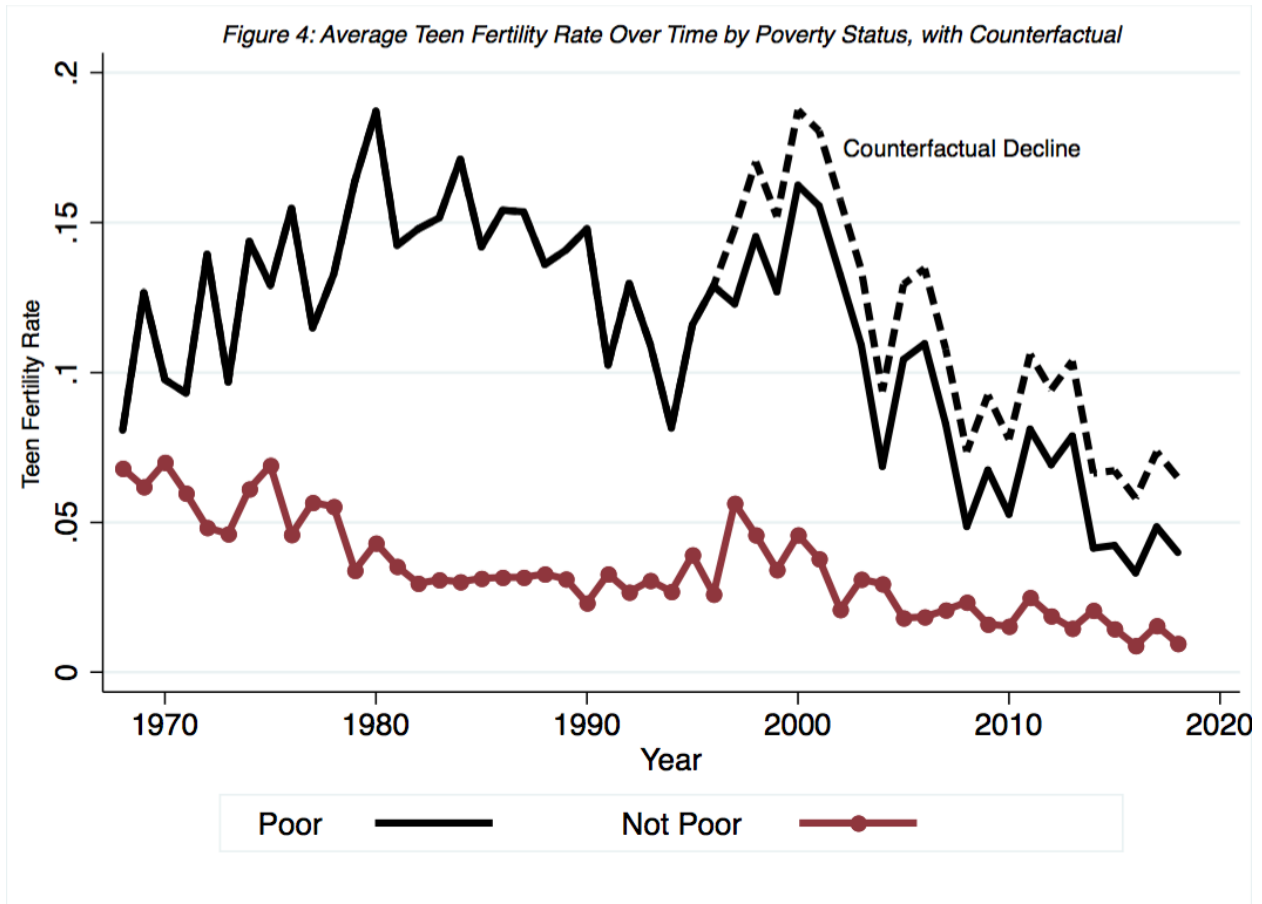
Figure 3B: Non-poor Teens Fertility Rate Differences Pre and Post State Sexual Education Mandate



Notes: The figure plots an event study for non-poor teens 10 years prior to mandate implementation, and 6 years post mandate implementation.

Source: Current Population Survey (1979-2018)

Figure 4: Average Teen Fertility Rate Over Time by Poverty Status, with Counterfactual Decline



Notes: The figure plots estimates for the average teen birth rate over time for the 10 southern states included in the study. The black line presents estimates for poor teens, and the red line plots estimates for non-poor teens. The dashed line displays the counterfactual situation for poor teen birth rates without the implementation of sexual education mandates.

Source: Current Population Survey (1979-2018)

Table 1: Legal Coding by State

STATE	YEAR OF MANDATE
ALABAMA	No mandate
ARKANSAS	No mandate
GEORGIA	1989
LOUISIANA	No mandate
MISSISSIPPI	2012
NORTH CAROLINA	2009
SOUTH CAROLINA	1988
TENNESSEE	No mandate
TEXAS	No mandate
VIRGINIA	1997

Notes: The table displays the year of implementation coded values for sex education mandates by state. Statutes and legislation were examined for each state to determine the year of implementation. For states that imposed a mandate in the month of October or after, the implementation is coded for the following year.

Table 2: Difference-in-Difference Teen Mother Estimates, 1970-2018

	(1) CPS Data Estimates	(2) Mean (Before 2000)	(3) Observations
Poor Live at Home	-0.021** (.007)	0.099	14,965
Not Poor Live at Home	-0.0004 (.003)	0.016	62,603
Poor	-0.025*** (.005)	0.132	19,281
Not Poor	0.002 (.005)	0.035	68,743

Notes: The table displays weighted birth rate estimates for the coefficient of the effect of sexual education mandates for poor teens who live at home, non-poor teens who live at home, all poor teens, and all non-poor teens. Estimates do not strictly measure birth rates, it measures teen motherhood rates.

Source: Current Population Survey (1979-2018)

Table 3: Difference-in-Difference Estimate Cross-Comparison Between ACS and CPS Data (1990, 2000-2017)

	(1) CPS Estimates	(2) ACS Estimates	(3) Mean CPS (After 2000)	(4) Mean ACS (After 2000)
Poor Live at Home	-0.005 (.012)	-0.006 (.002)	.031	.024
Not Poor Live at Home	0.005** (.002)	0.0006 (.0006)	.011	.007
Poor	-0.013 (.008)	0.001 (.002)	.064	.033
Not Poor	0.008 (.034)	0.00001 (.0005)	.021	.011

Notes: The table displays weighted birth rate estimates for the coefficient of the effect of sexual education mandates for poor teens who live at home, non-poor teens who live at home, all poor teens, and all non-poor teens using the CPS and ACS datasets in the same time period of 1990, and 200-2017. Data includes years 1990, 2000-2017, as those were the years in which data were available for the ACS source. For this reason, the same years are used for the cross-comparison between data sources. Estimates do not strictly measure birth rates, it measures teen motherhood rates.

Source: Current Population Survey (1990, 2000-2017), American Community Survey (1990, 2000-2017)

Table 4: Difference-in-Difference Teen Birth Rate Estimates with Controls

	(1) Age	(2) Race	(3) Grade Completed	(4) Employment Status
Poor Live at Home	-0.018** (.008)	-0.020** (.007)	-0.018* (.008)	-0.020** (.007)
Not Poor Live at Home	-0.0001 (.003)	-0.001 (.003)	-0.0008 (.003)	-0.0006 (.003)
Poor	-0.020** (.006)	-0.025*** (.007)	-0.015 (.009)	-0.022** (.008)
Not Poor	0.001 (.004)	0.002 (.004)	0.002 (.004)	0.002 (.005)
	(5) Unemployment Rate	(6) Welfare Reform	(7) Controls 1-6	(8) Religion
Poor Live at Home	-0.010 (.007)	-0.021** (.007)	-0.004 (.009)	-.019** (.006)
Not Poor Live at Home	-0.0001 (.003)	-0.0003 (.003)	0.002 (.003)	.0006 (.004)
Poor	-0.020** (.005)	-0.027*** (.006)	-0.018** (.008)	-.021*** (.006)
Not Poor	0.003 (.004)	0.002 (.005)	0.001 (.005)	.002 (.006)

Notes: The table displays weighted birth rate estimates for the coefficient of the effect of sexual education mandates for poor teens who live at home, non-poor teens who live at home, all poor teens, and all non-poor teens with controls. Controls include age, race (white and non-white), grade completed, employment status, the average unemployment rate by state per year, welfare reform (state reform with TANF and waivers). Each column provides estimates with each individual control, and column (7) provides estimates with all controls included in the model. Estimates do not strictly measure birth rates, it measures teen motherhood rates.

Source: Current Population Survey (1970-2018)

Table 5: Difference-in-Difference Teen Birth Rate Estimates Controlling for Welfare Reform

	(1) TANF Time Limits	(2) TANF Full Initial Sanction	(3) Any Family Cap	(4) Waivers, TANF Time Limits, Family Caps
Poor Live at Home	-0.021** (.007)	-0.021** (.007)	-0.017 (.010)	-0.016* (.009)
Not Poor Live at Home	-0.0003 (.003)	-0.0005 (.003)	0.002 (.004)	0.002 (.004)
Poor	-0.025*** (.005)	-0.028*** (.003)	-0.028** (.007)	-0.028*** (.004)
Not Poor	0.002 (.005)	0.001 (.005)	-0.004 (.005)	.004 (.006)

Notes: The table displays weighted birth rate estimates for the coefficient of the effect of sexual education mandates for poor teens who live at home, non-poor teens who live at home, all poor teens, and all non-poor teens with controls. TANF time limits include <60 months, and =60 months. Each column includes estimates with individual controls. Column (4) includes estimates with all welfare reform controls included in the model. Estimates do not strictly measure birth rates, it measures teen motherhood rates.

Source: Current Population Survey (1970-2018)

Table 6: Difference-In-Difference Teen Birth Rate Estimates by Race

	(1) White	(2) Non-white
Poor Live at Home	-0.017 (.012)	-0.020*** (.006)
Not Poor Live at Home	0.0006 (.002)	-0.0005 (.003)
Poor	-0.029** (.011)	-0.024*** (.005)
Not Poor	0.005 (.004)	.002 (.005)

Notes: The table displays weighted birth rate estimates for the coefficient of the effect of sexual education mandates for poor teens who live at home, non-poor teens who live at home, all poor teens, and all non-poor teens. Column (1) includes estimates for white samples, and column (2) presents estimates for non-white samples. Estimates do not strictly measure birth rates, it measures teen motherhood rates.

Source: Current Population Survey (1970-2018)

Table 7: Difference-in-Difference Teen Birth Rate Estimates by Age

	(1) Age 15	(2) Age 16	(3) Age 17	(4) Age 18	(5) Age 19
Poor Live at Home	-0.001 (.006)	0.018 (.017)	-0.009 (.022)	-0.072* (.034)	-0.124** (.042)
Not Poor Live at Home	0.0006 (.002)	-0.002 (.002)	0.002 (.007)	-0.005 (.008)	0.002 (.011)
Poor	-0.002 (.004)	0.023** (.010)	-0.026 (.029)	-0.048* (.027)	-0.105** (.026)
Not Poor	-0.0002 (.001)	0.004* (.002)	0.003 (.013)	-0.009 (.012)	0.014 (.015)

Notes: The table displays weighted birth rate estimates for the coefficient of the effect of sexual education mandates for poor teens who live at home, non-poor teens who live at home, all poor teens, and all non-poor teens. Each column presents difference-in-difference estimates for each individual age group. Estimates do not strictly measure birth rates, it measures teen motherhood rates.

Source: Current Population Survey (1970-2018)

XI. Legal Coding

Alabama

I code no year for sexual education mandate implementation for Alabama, as according to Code of Ala. § 16-41-8, there is no specific mandate for sexual education curriculum in the state of Alabama: “Sex education not authorized. Nothing this chapter shall be construed to authorize or require the teaching of sexual education in any form.”

Arkansas

Arkansas is coded with no mandate, as A.C.A. § 6-18-703 indicates no specific mandate for sexual education. Rather it requires schools that choose to offer “sex education in school-based health clinics shall include instruction in abstinence.”

Georgia

Georgia’s sex education mandate is coded for 1989, as O.C.G.A. § 20-2-143 states “Each local board of education shall prescribe a course of study in sex education and AIDS prevention instruction for such grades and grade levels in the public school system as shall be determined by the State Board of Education.”

Louisiana

Louisiana does not include a mandate for sex education. According to La. R.S. § 17:281, “Any public elementary or secondary school in Louisiana may, but is not required to, offer instruction in subject matter designated as “sex education”, provided such instruction and subject matter is

integrated into an existing course of study such as biology, science, physical hygiene, or physical education.”

Mississippi

Mississippi’s year of sexual education implementation is coded as 2012, as Miss. Code Ann. § 37-13-171 states “The local school board of every public school district shall adopt a policy to implement abstinence-only or abstinence-plus education into its curriculum by June 30, 2012, which instruction in those subjects shall be implemented not later than the start of the 2012-2013 school year or the local school board shall adopt the program which has been developed by the Mississippi Department of Human Services and the Mississippi Department of Health.”

North Carolina

North Carolina’s sexual education mandate is coded as 2009 due to 2009 N.C. HB 88 which requires “reproductive health and safety education” and the act “applies beginning with the 2010-2011 school year.”

South Carolina

The implementation year for the sex education mandate in South Carolina is coded as 1988. South 1997 Bill SC H.B. 4840 discusses Section 59-31-20 of the Comprehensive Health Education Act which states beginning in the 1988-1989 school year, comprehensive health education must be taught, which includes “reproductive health education.”

Tennessee

Tennessee is coded as having no sexual education mandate due to Tenn. Code Ann. § 49-6-1302.

This code states that beginning in the 1991-1992 school year, Tennessee only permits sexual education instruction in counties that “exceeded nineteen and five tenths pregnancies per one thousand females fifteen through seventeen years of age.” In this way, Tennessee effectively requires approval for sex education curriculum rather than require it.

Texas

Texas does not include a specific sexual education mandate in their curriculum according to Tex. Educ. Code § 28.004 which specifies that sexuality education is a district choice rather than a state mandate.

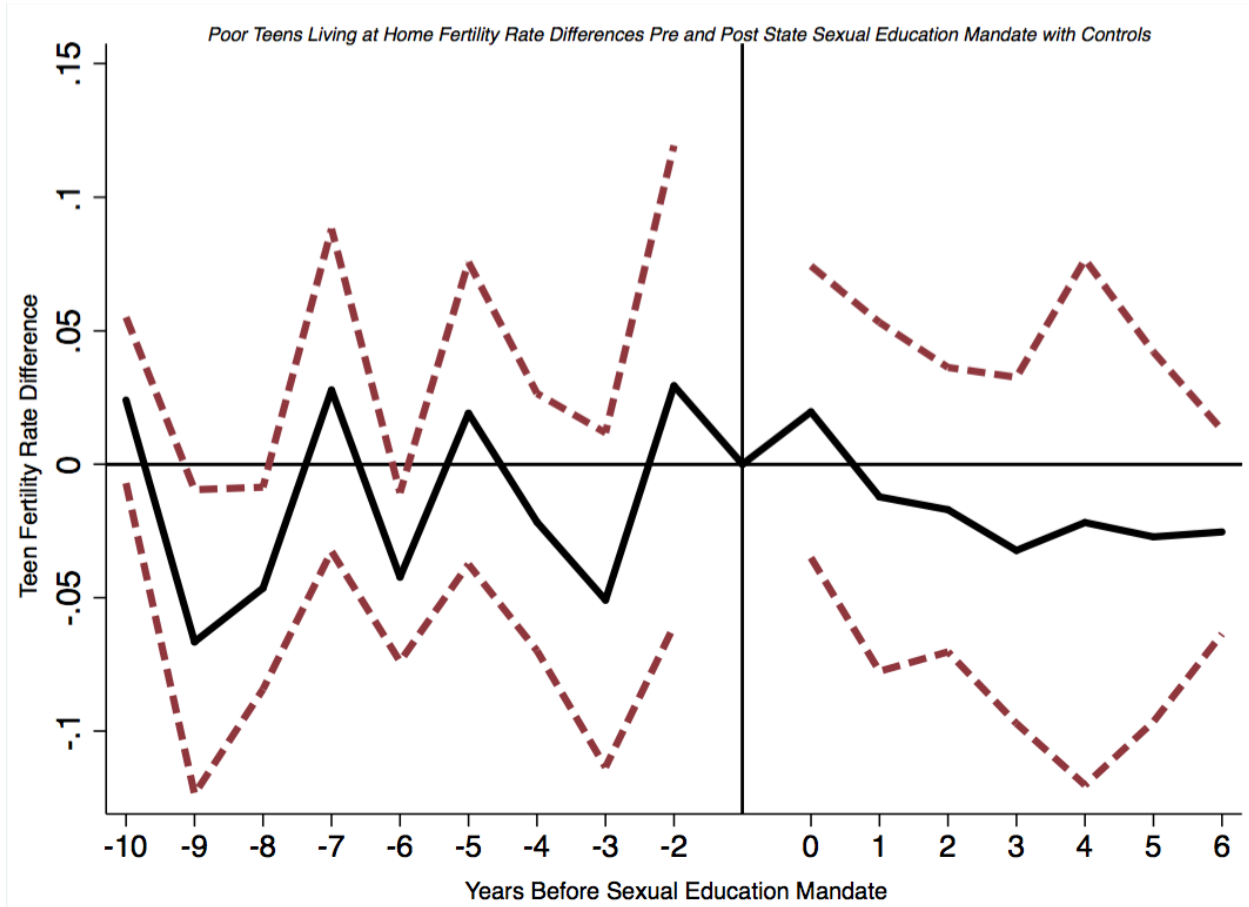
Virginia

Virginia sexual education mandate implementation is coded as 1997 due to § 22.1-207.1:1.

Family life education; certain curricula and Standards of Learning. “The *Regulations Establishing Standards for Accrediting Public Schools in Virginia (8 VAC 20-131-170)* were amended by the Board of Education to state that “Each school may implement the Standards of Learning for the Family Life Education program promulgated by the Board of Education or a Family Life Education program consistent with the guidelines developed by the Board of Education which shall have the goals of reducing the incidence of pregnancy and/or sexually-transmitted disease and substance abuse among teenagers” (Virginia Family Life Education).

Appendix

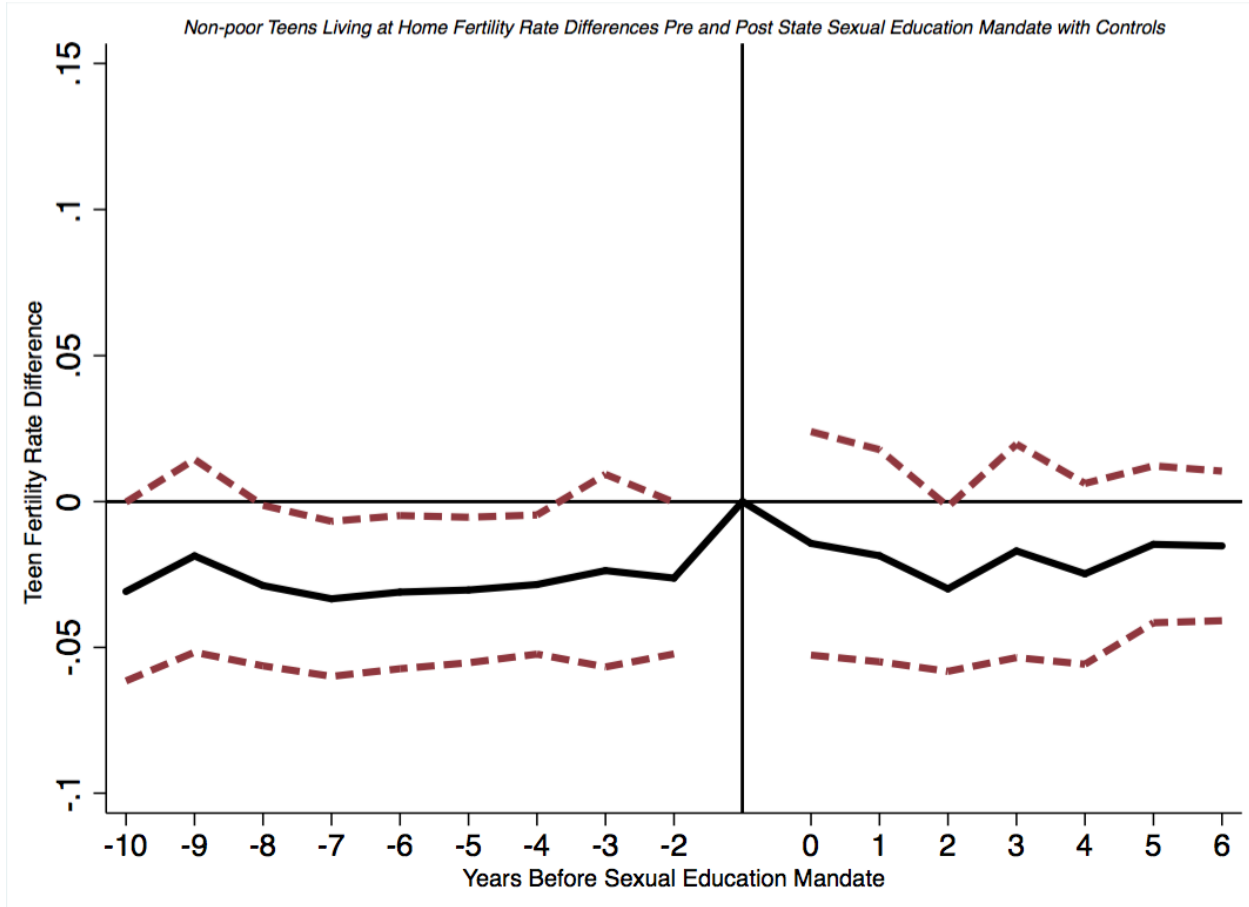
Appendix Figure 1A: Event Study with Controls for Poor Teens Living at Home



Notes: The figure plots an event study for poor teens who live at home, with controls, 10 years prior to mandate implementation, and 6 years post mandate implementation.

Source: Current Population Survey (1979-2018)

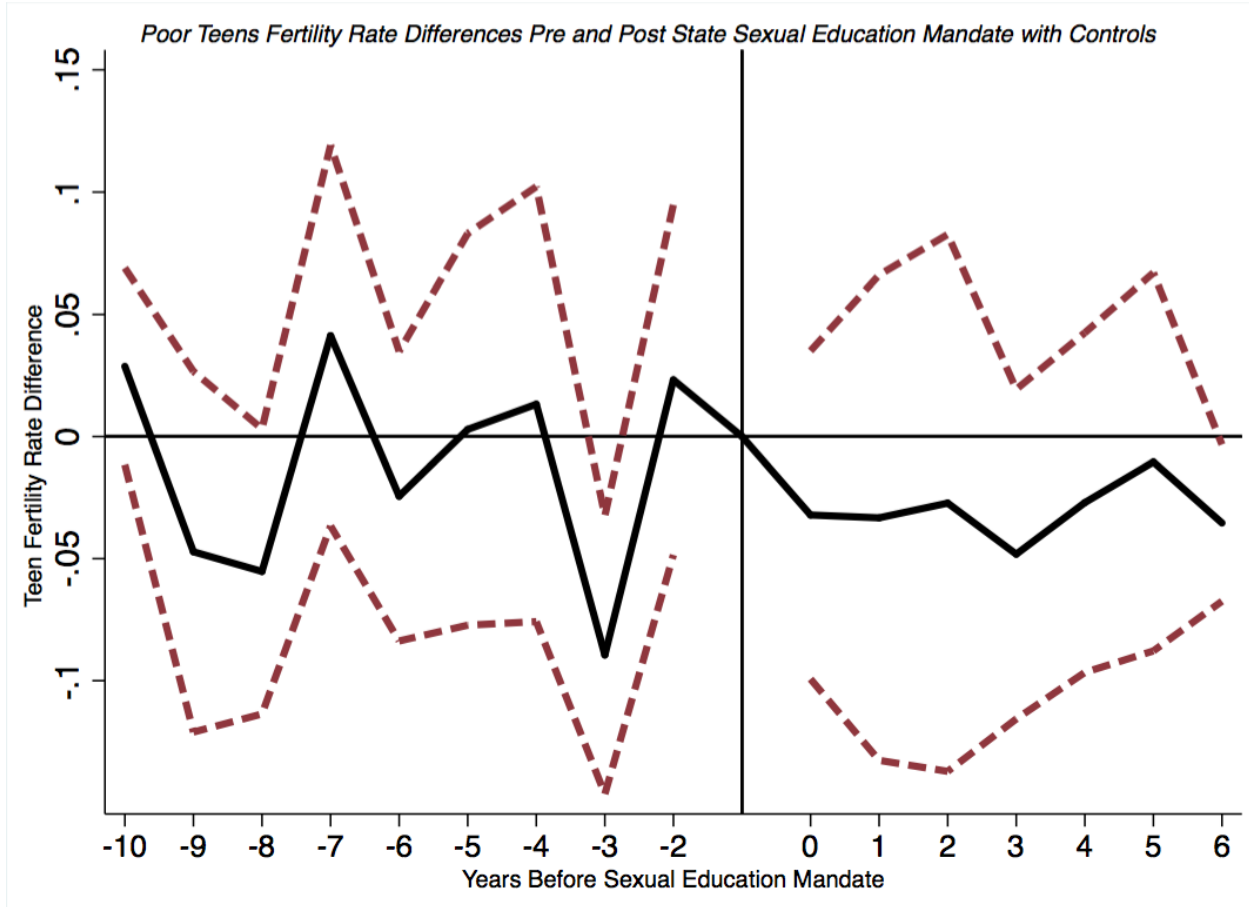
Appendix Figure 1B: Event Study with Controls for Non-poor Teens Living at Home



Notes: The figure plots an event study for non-poor teens who live at home, with controls, 10 years prior to mandate implementation, and 6 years post mandate implementation.

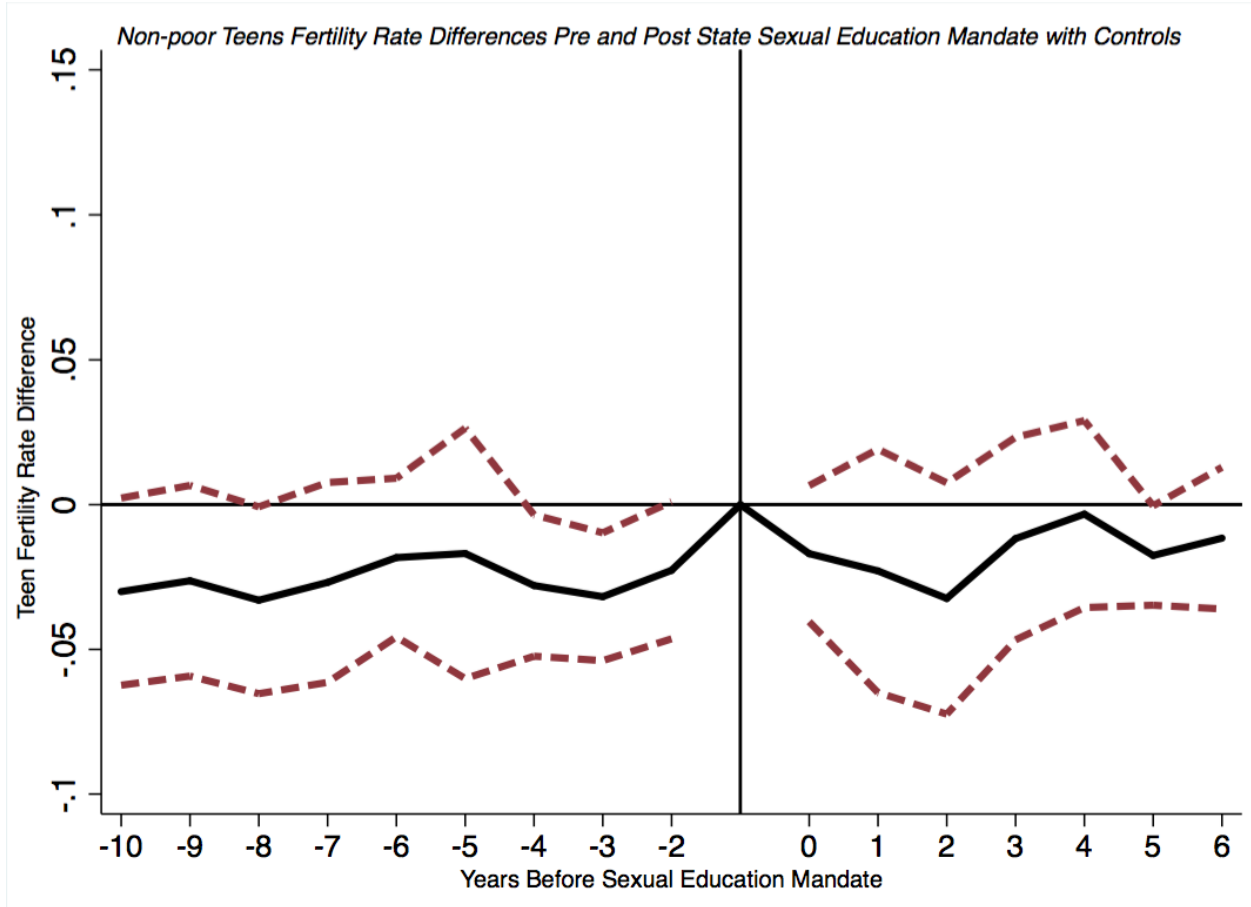
Source: Current Population Survey (1979-2018)

Appendix Figure 2A: Event Study with Controls for Poor Teens



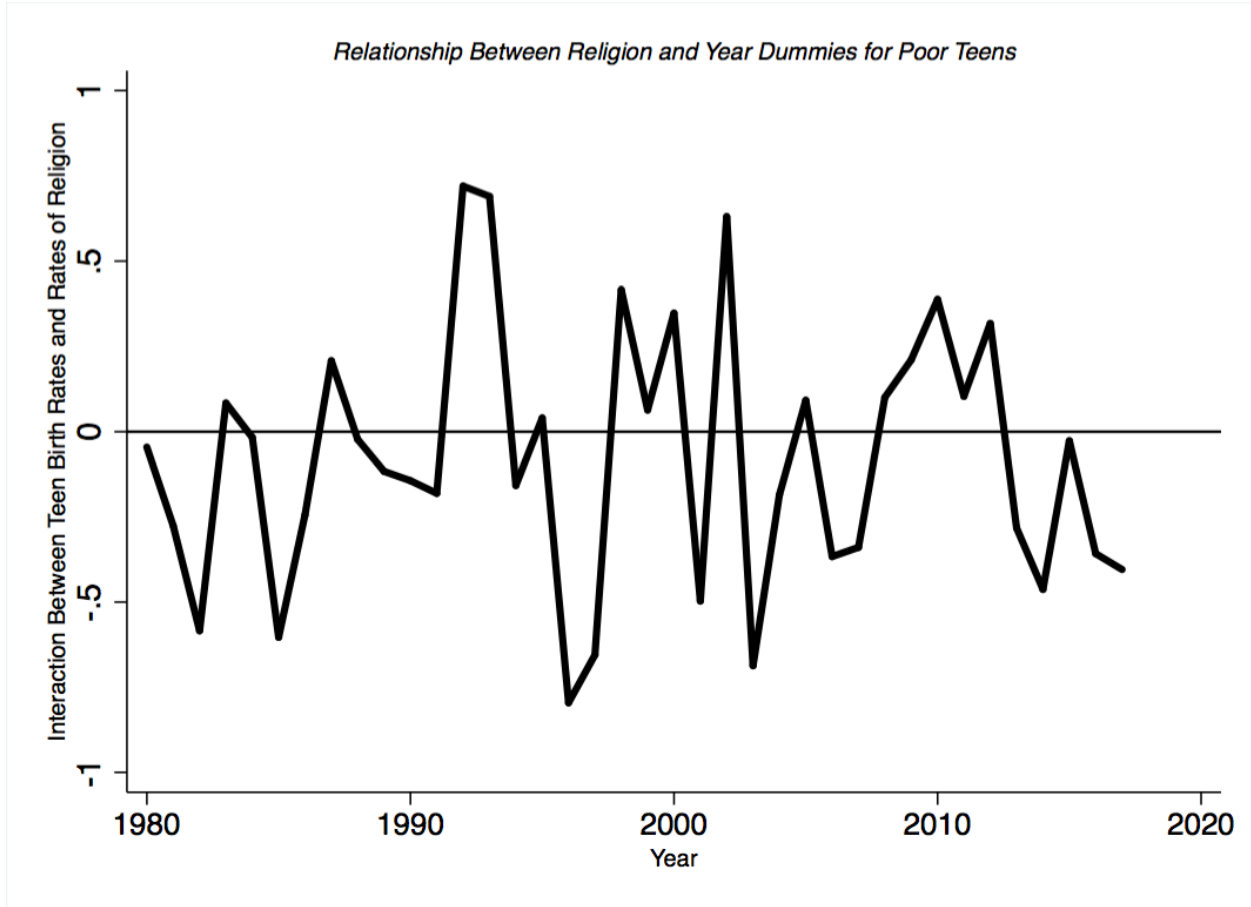
Notes: The figure plots an event study for poor teens, with controls, 10 years prior to mandate implementation, and 6 years post mandate implementation.
Source: Current Population Survey (1979-2018)

Appendix Figure 2B: Event Study with Controls for Non-poor Teens



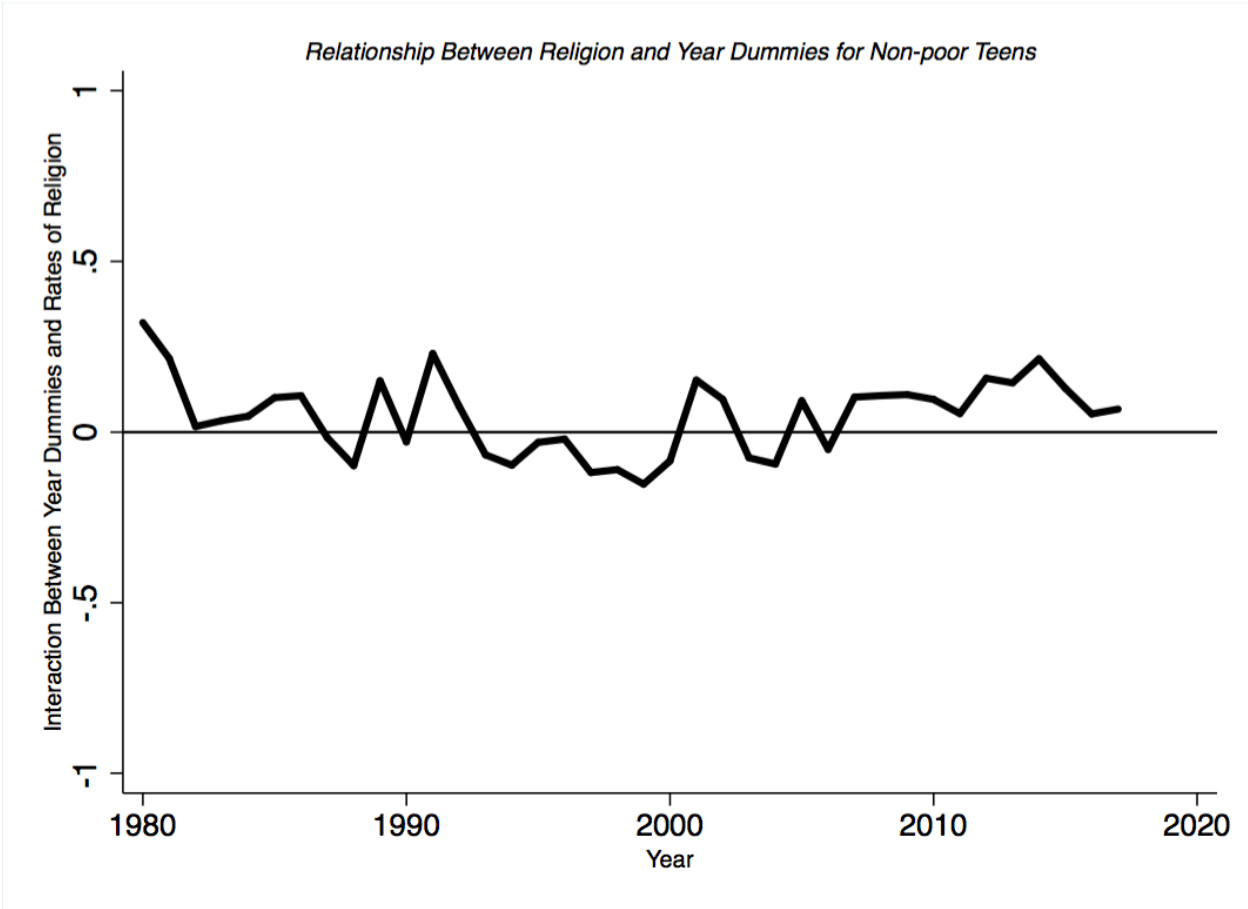
Notes: The figure plots an event study for non-poor teens, with controls, 10 years prior to mandate implementation, and 6 years post mandate implementation.
 Source: Current Population Survey (1979-2018)

Appendix Figure 3A: Controlling for Religion, Poor Teens



Notes: The figure plots estimates for the relationship between year dummies and religion rates. The black line presents estimates for poor teens.
Source: Current Population Survey (1980-2018)

Appendix Figure 3B: Controlling for Religion, Non-poor Teens



Notes: The figure plots estimates for the relationship between year dummies and religion rates. The black line presents estimates for non-poor teens. Source: Current Population Survey (1980-2018)