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ABSTRACT

In this article, we conduct a comprehensive analysis of the effect of parental involvement (PI) laws on the incidence of abortions to minors across a span of nearly three decades. We contribute to the extant literature on this topic in several ways. First, we explore differences in estimates of the effect of PI laws across time that may result from changes in contraception, the composition of pregnant minors, access to confidential abortions in nearby states, or through judicial bypass, and the degree to which these laws are enforced. We find that, on average, PI laws enacted before the mid-1990s are associated with a 15% to 20% reduction in minor abortions. PI laws enacted after this time are not, on average, associated with declines in abortions to minors. Second, we assess the role of out-of-state travel by minors, estimating models that allow the effect of PI laws to differ by the distance to the nearest state without a PI law. We find that out-of-state travel is not a substantive moderating factor of the effect of PI laws. Third, we use a synthetic control approach to explore state-level heterogeneity in the effect of PI laws and find large differences in the impact of PI laws on minor abortions by state. These differences are unrelated to the type of law (consent versus notification) or whether contiguous states have enacted PI laws. Finally, we show that estimates of the effect of PI laws using data from either the Centers for Disease Control or the Alan Guttmacher Institute do not differ qualitatively once differences in coverage by state and year across these data are harmonized.

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Introduction

State regulation of fertility control methods, such as access to birth control medication and abortion services, are widespread and have the potential to significantly affect the timing and number of children born. The effect of such regulations on the abortion rates of minors is particularly important because of the theoretical and empirical linkages between abortion and unintended childbearing. If state laws reduce minor abortion rates, then it is likely, but not necessarily the case, that the birth rates of minors will rise and most of these additional births will be unintended. And while there is some debate over the consequences of teen births, it is likely that unintended births—births that would have been aborted in the absence of a state restriction—adversely affect teens' current and future wellbeing because they impose a significant constraint on a teen's choices related to schooling, work and household formation.

A common type of state regulation is parental involvement (PI) laws. These statutes require that an abortion provider notify a parent, or parents, of a minor's request for an abortion, or that the parent(s) provide written consent before a procedure can be performed. While there have been a few studies of the effect of such laws on minor abortion rates, which we review below, most of these studies are from an earlier period and there remain several gaps in the evidence that warrant additional research. One of the most important unanswered questions is whether the effect of PI laws differs by geography and time.

There are several plausible reasons to suggest that the effect of PI laws on minor abortion would vary by time and geography. First, the incidence of PI laws has increased over time. Currently, 37 states enforce PI laws and the widespread geographic coverage of current PI laws may make it more difficult for teens to avoid compliance by traveling to another state. For example, Myers and Ladd (2017) reported that the average distance to avoid a PI law increased from 55 miles in 1992 to 454 miles in 2017. So, over time the effect of PI laws on abortion may have increased. On the other hand, the growing use of medication abortion after 2000, when it became legal in the U.S., may have reduced the travel distance required to avoid PI laws because of the wider geographic distributions of OB-GYNs relative to surgical abortion clinics (Guttmacher Institute 2018).[1]

Second, methods of contraception have changed over time and the use of different methods varies by region. The increased use of long-acting reversible contraception (LARC) is most notable (Daniels et al. 2013; Kavanaugh and Jerman 2018). Temporal and geographic variation in contraception may have altered the demographic characteristics of teens seeking an abortion and the effect of PI laws on abortion. Abortion rates, for example, have been declining for all race/ethnic groups, but there has been a greater decline among black teens relative to non-Hispanic whites (Child Trends 2014).

Another factor that may have altered the effect of PI laws is the surprising variation by states in the use of judicial bypass for minors seeking an abortion without parental consent (Altindag and Joyce 2017). Fifteen percent of all abortions to minors in Texas were obtained via a judicial bypass between 2010 and 2012. In Alabama and Georgia less than 1% of abortions to minors were through a judicial bypass.

Finally, family structure (e.g., cohabitation) and parental characteristics (e.g., age and education of mother) differ significantly by geography and time, and these differences may affect child-parent relationships and the composition of teens at risk of being affected by PI laws.[2] Overall, there are ample reasons to suggest that the effect of PI laws will differ by geography and time. However, no research has assessed this issue systematically.

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[1] Medication abortions now account for one-third of all abortions at eight weeks of gestation or less, which is up from 14% in 2004. However, many states that have PI laws for clinical abortions also have laws that constrain access to medication abortion such as mandatory counseling, mandatory waiting periods, and restrictions on telemedicine access to abortion medication (Kaiser Family Foundation, 2018).

[2] An analysis of Census (1990 and 2000) and American Community Survey (5-year 2013) data reveal significant changes over time and across states in the characteristics of mothers/families with teenage children. For example, the share of mothers that are married was 78% in 1990 and 73% in 2013. The share of mothers who were married also differed significantly across states by up to 12 percentage points. The share of mothers with a teen child and with a Bachelor's degree or higher was 14% in 1990 and 27% in 2013, and the share with Bachelor's degree or more differed by up to 11 percentage points across states. The average age of mothers also has increased over time and differs across states by 1 to 2 years.

In this article, we add to the literature on the effect of PI laws on the abortion rates of minors by exploring potential heterogeneity of the effect of PI laws by time and geography. We examine the effect of PI laws on abortion rates of minors from 1985-2013 allowing effects to vary by time period and state. A number of studies of PI laws in the 1980s and 1990s concluded that travel by minors to neighboring states without a PI law greatly diminished its impact on abortion rates (Cartoof and Klerman 1986; Henshaw 1995; Joyce and Kaestner 1996; Ellerston 1997; Dennis et al. 2009). We review this literature critically and we use novel data to show that travel to other states by minors has likely been overstated. In addition, we assess directly whether distance to a confidential abortion provider is an important moderator of the effect of PI laws.

Another contribution of our research is the assessment of whether the two primary data sources used in abortion research yield different estimates of the effect of PI laws and, if so, what may explain these differences. Abortions by age, year and state of occurrence are published by the Centers for Disease Control and Prevention (CDC). The other major data source is from the Alan Guttmacher Institute (GI), which uses its periodic survey of abortion providers to estimate abortions by age and state of residence. These data sources differ in the number of states and years available, and most importantly, whether abortion is measured by place of occurrence or place of residence. Previous research has used both CDC and GI data, but our study is the first assessment of whether these two primary data sources yield different estimates of the effect of PI laws and, if so, what may explain these differences.

Lastly, we advance the literature by using methods not previously employed: an event-study approach applied to the standard difference-in-differences design and a synthetic control approach applied to individual states. The latter approach allows us to explore heterogeneity of effects across states.

Results from our analyses indicate that there were significant declines of approximately 15% to 20% in abortions to minors aged 15 to 17 in states that adopted PI laws prior to the mid-1990s. After this time we find little evidence that, on average, PI laws reduce abortions to minors. Second, results indicated that the effect of a PI law did not differ significantly by the distance to a state without a PI law.

This suggests that the ability to travel out-of-state to avoid compliance with a PI law is limited among minors and is consistent with case studies on travel in three states, and with the broader literature demonstrating that distance to a provider is a significant barrier to abortion access. Third, we found that results were qualitatively the same regardless of the source of abortion data, whether from the CDC or GI. And once we harmonized these data sources to have the same states and years, estimates were quantitatively very similar. Fourth, state-specific case studies using synthetic control methods suggest significant heterogeneity in the effects of PI laws on abortions to minors. This heterogeneity does not appear to be related to the type of law (notification or consent) or whether surrounding states have PI laws, which provides additional evidence that travel is not a widely used option by minors.

Related Literature

There have been several previous studies of the effects of PI laws on minor abortion, and results from these studies generally indicate that PI laws reduce minor abortions. The literature consists of state-specific case studies (Cartoff and Klerman 1986; Rogers et al. 1991; Ellertson 1997; Henshaw 1995; Joyce and Kaestner 1996, 2001; Joyce et al. 2006; Colman, Joyce and Kaestner 2008; MacAfee, Castle and Theiler 2015; Ramesh, Zimmerman and Patel 2016; Ralph et al. 2018) and analyses using a broader set of states (Ohsfeldt and Gohmann 1994; Haas-Wilson 1996; Levine 2003; New 2011; Myers and Ladd 2017). However, the literature remains relatively small and there are several limitations that we describe below.

One of the earliest studies of the effect of PI laws was by Cartoff and Klerman (1986) who examined the effect of a PI law in Massachusetts in 1981 on abortions to minors. Results of the analysis indicated that abortions among minors aged 15 to 17 in Massachusetts were 45% lower in 1982, the first full year after the law's enactment, than in 1980, the last full year prior to the law. The 45% drop in minor abortions represented 192 abortions per month. There was no similar change in abortion among women aged 18 and older. Cartoff and Klerman (1986) claim that, after accounting for the Massachusetts minors that went out-of-state for an abortion and non-resident minors that stopped coming in to the state, "…this state's parental consent law had little effect on adolescent's pregnancy-resolution behavior" (Cartoof and Klerman 1986, p. 397). We show that this conclusion is likely overstated. Using their published data, we estimate that abortions to resident minors fell 20% in Massachusetts.[3]

Henshaw (1995) analyzed Mississippi's 1993 PI law and concluded, like Cartoof and Klerman (1986), that the Mississippi statute had little effect on minor abortion because of increased travel out-of-state. One challenge in evaluating Mississippi's PI law was the confounding effect of Mississippi's mandatory delay statute that went into effect in August of 1992, eight months prior to the PI law. The delay statute required two in-person visits to the provider and many women of all ages went out-of-state for an abortion (Joyce, Henshaw and Skatrud 1997; Joyce and Kaestner 2000). Other challenges include the small number of abortions and associated lack of statistical power, and potential bias related to misreporting of abortions. Henshaw (1995) notes that his estimates cannot rule out a decline of 18% in minor abortions.

Ellertson (1997) also conducted a before and after analysis of the effect of PI laws in three states: Minnesota (1981), Missouri (1985) and Indiana (1982). She reported that PI laws were associated with a 26%, 20% and 17% decrease in in-state abortions to minors in Minnesota, Missouri and Indiana, respectively. She also found that out-of-state travel by Missouri minors increased by 53% (relative to an unreported base). However, Ellertson (1997) measured travel in 1989, four years after the law's implementation, a time lag that makes it difficult to make a claim that travel offset part of the effect of the law in Missouri. Missouri's PI law was also associated with a significant increase in out-of-state travel for

[3] Cartoof and Klerman (1986) is frequently cited as the seminal example of travel by minors in response to a PI law (See Dennis et al. 2009). Thus, it is worth detailing our claim. The Massachusetts PI law went into effect in May of 1981. There were 5,113 abortions to minors performed in the state in 1980; 6.3% of all abortions in the state were to non-residents and 3% of Massachusetts residents obtained abortions in other states. If we assume 6.3% of abortions to minors were also non-residents, and 3% of resident minors went out of state in 1980, then there were 4,935 abortions to resident minors in 1980. In 1982 there were 3,942 abortions to resident minors 2,802 were performed in Massachusetts and 1,140 in other states. Accordingly, abortions to resident minors fell by 20.1 % from 1980 to 1982 ((4,935-3,942)/4,935).

an abortion among women aged 18 to 19 (13%) and 20 to 24 (18%) who should not have been affected directly by the law.

Joyce and Kaestner (1996, 2001) analyzed the effect of PI laws in Mississippi, South Carolina and Tennessee in the late 1980s and early 1990s. The laws in Mississippi and South Carolina were associated with a decrease in abortions of between 8% and 10%.[4] Results also indicated that Mississippi minors were more likely to go out-of-state for an abortion in response to the law, but travel did not obviate the law's impact. However, as noted earlier, Mississippi's law was possibly confounded by the enforcement of a mandatory delay statute just 8 months earlier. Joyce and Kaestner (1996) found no effect of Tennessee's 1989 PI law. However, a recent review of legal decisions indicated that Tennessee's 1989 statute was enjoined and the PI law did not go into effect until 1992 (Myers and Ladd 2017).

A recent case study of the effect of Texas's PI law measured exposure to the law by age at conception and not age at termination (Joyce, Kaestner and Colman 2006).[5] The authors compared changes in abortion to minors who were 17 years and 6 months at conception to those who had just turned 18 and were, thus, unexposed. The authors' preferred estimate was that Texas' PI law caused a 16% decline in the abortion rate of 17-year-olds.

Three recent case studies looked at the effect of PI laws in New Hampshire and Illinois, but all three were limited to an analysis of one or a few abortion clinics. MacAfee et al. (2014) reported that abortion to minors in Planned Parenthood clinics in New Hampshire fell from 95 to 50 after the state imposed a parental notification law in 2011. Abortions to Massachusetts residents accounted for 62% of the decline. The law had no statistically significant effect on resident minors from New Hampshire. Illinois began to enforce a parental notification law in 2013. Ralph et al. (2018) analyzed changes in

[4] Joyce and Kaestner (2001) also report difference-in-differences estimates of the effect of the PI law on the abortion rate adjusting for age, race and other factors. In this case, there is no evidence of a decline in abortions in South Carolina. The difference between this finding and the one reported above in the text is because the analysis reported here was in absolute terms, not proportional changes. Because baseline abortion rates differed significantly between the affected teens and older teens used as a comparison group, the difference-in-differences estimates differed.

[5] See also Colman, Joyce and Kaestner 2008 and Colman and Joyce 2009.

abortion to minors and young adults at a clinic in Illinois on the border with Missouri. Abortion to Illinois minors fell 26% (p<.17,) but they fell 32% to non-resident minors, almost all of whom were from Missouri. Overall, abortion to all minors fell from 220 abortions the year before the law to 156 the year after (p<.016). A similar study at a single facility in Cook County reported no meaningful change in abortions to minors after Illinois' PI law (Ramesh, Zimmerman and Patel 2016).

Among the studies that conducted broader analyses of the effect of PI laws across several states, the first was by Ohsfeldt and Gohmann (1994) who studied the effect of PI laws in place in 1984, 1987 and 1988 in approximately 30 states using data on abortion by state of residence.[6] They reported that PI laws reduced minor abortion by approximately 20%. However, the research design used in this study did not include state fixed effects and it used the ratio of the teen to adult (ages 18-19 or ages 20-44) abortion rate as the dependent variable.

Haas-Wilson (1996) used data from 1978 to 1990 to examine the effect of PI laws on teen abortion (ages 15 to 19). She used data from the CDC, which is measured by state of occurrence. The research design used in this study was the now standard difference-in-differences (two-way fixed effects) approach. Results indicated that PI laws reduced teen abortion by 13%. Notably this was the effect of PI laws on teens aged 15 to 19, but only teens aged 15 to 17 were affected. Given that not all teens were affected, it is reasonable to multiply the estimate reported by Haas-Wilson by a factor of three because only one-third of abortions among those aged 15 to 19 are among those aged 15 to 17 (Henshaw and Kost 1992). Doing so, yields an estimate of the effect of PI laws on minor abortions of 39%. Scaling the Haas-Wilson estimate in this way assumed that all of the decline in abortions was among those 15 to 17. If there was a fall in abortions among older women, then scaling by a factor of three overstates the effect size.

[6] Myers (2017) examined the effect of parental consent on the probability of giving birth in the early 1970s. Although abortion was legal nationally in 1973, many states required that minors have parental consent before a termination could be performed. Parent's blanket veto power over a minor's decision to abort was ruled unconstitutional by U.S. Supreme court in *Danforth* (1976). Myers found that the probability that a teen gave birth prior to 19 years of age was 5.2 percentage points lower in states that granted minors confidential access to abortion.

Levine (2003) used a difference-in-differences design with GI data on abortion by state of residence for teens aged 15 to 17 for four years: 1985, 1988, 1992 and 1996. Results indicated that PI laws reduced abortions among minors by 15% to 20%. However, estimates were sensitive to the inclusion of state-specific trends and there was some evidence that PI laws were associated with reductions in abortions among teens aged 18 to 19.[7]

The most recent study is Myers and Ladd (2017) who analyzed the effect of PI laws on the birth rates of minors from 1980 to 2014.[8] Myers and Ladd (2017) argued that the impact of PI laws would increase as more states enforced them because access to confidential abortion providers would require more extensive travel. While their analysis focused on births, Myers and Ladd (2017) reported estimates of the effect of PI laws on abortion using GI data from 1985 to 2011. They find that PI laws were associated with a 12% to 13% decline in the abortion rates of minors. Myers and Ladd (2017) found no significant effect of distance necessary to avoid a law on minor abortions.[9]

Summary and Contributions of Our Research

Taking an inventory of results from previous studies indicates that most studies find that PI laws decreased abortions of teens aged 15 to 17, and that an effect size of 15% is typical, although there is meaningful variation across studies. This consensus masks several unresolved issues that we attempt to address.

An important consideration in the analysis of PI laws has been the extent to which minors will travel to other states for an abortion without parental involvement (Dennis et al. 2009). While Cartoof and Klerman (1986) is often cited as evidence that there is significant travel among teens to evade the law, the

[7] With only four years of data (1985, 1988, 1992, and 1996), state-specific trends are estimated from only a few data points and are, thus, unlikely to be estimated with much precision.

[8] Also see New (2011) who examined the effect of PI laws using CDC from 1985 to 2005. He reported a 15% decline in the abortion rate of minors associated with PI laws. New (2011) did not include state or year fixed effects.

[9] Distance necessary to avoid a PI law is measured as the difference in distance between the nearest abortion provider and distance to nearest confidential provider. Thus, a teen who is 10 miles from nearest provider and 110 miles from nearest confidential provider faces the same avoidance distance as a teen who is 110 miles from the nearest provider and 210 miles from the nearest confidential provider.

authors' conclusions were arguably overstated. Minors did travel, but this did not negate the impact of the law. The study also pertained to a small state in 1981 with short travel distances to nearby states without PI laws. Similarly, MacAfee et al. (2015) and Ralph et al. (2018) showed that abortions fell more among out-of-state minors following PI laws in New Hampshire and Illinois than among resident minors of the state. But their results pertain to one clinic or a few clinics in close proximity to states where parental consent was not required. Other evidence of travel is less compelling. Ellertson's (1997) simulation analysis is speculative and uses data on travel four years *after* the implementation of the PI law to argue that travel may have offset much of the effect of the PI law in Missouri. Henshaw (1995) argued that Mississippi's PI law had no effect on the abortion rate of minors as most resident minors went out of state for an abortion in response to the law. However, Henshaw's estimates are potentially confounded by Mississippi's mandatory delay law that was enforced just 8 months prior to its PI law, which also induced many non-minors to leave the state for an abortion.

Identifying the extent of out-of-state travel by minors for a confidential abortion is a central empirical issue for national analyses of PI laws. The impact of distance to a confidential abortion provider becomes increasingly salient as more states enforce PI laws. Recent studies by Colman and Joyce (2011), Lindo et al. (2018) and Fischer et al. (2018) of abortion in Texas after closures of abortion clinics reported that distance to an abortion provider represents a substantial barrier to obtaining an abortion.[10] These studies, which apply to women of all ages, suggest that travel would be an even larger barrier for minors who lack the resources and capabilities of adult women and raise questions about whether out-of-state travel is an easily exercised option for teens. We explicitly analyze whether the distance necessary to evade a PI law affects abortion rates among minors (and older teens). We also assess whether the effect of PI laws has changed over time as distance to a confidential abortion provider has grown.

[10]Also see Jewell and Brown (2000) who reported that, among teens in Texas, the increased cost of travelling to a county with an abortion provider for teens living in a county without one, was associated with a 10% decline in abortions.

The issue of travel by minors is also relevant to our second contribution, in which we compare the effect of PI laws in state-year panels with data on abortions by state of residence and state of occurrence. The Guttmacher Institute estimates abortions to minors and older teens by state of residence, while the CDC's abortion surveillance system reports abortions by state of occurrence. State-year analyses of PI laws based on abortion rates by state of occurrence will overstate the impact of the law if resident minors leave the state for a confidential abortion and non-resident minors stop coming into the state with a PI law. Abortions by state of residence would resolve the issue, but such data are unavailable nationally and they are estimated by Guttmacher Institute. The GI data may not account for travel by minors in response to a law, as we describe below. Another complication is that the states and years included in the CDC and GI data differ (see Appendix Table 1). We harmonize these data and report estimates using a common set of states and years to illuminate the source of differences, if any, in estimates obtained using the two data sources.

Finally, we conduct several state-specific case studies using a synthetic control approach to assess heterogeneity of effects by state and time period. As argued earlier, there are several plausible reasons to expect that the effect of PI laws will differ by state and year. The case studies we conduct vary over time and include states with different types of PI policies and different proximity to confidential providers. The synthetic control approach also provides an assessment of whether minors adjust their behavior overtime in response to a PI law (Kane and Staiger 1996).

Empirical Approach

We use two empirical approaches to obtain estimates of the effect of PI laws on abortions to teens aged 15 to 17. And, as noted earlier, we use two data sources: information on abortions by state of residence provided by the GI and abortions by state of occurrence available from the CDC.

Difference-in-differences

The first approach is a difference-in-differences (DiD) research design (i.e., two-way fixed effects) that measures changes in abortions to teens aged 15 to 17 pre- and post-adoption of a PI law in states that did (treatment states) and did not (control states) adopt a law.

The DiD will be implemented using multivariate regression methods and the following regression model specification:

$$A_{jt} = \alpha_j + \delta_t + \beta PI_{jt} + \lambda\, Z_{jt} + u_{jt} \tag{1}$$

In equation (1), the abortion rate (*A*), or log of the abortion rate, of teens aged 15 to 17 in state j and year t depends on: state fixed effects (α_j); year fixed effects (δ_t); and a binary indicator of whether any PI law is enforced in that state and year. In addition, the model includes the following state-specific, time-varying covariates (Z_{jt}): state unemployment rate, state median wage for women ages 25 to 44; and shares of women ages 15 to 19 who are black, non-Hispanic and white-Hispanic. The coefficient, β, is the adjusted DiD estimate. The DiD regression model in equation (1) is standard. We estimate the model using weighted least squares where the weight is the state population of women ages 15 to 17. Standard errors allow for non-independence of observations within state (i.e., cluster robust standard errors).[11]

The primary threat to the validity of the DiD approach is from unmeasured confounders that vary by state and year (i.e., violation of parallel trends). To assess this problem, we estimate an event-study specification of the DiD regression model in which we allow the effect of the PI law to differ by the years surrounding implementation. Specifically:

$$A_{jt} = \alpha_j + \delta_t + \sum_{l=-6}^{l=5} B_l\, \mathbf{1}(PI_j * \delta_{l=t-t*}) + \lambda Z_{jt} + u_{jt} \tag{2}$$

The indicator function (**1**) means $\delta_{l=t-t*}$ is 1 if $l=t-t*$ and zero otherwise; t* is the year a PI law was enforced; l = -6 includes all years more than 5 years prior to the implementation of a PI law and l = 5

[11] We also estimated unweighted regressions and report results from these regressions in Appendix Table 2. Unweighted estimates are somewhat smaller than results reported in the text.

includes all years more than 4 years after the implementation of a PI law. The test of the validity of the DiD is that estimates of B_l in periods prior to the implementation of the law are zero.

We also address the potential threat from confounding factors by estimating a modified version of equation (1) that allows the effect of state-specific, time-varying covariates (*Zjt*) to differ by year. This specification is given by:

$$A_{jt} = \alpha_j + \delta_t + \beta PI_{jt} + \lambda\, Z_{jt} + \pi_{kt}\left(Z_{jkt} * \delta_t\right) + u_{jt} \tag{3}$$

The inclusion of the covariates (*Zjt*)-by-year effects is one way to control for potential confounding (see Jaeger et al. 2018). Note that we have used the subscript k to index covariates. An alternative approach is to include state-specific linear time trends, as in the following model:

$$A_{jt} = \alpha_j + \delta_t + \beta PI_{jt} + \lambda\, Z_{jt} + \pi_j\left(\alpha_j * TREND_t\right) + u_{jt} \tag{4}$$

Finally, to assess whether the effect of a PI law differs by the distance to the nearest non-PI law state, we estimate a model that allows the effect of the PI law to differ by the distance to the nearest state without a PI law. Distance is measured as in linear miles from the most populous city in the state with a PI law to the most populous city of the nearest state without a PI law.[12]

$$\begin{aligned} A_{jt} = {} & \alpha_j + \delta_t + \beta_1(PI_{jt} * DIST\_1) + \beta_2(PI_{jt} * DIST\_2) \\ & + \beta_3(PI_{jt} * DIST\_3) + \lambda_1 Z_{jt} + \pi_j\left(\alpha_j * TREND_t\right) + u_{jt} \end{aligned} \tag{5}$$

The new variables in equation (5) are the interactions between the indicator that the state had adopted a PI law and the distance to the nearest state without a PI law. We divided states that adopted a PI law into three groups that refer to the tercile of the distribution of distance from a state with a PI law to the nearest state without a PI law (*DIST_1* being the shortest distance tercile, *DIST_2* being the middle distance tercile, and *DIST_3* being the farthest distance tercile). The distance to a state without a PI law is updated as states adopt laws. Note that the model does not include a main effect for the indicator that the state

[12] We also used an alternative measure of distance: distance from the population centroid of the state with a PI law to the population centroid of the nearest non-PI state. Results did not differ meaningfully from those reported here and are available on request.

adopted a PI law because, in this specification, coefficients on the interaction terms measure the effect of a PI law in each type of state.[13]

We estimate equations (1), and (3) through (5) using two data sources on abortions to teens ages 15 to 17: CDC data on abortions measured by state of occurrence and GI estimates of abortion by state of residence. The CDC data contain information on between 30 to 40 states depending on the year and cover each year from 1985 to 2013. The GI data have information on all 50 states but for only ten different years between 1985 and 2013 (see Appendix Table 1).

We also test whether the effect of PI laws has changed over time. If distance to a confidential abortion matters, then, all else equal, the effect of PI laws on the abortion rates of minors should increase as minors have to travel further to avoid parental involvement. To explore this hypothesis, we estimate equation (3) for five time periods of approximately 12 years each defined by the span of years available in the GI abortion data (1985-1996, 1988-2000, 1992-2005, 1996-2008, 2000-2013). In addition, we estimate equation (3) in ten-year rolling panels using only the annual reported CDC data so as to trace out the evolving impact of PI laws over the 28-year study period.

Finally, we repeat the analyses just described, but using the abortion rate of teens ages 18 to 19. This group is almost completely unaffected by PI laws and the analysis of these teens is a falsification test that provides further evidence on the validity of the DiD approach.[14]

Synthetic Control Approach

We conducted a series of case study analyses using the synthetic control method of Abadie et al. (2010). The methodology is well-suited to case studies because it adjusts for pre-law trends among states with and without PI laws and uses randomization inference to determine statistical significance.

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[13] We also estimated this model using the regression model specification of equation (3) as an alternative and results (available upon request) were similar to those reported in the text.

[14] Joyce, Kaestner, and Colman (2006) show that some older minors, 17 years and between 8 and 11 months of age at the time of conception will delay their abortion until age 18 so as to avoid parental involvement. Thus, a small portion of abortions to teens 18 and 19 years of age include some who were minors at conception and exposed to the PI law.

Synthetic control methods also provide evidence as to whether the effect of a law persists or whether there is adjustment to the law over time.

For each state that adopted a PI law and for which we had sufficient data, the synthetic control approach uses a matching procedure to construct a counterfactual minor abortion rate consisting of a weighted average of minor abortion rates in states that did not adopt a PI law. However, not all states that did not adopt a law are used to construct the counterfactual minor abortion rate. The selection of control states is accomplished using a matching algorithm that minimizes the pre-adoption difference between the abortion rate in the treated state and the weighted average of abortion rates of the control states. Only states that have positive weights contribute to the counterfactual abortion rate.

The Abadie et al. (2010) approach is in the same spirit of the DiD approach because the estimate of the effect of a PI law on minor abortions is obtained by taking the difference in mean abortion rates between the treated state and weighted average of control states (i.e., synthetic control), but only in the post-adoption period. The synthetic control approach assumes that the pre-adoption difference in abortion rates between the treated and synthetic control group is zero. The reasonableness of this assumption can be verified not only through visual inspection, but also numerically.

The key decision in implementing the synthetic control approach is the selection of the weights that are used to construct the counterfactual outcome for each state that adopts a PI law from a pool of potential "donor states." There are a variety of ways to select the weights that are used to construct the counterfactual outcome, and there is no generally accepted "best" method. Accordingly, we use three methods. Method one uses the annual value of the dependent variable in each of the pre-period years to match and derive weights for control states. Method two uses the average level of the dependent variable across all pre-period years and the average level of controls for state unemployment rate, state median wage, state share of 15-19 year-olds black, and state share of 15-19 year-olds Hispanic in the pre-period years to match and derive weights for control states. Method three is the same as method 2 but adds the value of the dependent variable in year t-1 to match and derive weights for control states

Once the weights are selected and the counterfactual outcome is constructed, the estimate of the effect of the PI law in state j on the abortion rate of minors in that state is derived by taking the post-adoption mean difference in abortion rates between the treated state and the synthetic comparison state. Inference for the estimate is obtained through permutation testing (randomization inference). This test consists of conducting the synthetic control analysis for all non-treated states. For example, if there are 20 non-treated states (even if they did not contribute a positive weight), then we obtain 20 synthetic control estimates corresponding to treating each of the 20 states as if they had a PI law. We then calculate the share of "randomized" estimates that are larger in absolute value than the estimate obtained using the actual treatment state. This share is the *p*-value corresponding to a two-sided hypothesis test.

We conducted case study analyses for any state that adopted a PI law as long as we had sufficient data. In practice, we required there to be five years of pre-adoption data and three years of post-adoption information, and for potential donor states to have no PI law change over this period.[15] However, we eliminated "treated" states from the analysis if we could not obtain a reasonable pre-period match, as measured by whether the mean abortion rate of the counterfactual state tracked the mean abortion rate of the treated state in the pre-adoption period.[16] Other data considerations, as described in detail below, resulted in a final sample of 12 "treated" states that we use with the synthetic control method. As a falsification exercise, we also conducted synthetic control analyses for the 12 states using teens ages 18 to 19. We expected to find no effect of PI laws on teens in this age group.

Data

Individual-level Data on Abortions

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[15] In order to maximize the number of states we analyze, we also generated synthetic control estimates for Minnesota, which had four years of pre-period data. All other potential treated states had three or fewer.

[16] We dropped two states for this reason: Idaho and Wyoming. These states are also dropped as potential donor states when constructing counterfactual outcomes.

We obtained individual-level data on abortion that included abortions to residents performed in-state and out-of-state as well as to non-residents performed in-state. The three states with data covering the date that a PI law was adopted are: Mississippi (1993), North Carolina (1996) and Texas (2000). Unlike with births, there is no mandatory reporting agreement between states in which induced termination of pregnancy certificates to residents in state A that occur in state B, for example, are sent back to the vital records office in state A. However, states that do collect data on abortions as part of the vital statistics surveillance often report a non-resident's state of residence. In the case of North Carolina, for example, we use data from South Carolina and Virginia to track the change in abortions to minors of North Carolina before and after the law. We did not have data on North Carolina residents who may have gone to Tennessee. In the case of Texas, we had data on abortions to Texas residents performed in Arkansas, New Mexico and Oklahoma. We lacked data from Louisiana, but Louisiana has had a parental consent law since 1981. In the case of Mississippi, the state Department of Health collected data on induced abortion to residents of Mississippi that occurred in other states with the exceptions of Florida and Louisiana. These data are used to illustrate the extent of travel by minors and older teens in response to PI laws. Large flows of minors in response to a PI law suggest that the use of occurrence data would overstate the effects of a PI law whereas minimal flows suggest that the bias from out-of-state travel is minimal.

State-year Panel Data

The primary data source on teen abortion is provided by the Centers for Disease Control (CDC) abortion surveillance system that collects annual data from participating states on abortions by age and state of occurrence. The data span 1985 to 2013, but a number of states do not report abortions to the CDC in every year. California and New Hampshire have never reported abortions to the CDC. Several states do not report abortions by age: Alaska, Florida, Illinois, South Dakota and, in more recent years, Maryland and Wisconsin. Other states, such as Colorado, Hawaii, and Oklahoma, only began reporting abortions by age in recent years.[17]

Another data source on teen abortions is from the Guttmacher Institute (GI). GI's surveillance system of abortion is considered a more accurate estimate of total abortions than the CDC's.[18] The mean value of the ratio of abortions to 15 to 17 year-olds reported by the CDC to abortions to 15 to 17 year-olds reported by the GI among the states present in both the CDC and GI data sets for the years of the GI data is 0.86. However, the Guttmacher Institute does not collect information on the age or the state of residence of a person. Instead, they generate estimates of the total number of abortions by age and state of residence from their total counts of abortion by state of occurrence using the age distribution and information on residence collected by the CDC and state reporting agencies. GI data are available for the years 1985, 1988, 1992, 1996, 2000, 2005, 2008, 2010, 2011, and 2013. One limitation of the GI data is that, in states and years when there is no CDC information, abortions to minors in a state are estimated using age distributions in either surrounding states or, in some cases, the national average. Therefore, in these cases, the GI data may not reflect the effect of PI laws on minor abortions because the share of minor abortions in other states will not change with the adoption of a PI law in the state of interest. Similarly, in states without PI laws, using the share of minors in surrounding states that have PI laws will introduce similar errors.[19] To address this difference, in some analyses, we restrict the GI data to the states and years present in the CDC data. Notably, analysts at the Guttmacher Institute note that their residence abortion rates do not account for potential out-of-state travel by minors in response to PI laws (Kost, Maddow-Zimet and Arpaia 2017).

Parental Involvement Laws

[17] We drop data from a small number of states due to either direct knowledge of fundamental changes in data reporting (e.g., Washington DC), or because of the presence of extreme outlier observations (year-to-year changes in abortion >3 standard deviations). The state-years excluded are: all years for Washington DC; Delaware prior to 1999; Kentucky prior to 1988; Texas prior to 1988; and West Virginia prior to 1992.

[18] See: https://www.guttmacher.org/gpr/2015/06/abortion-reporting-promoting-public-health-not-politics

[19] For some states, Guttmacher uses an averaging procedure on the distributions of abortions by age in surrounding states that has varied over time (e.g., https://www.guttmacher.org/report/us-adolescent-pregnancy-trends-2013).

Information on PI laws was obtained from several sources.[20] We created a dichotomous indicator of whether a PI law was in effect in a state and year. In states that adopted a PI law mid-year, we used the fraction of the year the law was in effect to the nearest half-month. We did not make a distinction between parental notification statutes that require a physician performing the abortion to notify the parents in advance of the procedure and parental consent statutes that require one, or in some cases both, parents to give written consent to the termination.

Results

Analysis of Out-of-state Travel in Three States

In Table 1, we show the number for abortions one year before and after a PI law went into effect in North Carolina (1996) and Texas (2000). For Mississippi (1993), we chose the number of abortions in 1991 as the pre-law period because Mississippi imposed a mandatory delay law in August of 1992 that required two in-person visits to the provider, one for the counseling and a second for the procedure. The mandatory delay law had a large impact on travel out of state for an abortion (Joyce, Henshaw and DeClerque Skatrud 1997). Data in Table 1 presented by age, state of occurrence and state of residence. The simple difference-in-differences analysis in Table 1 is descriptive and intended to highlight changes in abortions by state of residence and occurrence, and the role of out-of-state travel.

In Mississippi, there were large absolute and relative changes in total resident abortions to minors (180, 25.2%) and teens 18 to 19 years of age (226, 25.7%). One hundred and forty-five resident minors left the state for an abortion and 173 non-resident minors stopped coming into the state. Similar changes in travel were observed for older teens aged 18 to 19. Thus, abortions by state of occurrence fell by 501 (89%) among minors and 471 (64.7%) among older teens suggesting a difference-in-difference estimate

[20] Our initial source up to 1994 was Merz, Jackson and Klerman 1996; We also relied on volumes of "Who Decides" published by the NARAL Foundation. The most complete compilation of PI laws is available from Myers (2017). We also had personal communication with Elizabeth Nash of the Guttmacher Institute.

in relative terms of 24.3% (89.0% – 64.7%). In contrast, abortions by state of residence suggested no relative changes.

Changes in minor abortions pre-to-post law in North Carolina and Texas indicate that resident abortions fell 17.2% more among minors relative to older teens in North Carolina (23.7% versus 6.5%) and 12.5% more in Texas (21.4% versus 8.9%). Similar estimates are obtained using occurrence data. The lack of difference in the estimates obtained with resident and occurrence data is due to the small amount of documented out-of-state travel in NC and TX.

It is not clear whether this difference in out-of-state travel between Mississippi and the other two states is related to the distance to confidential providers. All states surrounding Mississippi had PI laws in 1993 and the closest states that did not have a law were Texas, Florida, North Carolina and Virginia—all relatively far from Mississippi. Despite these distances, out-of-state travel was substantial. However, Mississippi required that both parents consent to the termination, which may explain why some minors travelled to Alabama and Arkansas, in which only a single parent was required to be involved. In contrast, the seemingly limited travel by minors both into- and out-of-state in North Carolina and Texas occurred despite the absence of PI laws in some nearby states. In the case of North Carolina, Virginia, which borders North Carolina, did not have a law in 1995. With respect to Texas, there were no PI laws in New Mexico and Oklahoma in 2000, but given the size of Texas, travel to these two states was likely difficult for many residents. Overall, the results in Table 1 on the extent of out-of-state travel are consistent with a weak relationship between distance to a confidential abortion provider and minor travel, suggesting that distance to a confidential provider may not be an important confounder of the association between PI laws and abortions to minors.

State Panel Data

We begin the presentation of results by showing the mean abortion rate by year for three groups of states: states that adopted a PI law pre1997, states that adopted a PI law post-1996, and states that never adopted a PI law (Figure 1). These figures are based on CDC data. A few patterns are notable.

Throughout the sample period, states that never adopted a PI law have higher abortion rates than states that adopted a PI law. It is also evident that the trend in abortion rates for states that adopted a law, either early or late, is very similar. Therefore, the adoption of PI laws appears to explain little of the secular decline in abortion rates to minors. Finally, for all three groups of states, there is a marked decrease in abortion rates from 1989 onward. Of course, Figure 1 does not exploit differences in the timing of state adoption of a PI law and does not adjust for any state, year or covariate influences on abortion rates.

Event-study Estimates

Next, we present the estimates from equation (2), the event-study specification of the DiD model. We use CDC data, and show results for minors in Figures 2 and for teens aged 18 to 19 in Figure 3. If the DiD design is valid, then estimates of the effect of adopting a PI law should be zero in periods prior to implementation. This is exactly the pattern found in Figure 2 in both panels A (abortion rate) and B (log abortion rate).[21] Estimates also suggest a negative effect of PI laws on abortion rates of minors after implementation of approximately 20 percent (e.g., minus 0.2 log points, panel B). It is also evident in Figure 2 that the effect of the PI law appears to persist for several years after implementation.

In contrast to estimates in Figure 2, estimates in Figure 3, which pertain to teens aged 18 to 19, indicate that the adoption of a PI law by a state had no effect on the abortion rates of teens of this age. All estimates in both panels A (abortion rate) and B (log abortion rate) are statistically insignificant and relatively small (<5%). This evidence is also supportive of the research design, although we note the somewhat imprecise nature of the estimates.

Difference-in-differences Estimates

Given the evidence in Figures 2 and 3, which support the validity of the DiD approach, we proceed by presenting DiD estimates based on models specified in equations (1), and (3) through (5). Table 2 presents estimates for each model using two measures of abortions: the abortion rate per 1000

[21] F-tests for these event study analyses all fail to reject the null hypothesis that all estimates of the coefficients on the interaction terms between an indicator that a state adopted a law and pre-period years are jointly equal to zero. The smallest p-value was 0.33.

women of the indicated age, and the natural logarithm of this abortion rate. We refer to estimates from equation (1) as Model A; estimates from equation (3) as Model B; estimates from equation (4) as Model C; and estimates from equation (5) as Model D. For each model, we present estimates using CDC and GI data. The CDC data are an unbalanced panel of states and span the years 1985 to 2013. The GI data are a balanced panel of states (50 states plus DC), but for selected years (1985, 1988, 1992, 1996, 2000, 2005, 2008, 2010, and 2013). To explore the sensitivity of the estimates to the number of states and years covered by each data set, we also present estimates from models that use CDC data limited to the years available in the GI data panel and from models that use only the GI data state-year observations that are present in the CDC data panel. To focus more on models that we think are preferred on statistical grounds, we will limit discussion of results to estimates obtained from Models B through D. Model A is the most basic model, and it is clear from the variation in estimates and standard errors that the addition of controls for state-specific confounders matters. However, there is general consistency among estimates obtained from Models B and C suggesting that the way we adjust for state-specific confounding is not particularly important.

Beginning with results from models that used the natural logarithm (log) of the abortion rate, estimates from Models B and C indicate that adoption of a PI law is associated with between a 13% and 24% decrease in abortions to teens aged 15 to 17, and all estimates are statistically significant. Estimates from Models B and C using the full CDC and GI data sets are around -13% to -18%%. Estimates from models B and C that use the CDC data limited to the years in the GI data panel and the GI data limited to state-years in the CDC panel are larger and indicate that PI laws decrease abortions by an average of approximately 22%.

The larger (more negative) estimates found when the GI data are limited to the CDC states and years is consistent with how the GI data are constructed. As noted, in years when there are no CDC data with which to estimate the distribution of abortions by age in a given state-year, researchers at GI apply the share of abortions to minors in other states to their total count of abortions (or use the national average

age distribution). In these cases, the minor abortion rate will not reflect any effect of the PI law in a state that adopted a law. In control states, using the share of minors from states with PI laws will also result in measurement error. Both of these sources of measurement error will attenuate estimates towards zero, which is what we observe. After accounting for this issue, the data source (CDC or GI) does not affect the estimates in a qualitatively meaningful way, as evidenced by the similarity of estimates using models B and C in the last two columns of each panel in Table 2.

Finally, estimates from Model D indicate that the effect of PI laws does not differ statistically or quantitatively by distance to a non-PI state. This finding suggests that minors do not travel much in response to the adoption of a PI law. If they did, we would expect the effect of a PI law to be larger in states that are far from another state that does not have a PI law. The estimates in Model D do not support this expectation.

Results from models that use the abortion rate are generally consistent with those that use the log abortion rate. In this case, however, there is a bit more variability of estimates between Models B and C. But all estimates from Models B and C are negative, generally similar in magnitude, and those from Model C are statistically significant (and larger). Estimates from Model B indicate that adoption of a PI law is associated with between a 10% (1.59/15.4) and 17% (1.81/10.9) decrease in abortions to teens aged 15 to 17, relative to the mean abortion rate. From Model C, estimated effects are between 12% and 29% and are, as noted, statistically significant. The 29% effect size is an outlier from the specification that uses CDC data limited to GI years. The difference in magnitude is similar to that observed in the analogous log abortion rate model. The other three estimates from Model C are between 12% and 22%. Estimates from Model D are all negative and statistically significant and suggest, again, that the effect of PI laws does not differ by distance to the nearest non-PI law state.

Overall, estimates in Table 2 provide consistent evidence that PI laws are associated with a decrease in abortion rates to teens aged 15 to 17. While there is some variability in estimates, all estimates are negative, most are statistically significant, and most are in the 15% to 20% range. In fact, taking a simple average of estimates from Model B (across all eight models) yields 16.0% and from Model C yields 19.6%. A second finding is that distance to the nearest non-PI state does not seem to affect estimates. This finding suggests that travel by minors is not a particularly important behavioral response to the adoption of a PI law. This finding is consistent with the evidence from the three-state analysis presented earlier. It is also consistent with the broader literature demonstrating that distance is an important barrier to obtaining an abortion among all women, which suggests that even modest distances would significantly limit out-of-state travel by minors to avoid compliance with a PI law. Finally, while there is some variability of estimates across data sets, estimates obtained using either CDC or GI data are similar, particularly when the samples are harmonized to include the same states and years. Estimates obtained using CDC data are larger on average, which is consistent with the likely attenuation bias associated with the GI data because of its method of construction.[22]

To further assess the validity of the DiD research design, we re-estimated the models in Table 2, using a sample of teens aged 18 to 19. These women were largely unaffected by PI laws. Estimates for this sample are presented in Appendix Table 3. No estimates from models B or C in Appendix Table 3 are statistically significant and there is no systematic evidence of a negative effect or any other consistent pattern. Effect sizes are also quite small; estimates from Models B and C in log abortion rates models are between -0.006 (>1%) and .059 (≈5%). In sum, estimates in Appendix Table 3 add to the previous evidence of a valid design found in the event study analysis.

Period-specific Estimates

We next assess whether the effects of the PI law differ by time period. As noted, the increasing adoption of PI laws by states over time has dramatically increased the distance from a state with a PI law to a state without a PI law. If teens were travelling out-of-state to avoid the effect of a PI law, the

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[22] As an additional assessment of the sensitivity of our estimates to years used in the analysis, Appendix Table 5 presents estimates using a restricted subset of the CDC data. First, we restricted to the years to 1991-2013. In earlier years, several states are missing information (see Appendix Table 1). Second, we kept only a set of states that are missing no more than two observations over this 23-year period. The results using this sample are similar to those reported elsewhere in the text.

increasing adoption and increasing distance necessary to evade the law would manifest as an increasingly negative effect of a PI law on the abortion rate of minors, all else equal. Alternatively, changes in the composition of minors at risk of abortion, as well as other factors affecting the impact of PI laws, may have changed over time and across states, and this would cause estimates to differ by time period. To assess these hypotheses, we conducted two exercises. First, we obtained estimates of the effect of PI laws for five, approximately 12-year periods. These periods are: 1985-1996, 1988-2000, 1992-2005, 1996-2008, and 2000-2013. We selected these periods based on the availability of GI data.

Table 3 presents estimates using these five, partially overlapping time periods for Model B. The general pattern of the estimates is as follows: for the periods that begin with the years 1985, 1988 and 1992, the effect of PI laws was always negative, statistically significant in all but one instance, and effect sizes ranged from -11% to -26% (i.e., -0.303 log points). Conversely, in the periods beginning with 1996 and 2000, estimates of the effect of PI laws are usually not statistically significant and not always negative. Among the estimates using the full set of states and years in the CDC and GI panels only three of the eight estimates are negative and none are statistically significant.

We also conducted an analysis similar to that in Table 3 using a sample of teens aged 18 to 19 (Appendix Table 5). This group is unaffected by PI laws and we expect estimates to be zero on average if the research design is valid. This is what we found. In the earlier periods we estimated imprecise, usually negative, point estimates that are quite small (averaging -2.4% across all the estimates using the log abortion rate outcome). In the latter periods, around half the estimates change sign, with only two (positive) estimates across all specifications having marginal statistical significance.

As a further exploration of the time-varying effect of PI laws, Figure 4 shows estimated effects of a PI law using 10-year rolling panels of the CDC data. This exercise resulted in 20 estimates covering the periods 1985-1994 through 2004-2013. All estimates from the earlier panels were negative, statistically significant, and increasing in magnitude through the estimate for the period 1991-2000. The largest effect size during these periods was approximately -25%. After this period, there is a clear, monotonic decline in the effect size and estimates become statistically insignificant after 1995-2004. The same rolling panel for 18- to 19-year-olds in the right-side panel of Figure 4 shows no statistically significant effect of PI laws on the abortion rates of older teens in any time period.

It is clear from estimates in Table 3 and Figure 4 that the effect of PI laws declined over time. The declining pattern is inconsistent with the notion that the effect of PI laws should increase as the travel distance required to evade the laws increases. Instead, our results are consistent with the notion that earlier evidence showing travel by minors to states with confidential access to abortion in response to a PI law was overstated. Moreover, the assumption that PI laws have homogeneous effects on the abortion rate of minors is also questionable. Enforcement of PI laws may vary as legal challenges create ambiguity among patients and providers. Second, the ease with which minors can obtain abortions without parental involvement through a judicial bypass also varies widely among states (Altindag and Joyce 2017). Lastly, access to contraception as well as new methods of contraception can affect the composition of minors at risk of an abortion. In the next section we use the synthetic control method to explore potential heterogeneity in the effect of PI laws by state.

Synthetic Control Estimates

We conducted a series of case studies using synthetic control methods to examine the effect of PI laws in 12 states: AZ, GA, MD, MN, MS, NE, NC, PA, SC, TN, TX and VA. These 12 states do not represent all of the states that passed a PI law, but are those that we can feasibly examine using given data limitations. Specifically, to implement this approach, we required that there be data for five years prior to adoption of the PI law and three years subsequent to adoption of the law.[23] We also limited the analysis to states in the CDC data because the synthetic control approach requires several pre-period observations

[23] As mentioned above, we included Minnesota with only four years pre-period data. For all other states besides South Carolina, which only had available five pre-period observations, we generated synthetic control estimates using six pre-period years. Results from these analyses were quantitatively the same. We preferred the five-year pre-period because it increased the number of potential donor states and therefore the statistical power of the randomization inference procedure.

that are unavailable in the GI data that has a limited number of unevenly-spaced years.[24] If a state passed a law after the beginning of the year, we assigned the adoption year to be the actual year if the law was passed prior to July. Otherwise, we assigned the adoption year as the next year.

We group the states between those that had a PI law before 1997 and those that enforced laws after 1996. The early group of states and the type of law (parental notice or consent) include: GA (1992, notice), MD (1992, notice), MN (1990, notice), MS (1993, consent), NE (1991, notice), NC (1995, notice), PA (1994, consent), SC (1990, consent) and TN (1992, notice). The late-adopting group of states and type of law are: AZ (2003, consent), TX (2000, notice) and VA (1997, notice).

Among the early adopters of PI laws, there are clear, substantial and (marginally) statistically significant effects of the laws on the abortion rates of minors in Mississippi, North Carolina and Pennsylvania (Figures 9, 11 and 12 and Appendix Tables 10, 12 and 13). We note that the match between the actual and counterfactual in Mississippi is not as good as in the other two states and thus we are cautious in interpreting these estimates as valid causal effects. Effects size range from 0.24 to 0.29 log points in North Carolina, between 0.33 and 0.39 log points in Pennsylvania, and approximately 0.60 log points in Mississippi depending on the specification. The effect size for Mississippi is substantially larger than that reported by Henshaw (1995) and Joyce and Kaestner (2000), although the absolute decline in minor abortions reported in Table 1 is approximately 60%. The negative effects of the PI law on minor abortions in Mississippi, North Carolina and Pennsylvania were found despite a difference in the type of law (consent v. notice) and differences in the distance to a confidential provider. In Mississippi all surrounding states had a PI law in effect at the time. In North Carolina and Pennsylvania here were nearby states that did not have PI laws; in the case of North Carolina, Virginia did not have a law, and in

[24] Among states with the requisite data, we dropped ID, and WY due to an inability to generate a good pre-period match using our three specifications. Given this, we also eliminated these states from the pool of potential “donor” states to use in constructing the synthetic control units. In Kansas, during the same year the law was enacted, reported abortions among all age groups increased by around 20% and stayed at this higher level across several subsequent years. In the regression models we use a Kansas times post-1992 dummy variable to address this global issue, but in the synthetic control method, there is no analogous solution to this data anomaly.

the case of Pennsylvania both New York and New Jersey did not have PI laws. Estimates in Mississippi and Pennsylvania indicate a growing effect of the law over time and estimates are relatively constant in North Carolina. These increasing or persistent effects of PI laws are inconsistent with the hypothesis that minors adapt to the law (Kane and Staiger 1996).

Four of the early adopting states experienced declines in minor abortion relative to the counterfactual, although the declines were not statistically significant despite being sometimes large. The decline in Minnesota (Figure 8, Appendix Table 9) was between 0.09 and 0.19 log points; in Nebraska (Figure 10, Appendix Table 11) the decline was between 0.19 and 0.24 log points; in South Carolina (Figure 13, Appendix Table 14) the decline was between 0.10 and 0.12 log points, and in Tennessee (Figure 14 and Appendix Table 15) the decline was between 0.02 and 0.12 log points.[25] In these states, there were differences in the type of law and differences in the distance to a nearest confidential provider, but little systematic relationship between the magnitude of the effects and these potential moderators of the effect of PI laws. The lack of statistical significance of even large estimates reflects the relatively small number of states that could be used in the randomization inference procedure and the associated lack of statistical power.

Among the early adopting states, only Georgia (Figure 6 and Appendix Table 7) and Maryland (Figure 7 and Appendix Table 8) did not experience a decline in minor abortions relative to the counterfactual. In the case of Maryland, the absence of an effect is consistent with the nature of the law that allowed a physician to certify that the minor was mature and, if so, to bypass the notification requirement. There was also easy access to abortion services for minors in Maryland in Washington DC, Pennsylvania and Delaware at the time.

For later adopting states, there is some evidence of a decline in the abortion rates of minors associated with the PI law in Texas (Figure 15 and Appendix Table 16), and Arizona (Figure 5 and

[25] The effect size reported here for Minnesota is similar to that reported by Ellertson (1997) and the effect size for South Carolina is similar to that reported by Joyce and Kaestner (2001).

Appendix Table 6), but in both cases, the magnitude of the estimated effects depends meaningfully on how the counterfactual outcome is constructed (i.e., using all pre-period values of the outcome or the other two methods that use covariate values along with pre-period outcome measures). In Arizona, estimated effect sizes are between -10% and -20% with two of the three estimates using the natural log of the abortion rate being statistically significant. In Texas, effect sizes range from 0.16 to 0.36 log points, consistent with Joyce, Kaestner and Colman (2006). However, estimates are only marginally significant. In Virginia (Figure 16 and Appendix Table 17) we find no effect of the PI law.

We also estimated effects of a PI law for women aged 18 to 19 using the same synthetic control approach. These results are presented in Appendix Figures 1 to 12. The great majority of these estimated effects are positive and not close to being statistically significant. But one important exception is Texas, where we estimated marginally significant, negative effects that are similar (40% to 75% of the magnitude) to the effects found for 15- to 17-year-olds. The effect implied by taking the difference between the estimated effects for women ages 15-17 and 18-19 ranges between -4% and -20%, but the lack of a clear null result for older teens suggests that the results for Texas minors may be confounded by unobservable factors. For this reason, we suggest caution in interpreting the Texas results causally.

Conclusion

State parental involvement laws that limit the ability of minors to obtain an abortion have potentially serious consequences. Besides the effect of such laws on abortion, these laws may affect unintended births, contraception and, through changes in these outcomes, the human capital investments of young women. In this article, we examined the effect of the PI laws on the abortion rates of minors. We added to the existing literature in several ways, most notably by assessing whether the effect of PI laws vary significantly across states and over time.

Results from our study indicated that PI laws adopted prior to the mid-1990s reduced abortion among minors, but that after this time the adoption of PI laws had little effect, on average, on the abortion rate of minors. Estimates suggest that earlier PI laws reduced minor abortions between 15% and 20%. We also found that there was little relationship between the effect of PI laws and the distance to a state without a PI law. This finding suggests that the ability to travel out-of-state to avoid complying with a PI law is not sufficient to offset the constraint such laws impose on abortion to minors as some previous research has suggested (Cartoof and Klerman 1986; Henshaw 1995). Third, we found evidence to suggest substantial state heterogeneity in the effect of PI laws, although the variation in effects did not appear to be related to the type of law, or, as already noted, whether surrounding states had laws that may have made it more difficult for minors to travel out-of-state to avoid compliance. We also note that the state-specific analyses were underpowered to detect reliably small to moderate effect sizes and therefore we view these results as more suggestive than definitive.

The finding of substantial heterogeneity in the effects of PI laws by year and state is an interesting result. We were unable to identify the causes of these heterogeneous effects, although we have provided evidence that this heterogeneity is not likely related to the ability to travel out-of-state or the type of law. One possibility is that the heterogeneity across states and over time is related to differential changes in the composition of teens at risk of abortion due to differences in the use of contraceptive technology, access to medication abortion and to changes in parent-child relationships. Differences in the availability of judicial and physician bypass may also play an important role in some settings. Other causes are also possible. This is clearly an important area for future research to investigate.

Finally, this study compared estimates using the two primary abortion surveillance data sets available in the U.S. The CDC data are the most detailed data available by state, year and age, but key states such as California and Florida are not included and these data reflect abortions by state of occurrence instead of residence. The GI survey of abortion providers is considered the most accurate count of total abortions by state, but researchers at the GI estimate abortions by age and state of residence using the age distribution of abortions obtained from the CDC. Additionally, the intermittent periodicity of the GI estimates, which omit as many as four years at a time, means that potentially important year-to-year variation will not be recorded. Given these important limitations, it is somewhat reassuring that both data sources yielded roughly similar estimates of the effects of PI laws on the abortion rates of minors, particularly when a common set of states and years were used in the analysis.

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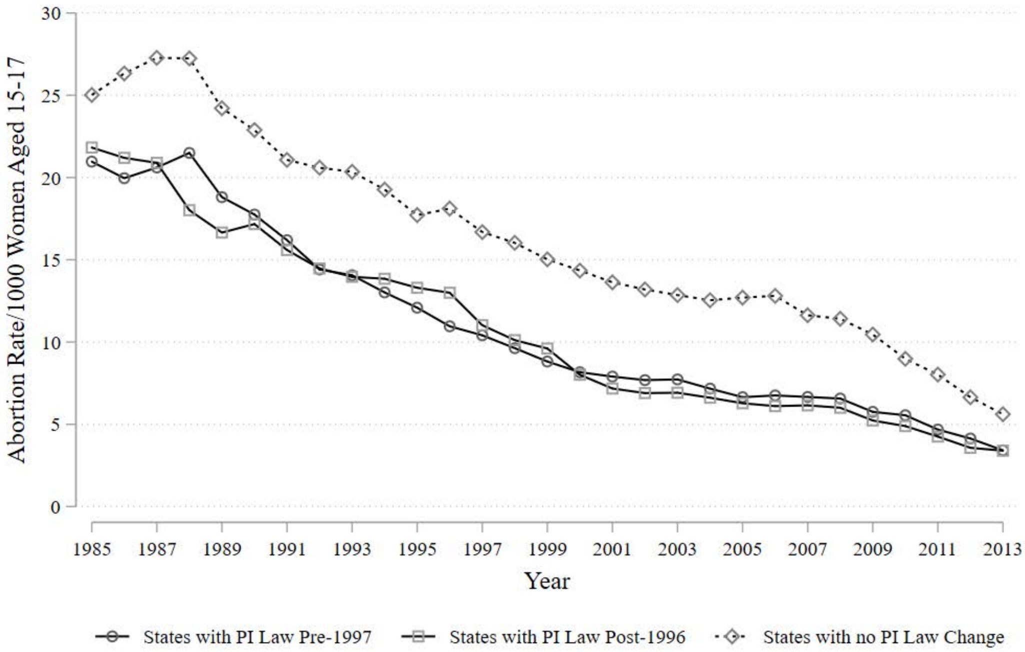
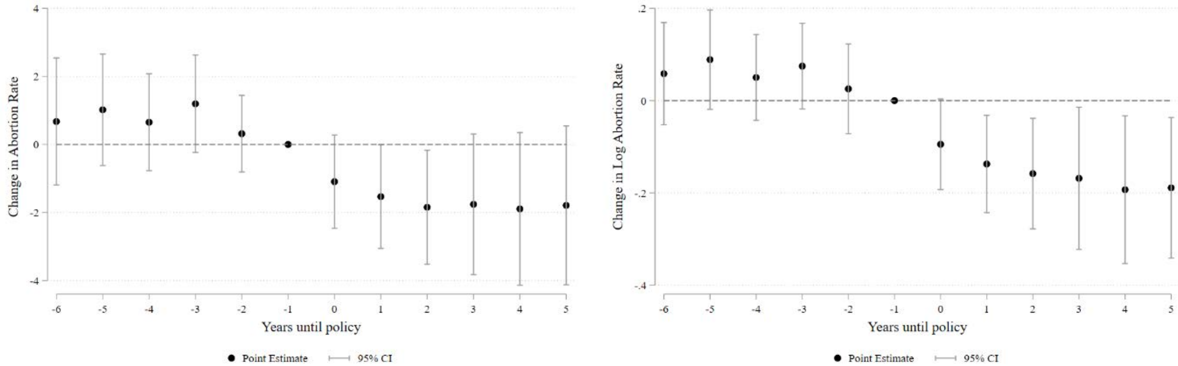
Figure 1: Annual State-Level Means of Abortion Rates to Women Ages 15-17



Source: CDC Abortion Surveillance Reports, 1985-2013. Each point is the mean abortion rate per 1000 women aged 15-17 within a group of states as specified. Uses unbalanced panel that includes states with any valid CDC state-year observations (this excludes California, Florida, Illinois, and New Hampshire). Each state's contribution to the annual mean value is weighted by female population ages 15-17.

Figure 2: Event Study Estimates of Effect of PI Law on Abortions Among Women Aged 15-17

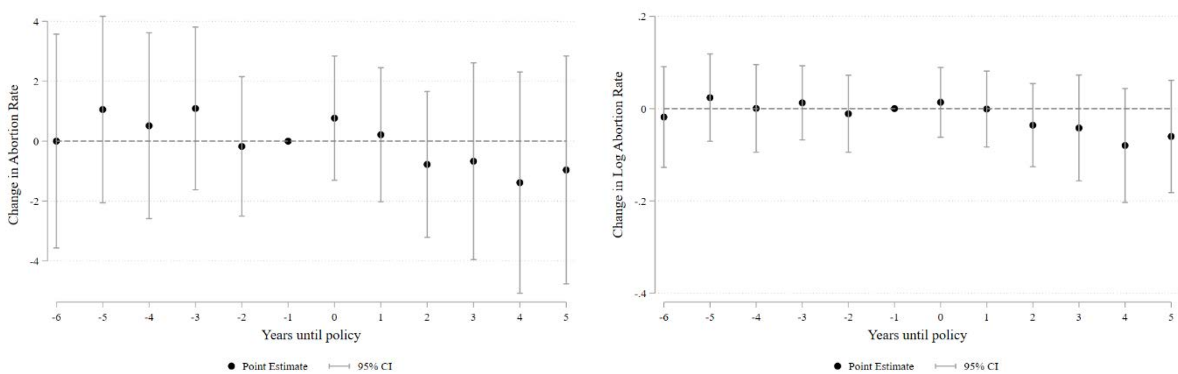
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



Regression model controls for state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic as well as each of these controls interacted with year indicators. Regressions are weighted by state population of women 15-17 and standard errors are clustered at the state level.

Figure 3: Event Study Estimates of Effect of PI Law on Abortion Rate per 1000 Women Aged 18-19

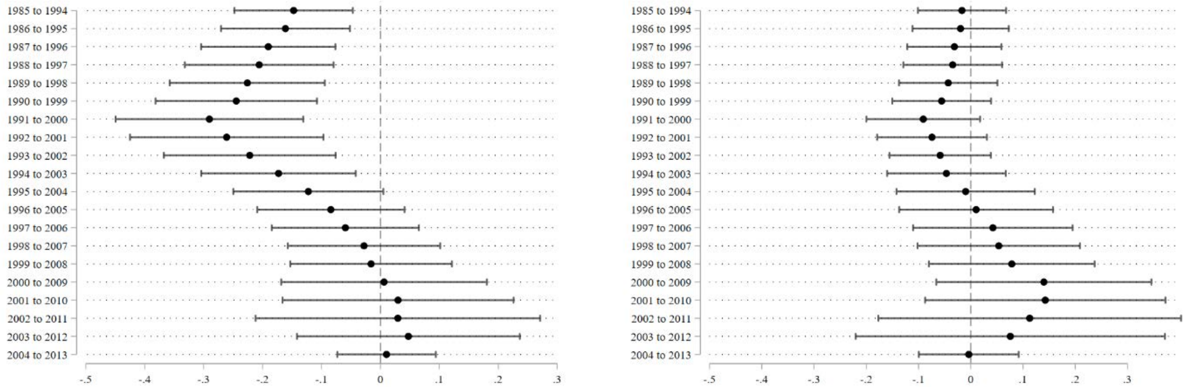
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



Regression model controls for state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic as well as each of these controls interacted with year indicators. Regressions are weighted by state population of women 18-19 and standard errors are clustered at the state level.

Figure 4: Estimated Effect of PI Laws on Log of Abortion Rate using a 10-Year Moving Average

Panel A: Women Ages 15 to 17 | Panel B: Women Ages 18 to 19



Source: CDC Abortion Surveillance Reports 1985-2013. Estimates are generated using a 10-year window of data incremented by 1 year for each estimate as indicated on y-axis. Estimates generated using Model ("B" in text), which includes: state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic, and interactions between these covariates and year fixed effects. Regressions weighted by female population aged 15-17 or 18-19. Standard errors clustered at the state level.

Figure 5: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Arizona

Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women

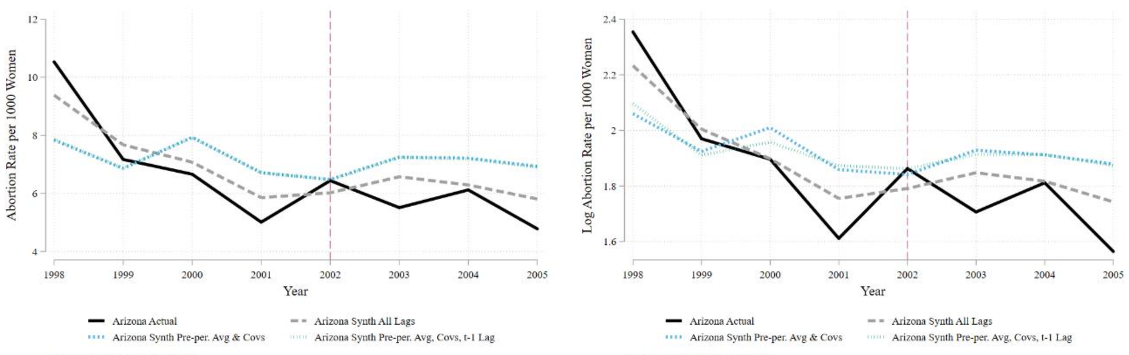
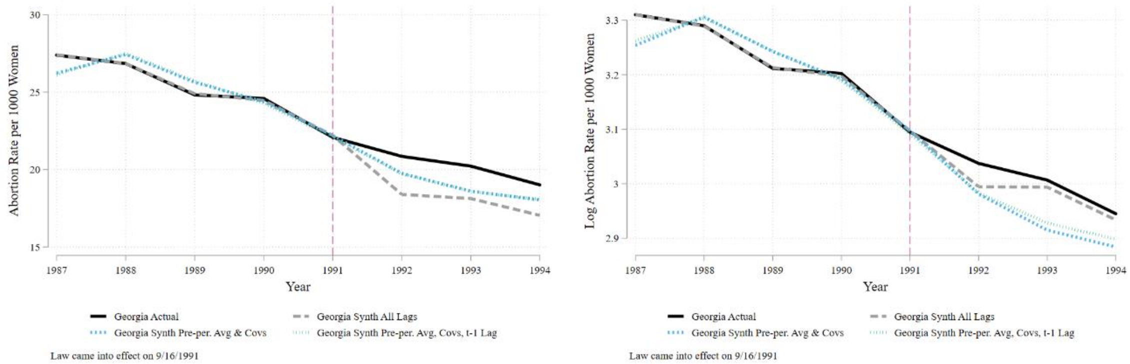


Figure shows the path of abortions for the "treatment" state and the counterfactual path for three different synthetic control models as indicated. "All Lags" model (Method 1 in tables) uses values of the dependent variable in the five pre-period years to match and derive weights for control states. "Pre-per Avg & Covs" model (Method 2) uses the average of the dependent variable over the five pre-period years and all pre-period values of controls for state unemployment rate, state median wage, state share of 15-19 year-olds black non-Hispanic, and state share of 15-19 year-olds white, Hispanic to match and derive weights for control states. "Pre-per Avg, Covs, t-1 Lag" model (Method 3) uses the inputs for method 2 along with the value of the dependent variable in year t-1 to match and derive weights for control states. Dashed line indicates year before policy began (t-1). When policies went into effect later than June 30th of a year, the following year is considered the year of initial policy enforcement.

Figure 6: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Georgia

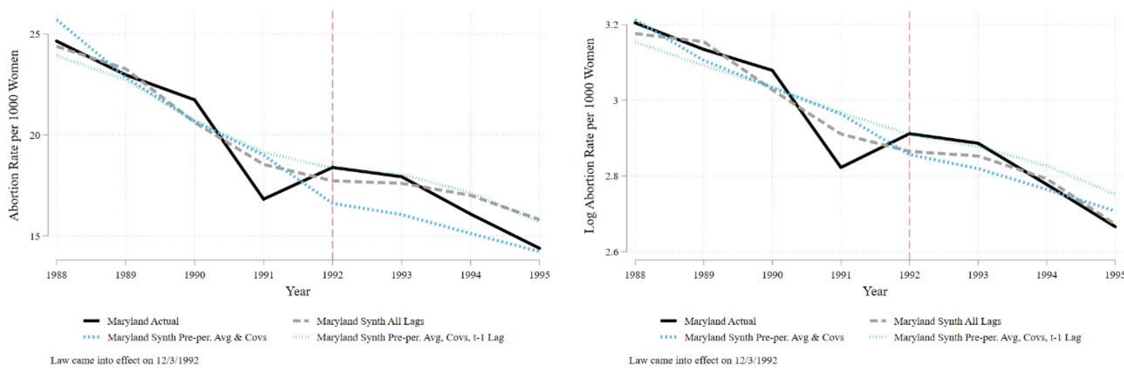
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Figure 7: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Maryland

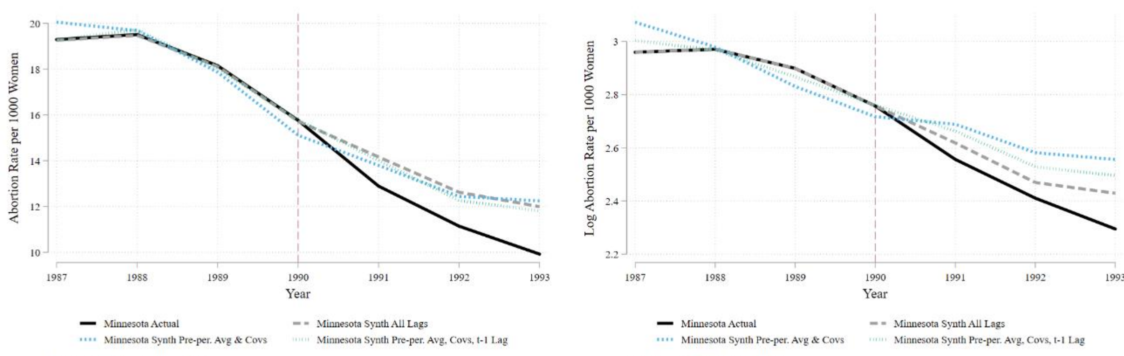
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Figure 8: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Minnesota

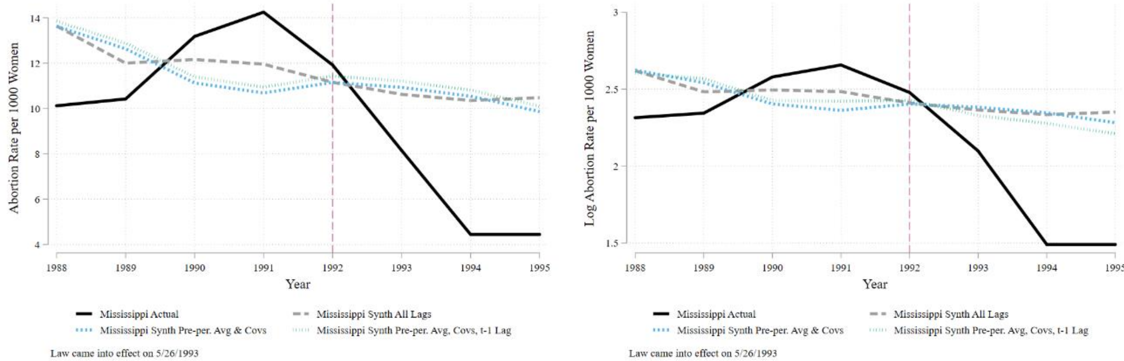
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5. Note MN limited to 4 pre-period years.

Figure 9: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Mississippi

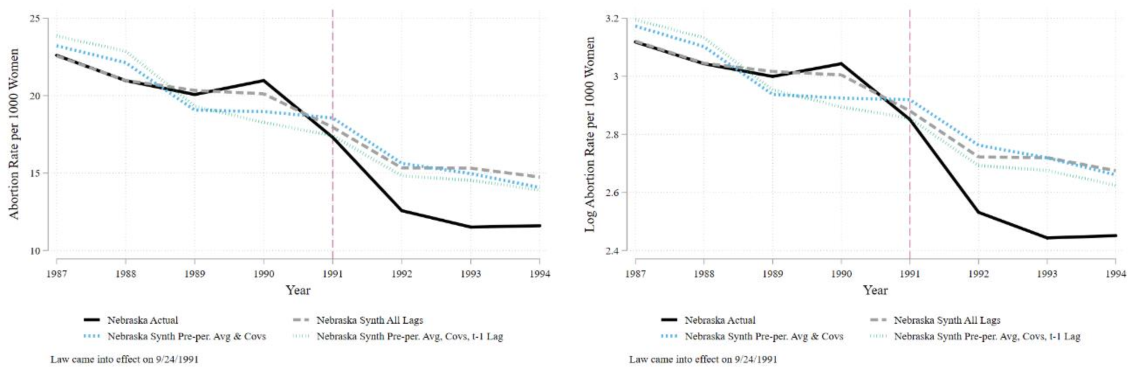
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Figure 10: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Nebraska

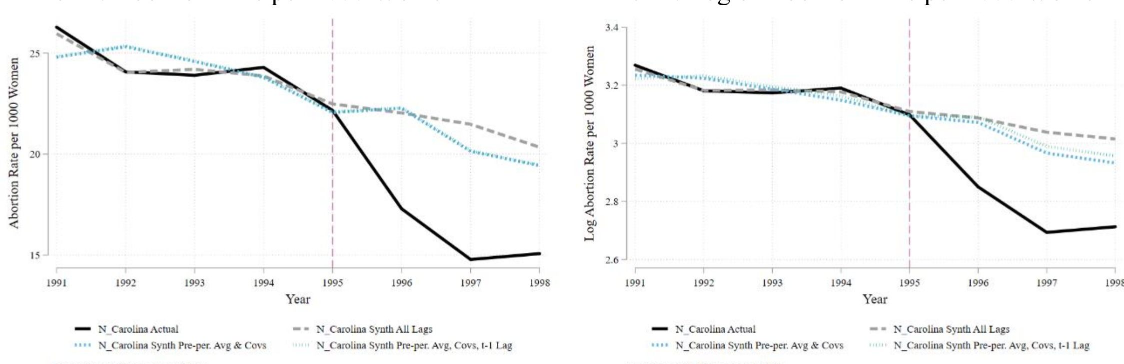
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Figure 11: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – North Carolina

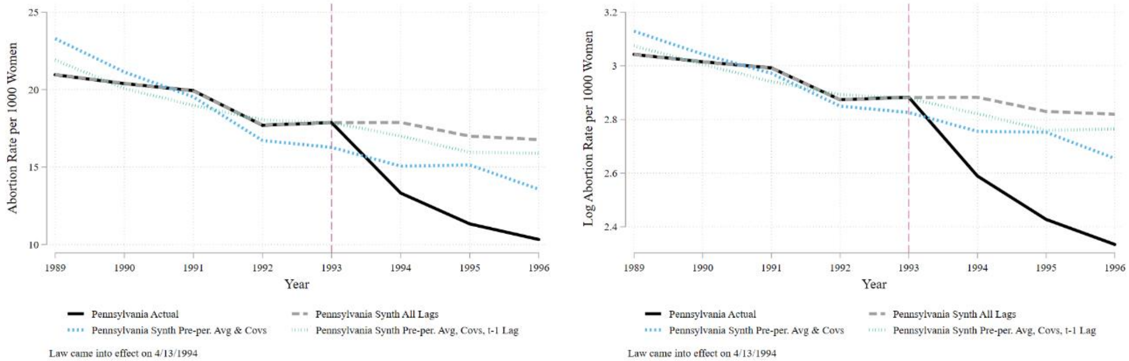
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Figure 12: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Pennsylvania

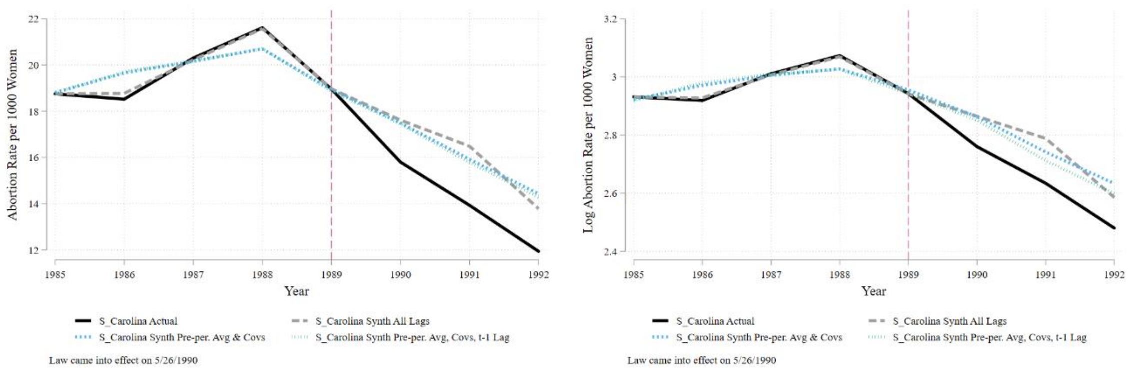
Panel A: Abortion Rate per 1000 Women   Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Figure 13: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – South Carolina

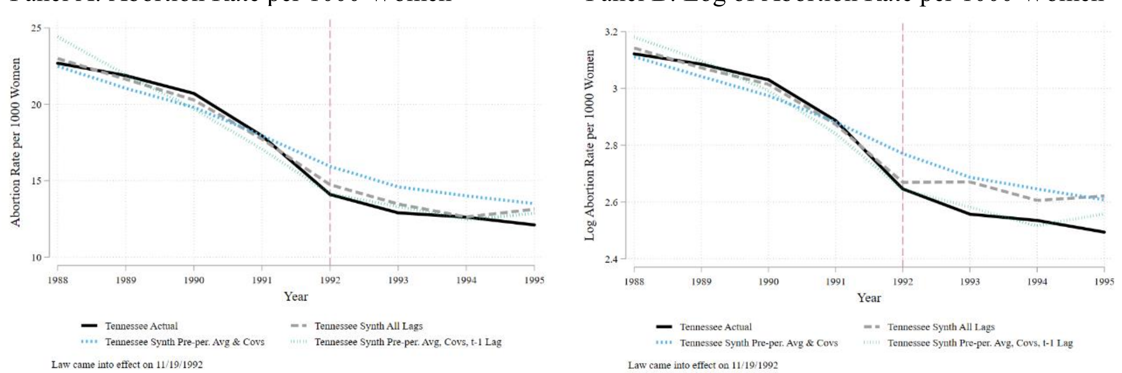
Panel A: Abortion Rate per 1000 Women   Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Figure 14: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Tennessee

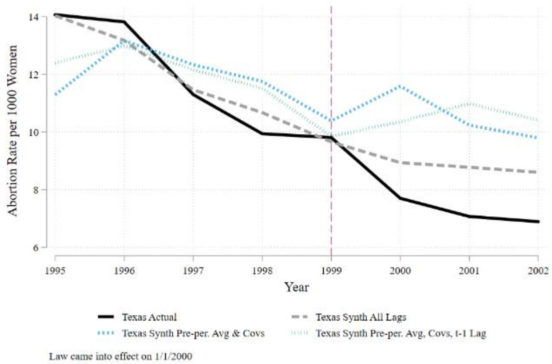
Panel A: Abortion Rate per 1000 Women   Panel B: Log of Abortion Rate per 1000 Women



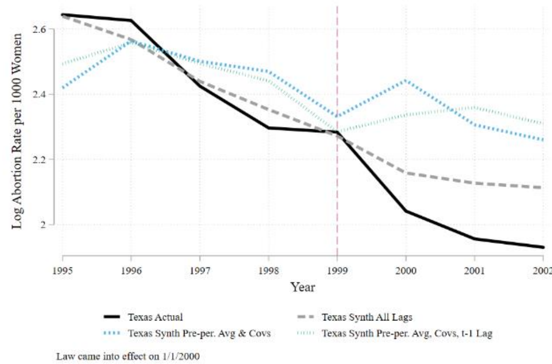
See notes to Figure 5.

Figure 15: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Texas

Panel A: Abortion Rate per 1000 Women



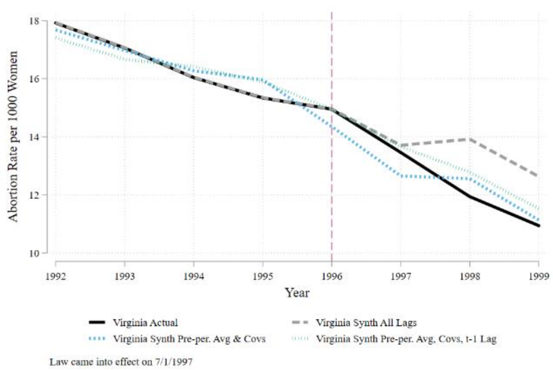
Panel B: Log of Abortion Rate per 1000 Women



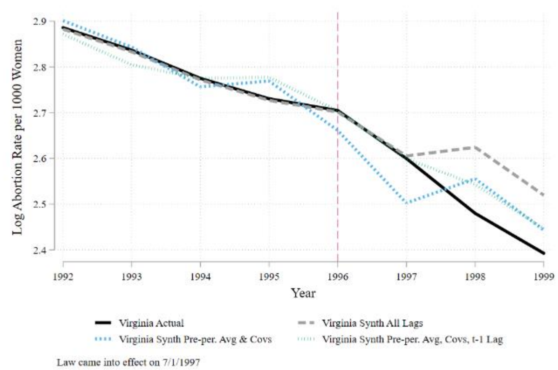
See notes to Figure 5.

Figure 16: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 15 to 17 – Virginia

Panel A: Abortion Rate per 1000 Women



Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Table 1: Number of Abortions to Minors and Older Teens in Three States Pre and Post a Parental Involvement Law by State of Residence and Occurrence

	Mississippi		North Carolina		Texas	
	Minors	Teens 18-19	Minors	Teens 18-19	Minors	Teens 18-19
In-state, resident						
Pre	663	780	3146	3860	4769	8578
Post	335	491	2431	3619	3829	7835
Δ	-328	-289	-715	-241	-940	-743
(%Δ)	(-68.2)	(-46.2)	(-25.8)	(-6.4)	(-22.0)	(-9.1)
In-state, non-resident						
Pre	187	209	544	501	173	343
Post	14	27	330	484	149	281
Δ	-173	-182	-214	-17	-24	-62
(%Δ)	(-259.2)	(-204.6)	(-50.0)	(-3.5)	(0.7)	(-9.6)
Out-of-state resident						
Pre	145	217	90	76	6	8
Post	293	280	121	71	28	19
Δ	148	63	31	-5	22	11
(%Δ)	(70.3)	(25.4)	(29.6)	(-6.8)	(154)	(86.5)
Total Resident						
Pre	808	997	3236	3936	4775	8586
Post	628	771	2552	3690	3857	7854
Δ	-180	-226	-684	-246	-918	-732
(%Δ)	(-25.4)	(-25.7)	(-23.7)	(-6.5)	(-21.4)	(-8.9)
Total Occurrence						
Pre	850	989	3692	4361	4942	8921
Post	349	518	2761	4107	3978	8116
Δ	-501	-471	-931	-254	-964	-805
(%Δ)	(-89.0)	(-64.7)	(-29.1)	(-6.0)	(-21.7)	(-9.5)

There are five categories of abortion. Abortions obtained in-state by residents of the state; abortions obtained in-state by non-residents; abortions to residents obtained out-of-state; total abortions to residents and total abortions that occurred in-state irrespective of residency. The pre-periods in MS, NC and TX are 1991, 1994 and 1999 respectively and the post-periods are 1994, 1996 and 2000. Sources: Abortions to residents and non-residents that occurred in MS, NC and TX are from state health departments in the three states. Data on resident of MS, NC and TX performed in other states came from individual level records in AL, AR, CO, GA, KS, MO, OK, SC, TN, UT, VA. Data from New Mexico was from Joyce et al. (2006). Percent changes are calculated as ln(pre)- ln(post).

Table 2: Estimates of the Effect of Parental Involvement Laws on Abortions Among Women Ages 15-17, 1985 to 2013

	Abortion Rate per 1000 Women				Log of Abortion Rate per 1000 Women			
1985 to 2013	CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years	CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years
Model A	-1.907*	1.240	-1.895*	-0.742	-0.241**	-0.159*	-0.316**	-0.259**
	(0.803)	(1.802)	(0.857)	(1.010)	(0.067)	(0.071)	(0.084)	(0.070)
Model B	-1.916*	-1.592	-1.807*	-1.744*	-0.181**	-0.129*	-0.220**	-0.209**
	(0.846)	(1.389)	(0.827)	(0.736)	(0.058)	(0.055)	(0.059)	(0.049)
Model C	-2.305**	-1.830*	-3.187**	-3.345**	-0.162**	-0.120**	-0.240**	-0.225**
	(0.615)	(0.787)	(0.741)	(0.619)	(0.048)	(0.044)	(0.066)	(0.047)
Model D								
Distance Tercile 1	-2.899**	-1.899*	-3.498**	-3.370**	-0.181*	-0.111+	-0.247**	-0.217**
(0-101 miles)	(0.670)	(0.777)	(0.764)	(0.705)	(0.071)	(0.062)	(0.076)	(0.061)
Distance Tercile 2	-2.125**	-2.134*	-2.899**	-3.696**	-0.155**	-0.129*	-0.227*	-0.246**
(102-272 miles)	(0.710)	(1.008)	(1.060)	(0.716)	(0.048)	(0.050)	(0.090)	(0.054)
Distance Tercile 3	-1.876**	-1.320	-2.713**	-2.894**	-0.151**	-0.122*	-0.237**	-0.224**
(>272 miles)	(0.616)	(0.855)	(0.767)	(0.718)	(0.052)	(0.049)	(0.071)	(0.055)
Mean Dep. Variable	11.9	15.4	10.9	15.4	11.9	15.4	10.9	15.4
Observations	1,114	492	386	386	1,114	492	386	386

Source: CDC Abortion Surveillance Reports 1985-2013 and Guttmacher Institute estimates of number of abortions by state residents for years 1985, 1988, 1992, 1996, 2000, 2005, 2008, 2010, 2011, 2013. Model A includes: state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic. Model B adds interactions between covariates and year fixed effects to Model A. Model C adds state-specific linear time trend to Model A. Model D is Model C, but with the effect of PI law allowed to differ by distance to nearest state without a PI law. Distance is measured between the most populous city in each state. Regressions weighted by female population aged 15-17. Mean of dependent variable is average across sample period. Standard errors clustered at the state level.
+ $p<0.10$, * $p<0.05$, ** $p<0.01$

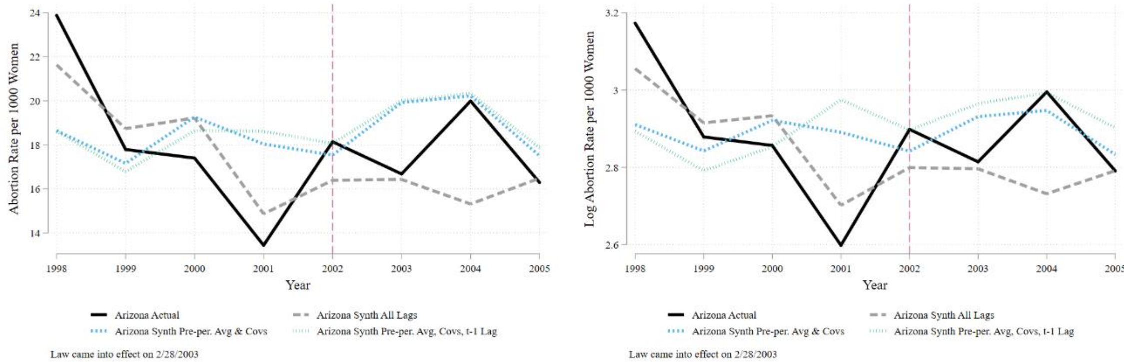
Table 3: Effect of Parental Involvement Laws on Abortions Among Women Ages 15-17 by Time Periods

Estimated Effect of PI Laws by Period	Abortion Rate per 1000 Women: CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years	Log of Abortion Rate per 1000 Women: CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years
1985 to 1996	-2.533**	-3.995*	-2.909*	-2.731**	-0.185**	-0.186**	-0.236**	-0.193**
	(0.912)	(1.568)	(1.132)	(0.963)	(0.057)	(0.059)	(0.075)	(0.051)
1988 to 2000	-3.000**	-1.677	-3.208**	-1.949*	-0.212**	-0.161**	-0.268**	-0.192**
	(0.831)	(1.843)	(0.937)	(0.798)	(0.067)	(0.055)	(0.093)	(0.050)
1992 to 2005	-2.656**	-0.341	-2.900*	-1.975*	-0.240**	-0.114	-0.303**	-0.191**
	(0.848)	(1.722)	(1.095)	(0.898)	(0.069)	(0.072)	(0.089)	(0.051)
1996 to 2008	-0.278	0.475	-0.537	-1.054	-0.075	0.013	-0.172+	-0.153*
	(0.634)	(0.836)	(0.904)	(0.887)	(0.066)	(0.065)	(0.086)	(0.063)
2000 to 2013	1.006	-0.887	-0.131	-2.051**	0.053	0.037	-0.007	-0.139*
	(0.770)	(1.127)	(0.783)	(0.676)	(0.081)	(0.064)	(0.081)	(0.068)
Mean Dep. Variable								
1985 to 1996	18.2	25.7	18.3	25.7	18.2	25.7	18.3	25.7
1988 to 2000	15.2	21.4	15.2	21.4	15.2	21.4	15.2	21.4
1992 to 2005	11.9	16.6	12	16.6	11.9	16.6	12	16.6
1996 to 2008	10.0	13.6	10.1	13.6	10.0	13.6	10.1	13.6
2000 to 2013	7.8	9.6	7.2	9.6	7.8	9.6	7.2	9.6
Observations								
1985 to 1996	425	192	140	140	425	192	140	140
1988 to 2000	494	196	152	152	494	196	152	152
1992 to 2005	559	198	160	160	559	198	160	160
1996 to 2008	527	199	163	163	527	199	163	163
2000 to 2013	570	300	246	246	570	300	246	246

Source: CDC Abortion Surveillance Reports 1985-2013 and Guttmacher Institute Estimates of number of abortions by state residents for years 1985, 1988, 1992, 1996, 2000, 2005, 2008, 2010, 2011, 2013. Model ("B" in text) includes: state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic, and interactions between these covariates and year fixed effects. Regressions weighted by female population aged 15-17. Means of dependent variables are averaged across the indicated period. Standard errors clustered at the state level. + p<0.10, * p<0.05, ** p<0.01

Appendix Figure 1: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Arizona

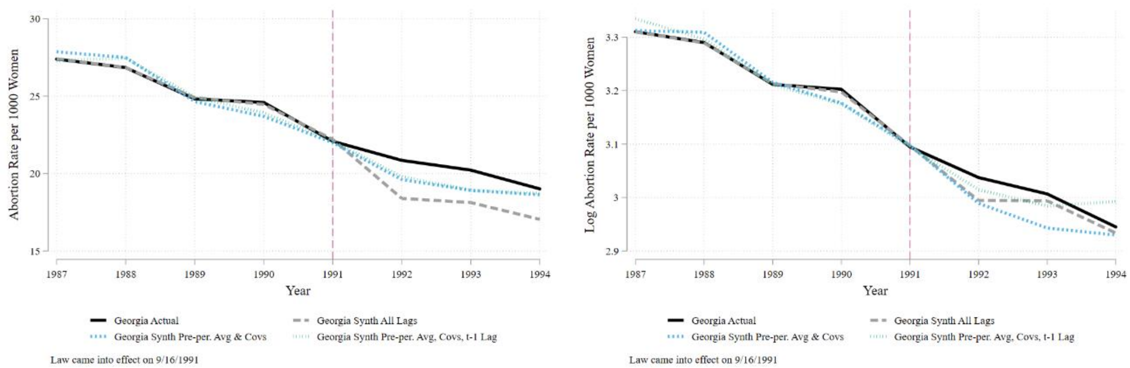
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 2: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Georgia

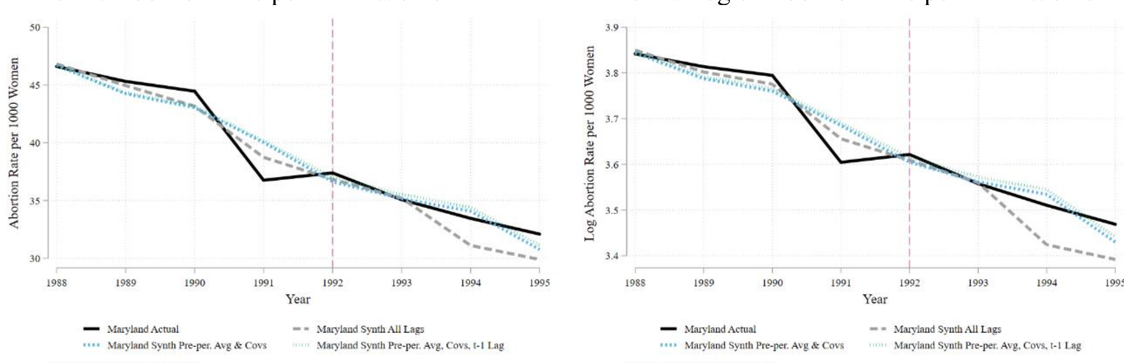
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 3: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Maryland

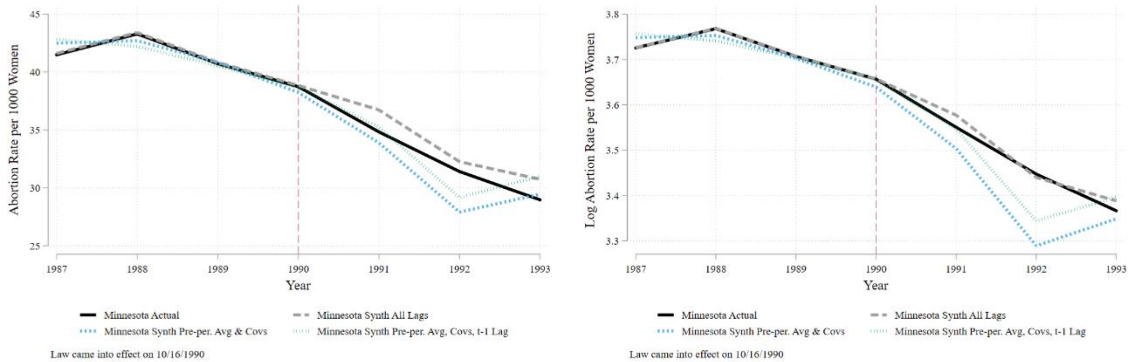
Panel A: Abortion Rate per 1000 Women | Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 4: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Minnesota

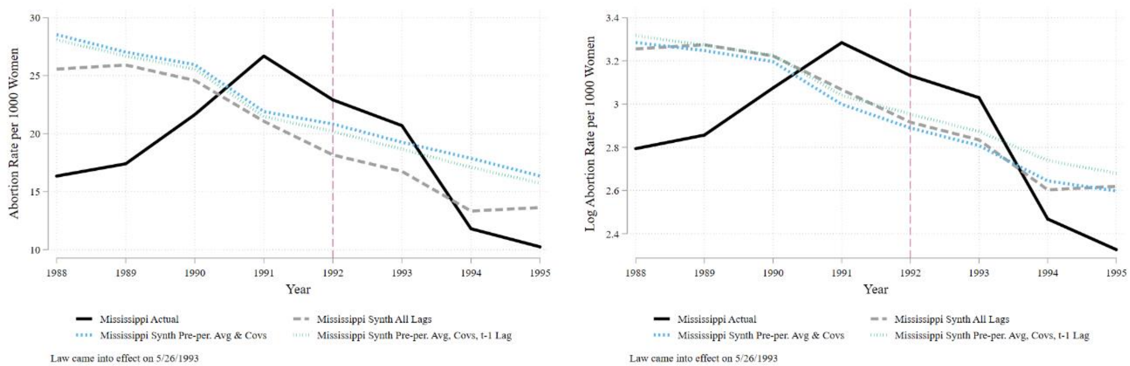
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5. Note MN limited to 4 pre-period years.

Appendix Figure 5: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Mississippi

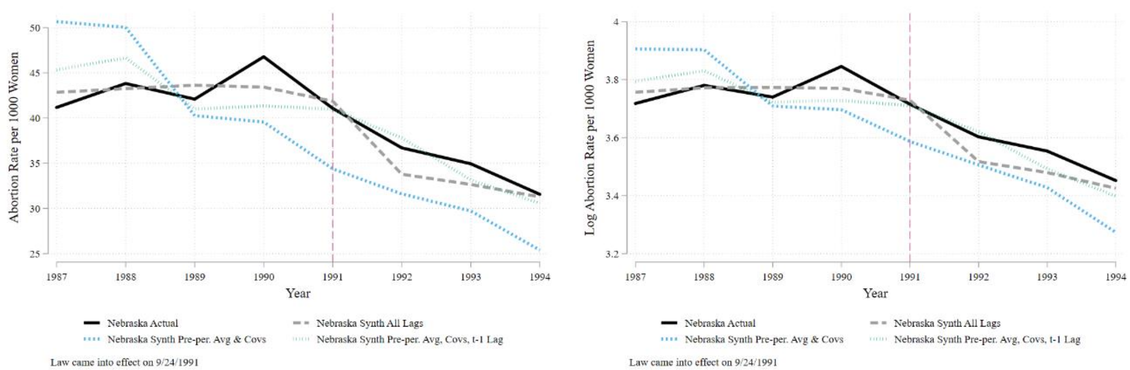
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 6: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Nebraska

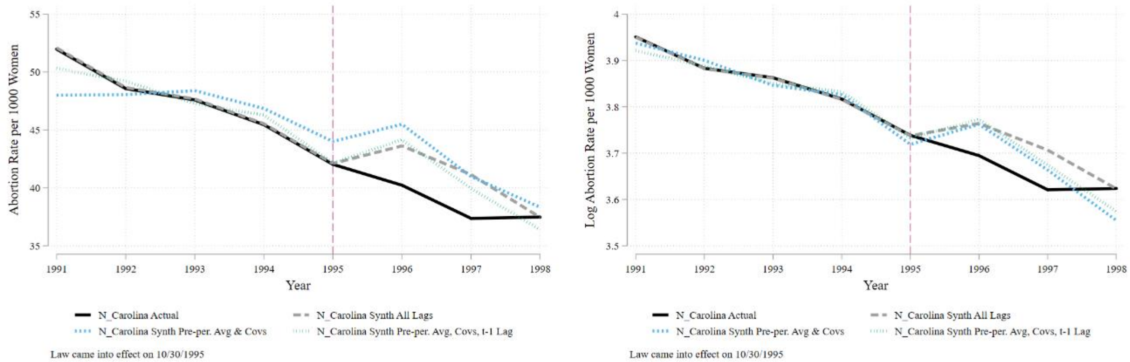
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 7: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – North Carolina

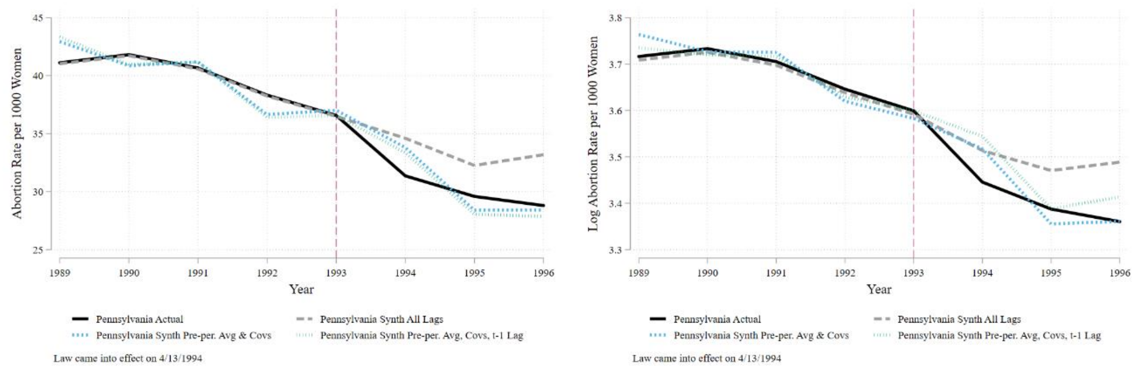
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 8: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Pennsylvania

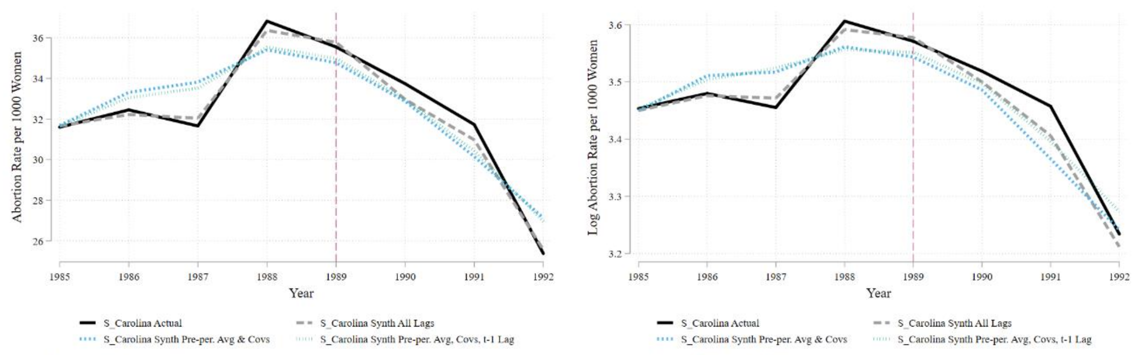
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 9: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – South Carolina

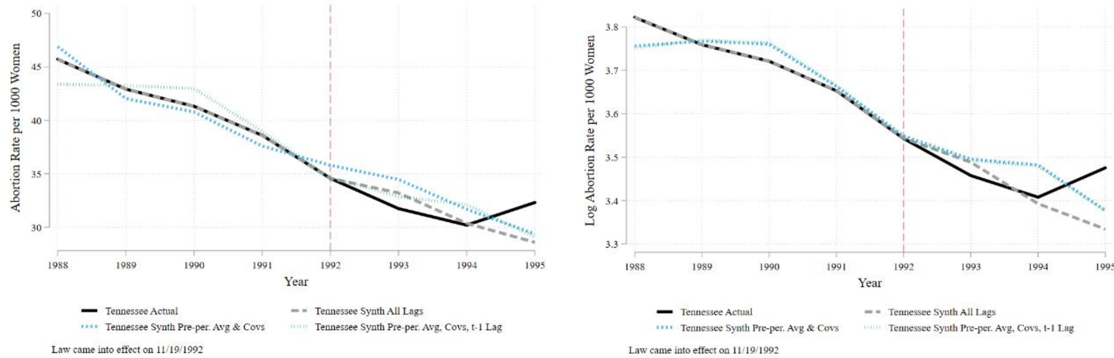
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 10: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Tennessee

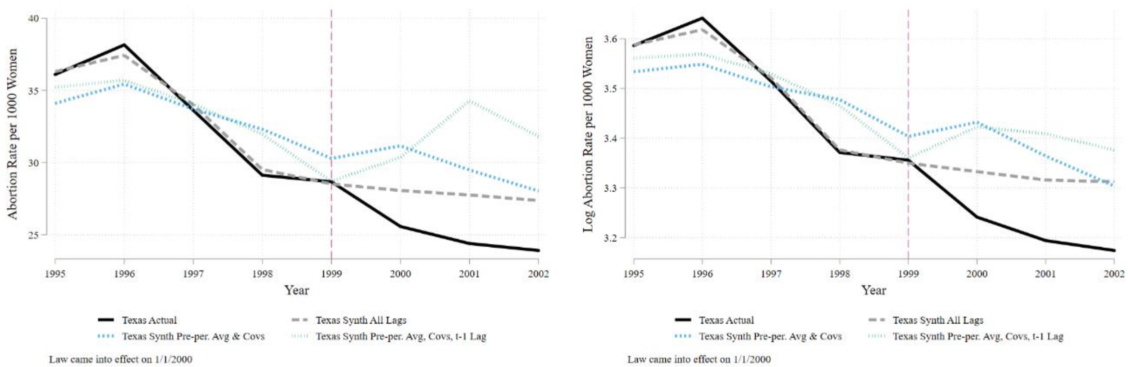
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 11: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Texas

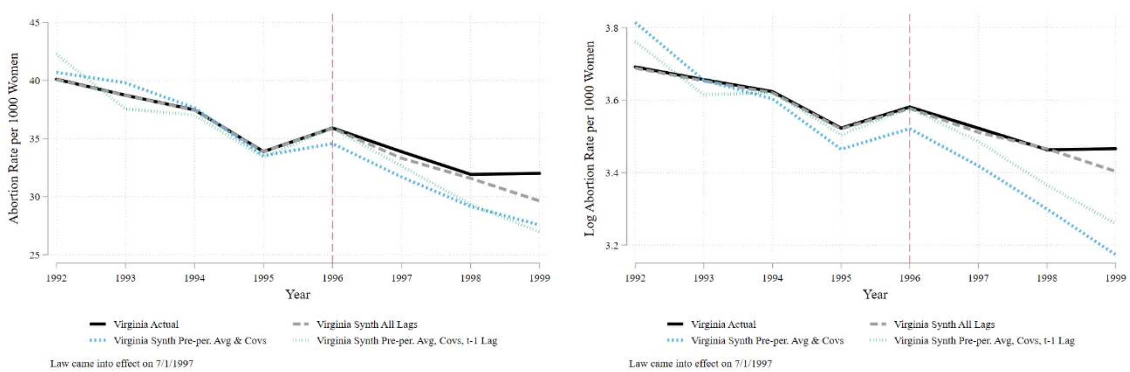
Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Figure 12: Synthetic Control Estimates of Effect of PI Laws on Abortion Among Women 18 to 19 – Virginia

Panel A: Abortion Rate per 1000 Women Panel B: Log of Abortion Rate per 1000 Women



See notes to Figure 5.

Appendix Table 1
Number of States with Valid Observations in CDC and Guttmacher Institute Data by Year

Year	Number of States	
	CDC Data	GI Data
1985	30	51
1986	30	-
1987	32	-
1988	33	51
1989	34	-
1990	35	-
1991	37	-
1992	38	51
1993	39	-
1994	39	-
1995	39	-
1996	39	51
1997	39	-
1998	40	-
1999	40	-
2000	42	51
2001	41	-
2002	42	-
2003	41	-
2004	39	-
2005	41	51
2006	41	-
2007	41	-
2008	41	51
2009	38	-
2010	41	51
2011	40	51
2012	41	-
2013	41	51

Source: Authors’ calculations from CDC and GI data.

Appendix Table 2: Unweighted Estimates of the Effect of Parental Involvement Laws on Abortions Among Women Ages 15-17, 1985 to 2013

	Abortion Rate per 1000 Women				Log of Abortion Rate per 1000 Women			
1985 to 2013	CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years	CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years
Model A	-1.205	0.034	-1.000	-1.195	-0.206**	-0.144**	-0.285**	-0.202**
	(0.939)	(1.136)	(1.104)	(1.174)	(0.059)	(0.053)	(0.078)	(0.056)
Model B	-1.205	0.034	-1.000	-1.195	-0.206**	-0.144**	-0.285**	-0.202**
	(0.939)	(1.136)	(1.104)	(1.174)	(0.059)	(0.053)	(0.078)	(0.056)
Model C	-2.162**	-1.087	-2.739**	-3.450**	-0.088	-0.058	-0.103	-0.200**
	(0.507)	(0.774)	(0.692)	(0.747)	(0.066)	(0.055)	(0.121)	(0.064)
Model D								
Distance Tercile 1	-2.467**	-1.113	-3.019**	-3.407**	-0.084	-0.032	-0.111	-0.183*
(0-101 miles)	(0.473)	(0.887)	(0.726)	(0.819)	(0.076)	(0.066)	(0.119)	(0.070)
Distance Tercile 2	-2.013**	-1.726	-2.226*	-3.729**	-0.097	-0.109	-0.092	-0.245**
(102-272 miles)	(0.589)	(1.066)	(0.921)	(0.921)	(0.066)	(0.074)	(0.143)	(0.078)
Distance Tercile 3	-1.729**	0.218	-2.071*	-2.500*	-0.061	-0.050	-0.068	-0.199*
(>272 miles)	(0.610)	(0.920)	(0.937)	(1.064)	(0.081)	(0.071)	(0.144)	(0.085)
Mean Dep Var	11.4	15.5	11	15.5	11.4	15.5	11	15.5
Observations	1,073	442	345	345	1,073	442	345	345

Source: CDC Abortion Surveillance Reports 1985-2013 and Guttmacher Institute estimates of number of abortions by state residents for years 1985, 1988, 1992, 1996, 2000, 2005, 2008, 2010, 2011, 2013. Model A includes: state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic. Model B adds interactions between covariates and year fixed effects to Model A. Model C adds state-specific linear time trend to Model A. Model D is Model C, but with the effect of PI law allowed to differ by distance to nearest state without a PI law. Distance is measured between the most populous city in each state. Standard errors clustered at the state level. + $p<0.10$, * $p<0.05$, ** $p<0.01$

Appendix Table 3: Estimates of the Effect of Parental Involvement Laws on Abortions Among Women Ages 18-19, 1985 to 2013

1985 to 2013	Abortion Rate per 1000 Women: CDC Occurrence	Abortion Rate per 1000 Women: GI Residence	Abortion Rate per 1000 Women: CDC Occurrence GI Years	Abortion Rate per 1000 Women: GI Residence CDC State-Years	Log of Abortion Rate per 1000 Women: CDC Occurrence	Log of Abortion Rate per 1000 Women: GI Residence	Log of Abortion Rate per 1000 Women: CDC Occurrence GI Years	Log of Abortion Rate per 1000 Women: GI Residence CDC State-Years
Model A	-0.423	5.508+	-0.455	2.950+	-0.067	-0.019	-0.122	-0.055
	(1.302)	(3.046)	(1.477)	(1.676)	(0.059)	(0.045)	(0.074)	(0.055)
Model B	-0.197	0.417	-0.078	0.471	-0.007	0.006	-0.026	-0.017
	(1.253)	(2.191)	(1.249)	(1.500)	(0.046)	(0.035)	(0.051)	(0.048)
Model C	-0.945	-1.057	-2.417	-1.239	-0.006	-0.013	-0.059	-0.024
	(1.104)	(1.674)	(1.747)	(1.572)	(0.042)	(0.041)	(0.064)	(0.045)
Model D								
Distance Tercile 1	-0.695	-0.691	-2.829+	-1.248	0.019	0.003	-0.060	-0.017
(0-101 miles)	(1.268)	(1.489)	(1.555)	(1.639)	(0.053)	(0.042)	(0.061)	(0.050)
Distance Tercile 2	-1.156	-1.096	-1.387	-1.459	-0.024	-0.019	-0.042	-0.037
(102-272 miles)	(1.339)	(1.936)	(2.273)	(1.971)	(0.046)	(0.047)	(0.085)	(0.055)
Distance Tercile 3	-0.855	-1.636	-2.483	-0.960	-0.002	-0.033	-0.076	-0.030
(>272 miles)	(1.325)	(2.120)	(2.001)	(1.753)	(0.052)	(0.052)	(0.070)	(0.048)
Mean Dep Var	28.8	37.3	26.7	37.3	28.8	37.3	26.7	37.3
Observations	1,115	492	385	386	1,115	492	385	386

Source: CDC Abortion Surveillance Reports 1985-2013 and Guttmacher Institute estimates of number of abortions by state residents for years 1985, 1988, 1992, 1996, 2000, 2005, 2008, 2010, 2011, 2013. We add fixed effects for DC (post-2004), DE (post-1999), and KS (post-1992) to adjust for large changes to overall reported abortions rates associated either implicitly or explicitly with changes in reporting/accounting methods. Model A includes: state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic. Model B adds interactions between covariates and year fixed effects to Model A. Model C adds state-specific linear time trend to Model A. Model D is Model C, but with the effect of PI law allowed to differ by distance to nearest state without a PI law. Distance is measured between the most populous city in each state. Regressions weighted by female population aged 18-19. Standard errors clustered at the state level. + $p<0.10$, * $p<0.05$, ** $p<0.01$

Appendix Table 4: Effect of Parental Involvement Laws on Abortions Among Women Ages 18-19 by Time Periods

Estimated Effect of PI Laws by Period	Abortion Rate per 1000 Women CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years	Log of Abortion Rate per 1000 Women CDC Occurrence	GI Residence	CDC Occurrence GI Years	GI Residence CDC State-Years
1985 to 1996	-1.247	-3.047	-2.002	-0.329	-0.035	-0.042	-0.071	-0.015
	(1.396)	(2.131)	(1.911)	(1.875)	(0.046)	(0.041)	(0.060)	(0.045)
1988 to 2000	-1.438	0.933	-2.492	0.596	-0.033	-0.000	-0.079	-0.004
	(1.353)	(2.410)	(1.688)	(1.264)	(0.051)	(0.036)	(0.073)	(0.031)
1992 to 2005	-2.097	3.657	-2.390	0.615	-0.067	0.062	-0.111	0.006
	(1.335)	(2.563)	(1.934)	(1.396)	(0.057)	(0.048)	(0.074)	(0.038)
1996 to 2008	0.282	1.089	0.262	0.129	0.020	0.063	-0.030	-0.005
	(1.844)	(2.588)	(2.564)	(2.008)	(0.073)	(0.060)	(0.085)	(0.065)
2000 to 2013	4.567^{+}	-0.838	2.752	-1.017	0.175^{+}	0.058	0.152	0.019
	(2.406)	(3.619)	(2.372)	(1.834)	(0.098)	(0.056)	(0.097)	(0.044)
Mean Dep. Variable								
1985 to 1996	39.9	56.1	40.2	56.1	39.9	56.1	40.2	56.1
1988 to 2000	35.3	49.3	35.3	49.3	35.3	49.3	35.3	49.3
1992 to 2005	29.2	40.9	29.9	40.9	29.2	40.9	29.9	40.9
1996 to 2008	25.9	34.9	25.9	34.9	25.9	34.9	25.9	34.9
2000 to 2013	21.4	26.6	20	26.6	21.4	26.6	20	26.6
Observations								
1985 to 1996	425	192	140	140	425	192	140	140
1988 to 2000	494	196	151	152	494	196	151	152
1992 to 2005	559	198	159	160	559	198	159	160
1996 to 2008	527	199	163	163	527	199	163	163
2000 to 2013	570	300	245	246	570	300	245	246

Source: CDC Abortion Surveillance Reports 1985-2013 and Guttmacher Institute estimates of number of abortions by state residents for years 1985, 1988, 1992, 1996, 2000, 2005, 2008, 2010, 2011, 2013. Model ("B" in text) includes: state and year fixed effects, state unemployment rate, state median wage, state share of women 15-19 black, non-Hispanic, and state share of women 15-19 white, Hispanic, and interactions between these covariates and year fixed effects. Regressions weighted by female population aged 18-19. Means of dependent variables are averaged across the indicated period. Standard errors clustered at the state level. + p<0.10, * p<0.05, ** p<0.01

Appendix Table 5
Effect of PI Laws on Abortions Among Women Ages 15-17 Using Restricted CDC State Panel from 1991-2013

	Abortion Rate per 1000 Women	Log Abortion Rate per 1000 Women
Model A	-1.533^{+}	-0.244**
	(0.892)	(0.049)
Model B	-2.474*	-0.240**
	(0.974)	(0.066)
Model C	-3.313**	-0.253**
	(0.778)	(0.061)
Mean of Dependent Var.	10.3	10.3
Observations	792	792

Source: CDC Abortion Surveillance Reports 1991-2013. These estimates exclude states with more than two missing observations over specified period. These are AK, CA, CO, DC, DE, FL, HI, IL, IA, LA, MD, NH, OK, SD, VT, and WY. Models A, B, and C described in detail in Table 2 and elsewhere. Regressions weighted by female population aged 15-17. Standard errors clustered at the state level. + p<0.10, * p<0.05, ** p<0.01

Appendix Table 6
Synthetic Control Estimates of Effect of PI Law in Arizona (2003) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-0.75	-1.66	-1.64	-0.11	-0.21	-0.21
	[0.52]	[0.11]	[0.22]	[0.48]	[0.04]	[0.07]
Difference in t=0	-1.06	-1.74	-1.72	-0.14	-0.22	-0.21
	[0.41]	[0.11]	[0.19]	[0.26]	[0.04]	[0.07]
Difference in t=1	-0.17	-1.10	-1.07	-0.01	-0.10	-0.10
	[0.89]	[0.22]	[0.30]	[0.96]	[0.41]	[0.41]
Difference in t=2	-1.03	-2.15	-2.12	-0.18	-0.31	-0.31
	[0.44]	[0.11]	[0.15]	[0.26]	[0.11]	[0.07]
Mean Dep. Var. in t=-1	6.4	6.4	6.4	1.9	1.9	1.9
Avg. Difference % Change	-11.7	-25.8	-25.4			
Potential Control States	27	27	27	27	27	27
States with Positive Weight	2	2	3	2	4	4

Method 1 uses values of the dependent variable in the five pre-period years to match and derive weights for control states. Method 2 uses the average of the dependent variable over the five pre-period years and all pre-period values of controls for state unemployment rate, state median wage, state share of 15-19 year-olds black, non-Hispanic, and state share of 15-19 year-olds white, Hispanic to match and derive weights for control states. Method 3 uses the inputs for method 2 along with the value of the dependent variable in year t-1 to match and derive weights for control states. P-values [in brackets] are constructed using randomization inference as described in text.

Appendix Table 7
Synthetic Control Estimates of Effect of PI Law in Georgia (1992) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	2.17	1.23	1.23	0.02	0.07	0.06
	[0.40]	[0.53]	[0.60]	[0.80]	[0.67]	[0.73]
Difference in t=0	2.46	1.09	1.13	0.04	0.06	0.05
	[0.40]	[0.60]	[0.67]	[0.67]	[0.73]	[0.80]
Difference in t=1	2.09	1.61	1.63	0.01	0.09	0.08
	[0.53]	[0.67]	[0.53]	[0.87]	[0.80]	[0.60]
Difference in t=2	1.97	0.98	0.94	0.01	0.06	0.05
	[0.60]	[0.87]	[0.87]	[0.93]	[0.93]	[0.73]
Mean Dep. Var. in t=-1	22.1	22.1	22.1	3.1	3.1	3.1
Avg. Difference % Change	9.8	5.6	5.6			
Potential Control States	15	15	15	15	15	15
States with Positive Weight	5	4	5	5	4	5

See notes to Appendix Table 6.

Appendix Table 8
Synthetic Control Estimates of Effect of PI Law in Maryland (1993) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-0.67	1.00	-0.83	0.00	0.01	-0.04
	[0.65]	[0.88]	[0.76]	[1.00]	[0.94]	[0.82]
Difference in t=0	0.33	1.88	-0.11	0.03	0.07	0.01
	[0.82]	[0.47]	[1.00]	[0.82]	[0.76]	[0.88]
Difference in t=1	-0.93	0.96	-1.07	-0.01	0.01	-0.05
	[0.71]	[0.82]	[0.65]	[1.00]	[1.00]	[0.65]
Difference in t=2	-1.42	0.16	-1.30	-0.01	-0.04	-0.09
	[0.35]	[1.00]	[0.41]	[1.00]	[0.76]	[0.41]
Mean Dep. Var. in t=-1	18.4	18.4	18.4	2.9	2.9	2.9
Avg. Difference % Change	-3.7	5.4	-4.5			
Potential Control States	17	17	17	17	17	17
States with Positive Weight	4	3	5	4	4	4

See notes to Appendix Table 6.

Appendix Table 9
Synthetic Control Estimates of Effect of PI Law in Minnesota (1991) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-1.61	-1.51	-1.37	-0.09	-0.19	-0.14
	[0.53]	[0.60]	[0.53]	[0.47]	[0.33]	[0.40]
Difference in t=0	-1.27	-0.90	-1.12	-0.06	-0.13	-0.11
	[0.73]	[0.93]	[0.60]	[0.60]	[0.40]	[0.53]
Difference in t=1	-1.48	-1.30	-1.12	-0.06	-0.17	-0.12
	[0.73]	[0.67]	[0.73]	[0.73]	[0.40]	[0.73]
Difference in t=2	-2.07	-2.32	-1.89	-0.13	-0.26	-0.20
	[0.67]	[0.53]	[0.73]	[0.60]	[0.27]	[0.40]
Mean Dep. Var. in t=-1	15.8	15.8	15.8	2.8	2.8	2.8
Avg. Difference % Change	-10.2	-9.6	-8.7			
Potential Control States	15	15	15	15	15	15
States with Positive Weight	15	4	5	15	4	6

See notes to Appendix Table 6. Note MN estimates limited to 4 pre-period years.

Appendix Table 10
Synthetic Control Estimates of Effect of PI Law in Mississippi (1993) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-4.81	-4.77	-5.03	-0.66	-0.64	-0.58
	[0.06]	[0.06]	[0.06]	[0.00]	[0.00]	[0.00]
Difference in t=0	-2.47	-2.78	-3.06	-0.27	-0.28	-0.23
	[0.24]	[0.29]	[0.12]	[0.12]	[0.12]	[0.18]
Difference in t=1	-5.91	-6.10	-6.37	-0.84	-0.86	-0.79
	[0.06]	[0.06]	[0.06]	[0.00]	[0.00]	[0.00]
Difference in t=2	-6.04	-5.42	-5.66	-0.86	-0.79	-0.72
	[0.06]	[0.06]	[0.06]	[0.00]	[0.00]	[0.06]
Mean Dep. Var. in t=-1	11.9	11.9	11.9	2.5	2.5	2.5
Avg. Difference % Change	-40.3	-40.0	-42.2			
Potential Control States	17	17	17	17	17	17
States with Positive Weight	3	2	2	2	2	2

See notes to Appendix Table 6.

Appendix Table 11
Synthetic Control Estimates of Effect of PI Law in Nebraska (1992) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-3.24	-2.99	-2.52	-0.23	-0.24	-0.19
	[0.27]	[0.40]	[0.33]	[0.20]	[0.27]	[0.20]
Difference in t=0	-2.76	-3.06	-2.25	-0.19	-0.23	-0.16
	[0.27]	[0.40]	[0.40]	[0.27]	[0.27]	[0.20]
Difference in t=1	-3.81	-3.45	-3.02	-0.28	-0.28	-0.23
	[0.20]	[0.33]	[0.27]	[0.20]	[0.20]	[0.20]
Difference in t=2	-3.14	-2.47	-2.30	-0.22	-0.21	-0.17
	[0.33]	[0.80]	[0.47]	[0.27]	[0.47]	[0.33]
Mean Dep. Var. in t=-1	17.3	17.3	17.3	2.9	2.9	2.9
Avg. Difference % Change	-18.7	-17.3	-14.6			
Potential Control States	15	15	15	15	15	15
States with Positive Weight	4	3	4	5	3	4

See notes to Appendix Table 6.

Appendix Table 12
Synthetic Control Estimates of Effect of PI Law in North Carolina (1996) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-5.57	-4.89	-4.93	-0.29	-0.24	-0.26
	[0.05]	[0.05]	[0.05]	[0.10]	[0.20]	[0.10]
Difference in t=0	-4.74	-4.97	-5.01	-0.24	-0.22	-0.24
	[0.05]	[0.05]	[0.05]	[0.10]	[0.20]	[0.10]
Difference in t=1	-6.69	-5.35	-5.39	-0.34	-0.27	-0.30
	[0.05]	[0.05]	[0.10]	[0.10]	[0.20]	[0.15]
Difference in t=2	-5.27	-4.35	-4.39	-0.30	-0.22	-0.24
	[0.05]	[0.05]	[0.15]	[0.10]	[0.25]	[0.20]
Mean Dep. Var. in t=-1	22.2	22.2	22.2	3.1	3.1	3.1
Avg. Difference % Change	-25.1	-22.1	-22.3			
Potential Control States	20	20	20	20	20	20
States with Positive Weight	5	2	2	5	3	2

See notes to Appendix Table 6.

Appendix Table 13
Synthetic Control Estimates of Effect of PI Law in Pennsylvania (1994) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-5.56	-2.93	-4.63	-0.39	-0.27	-0.33
	[0.06]	[0.12]	[0.06]	[0.12]	[0.12]	[0.12]
Difference in t=0	-4.56	-1.74	-3.69	-0.29	-0.17	-0.23
	[0.06]	[0.59]	[0.06]	[0.12]	[0.35]	[0.12]
Difference in t=1	-5.66	-3.81	-4.62	-0.40	-0.32	-0.33
	[0.06]	[0.12]	[0.06]	[0.12]	[0.24]	[0.18]
Difference in t=2	-6.46	-3.25	-5.58	-0.49	-0.32	-0.43
	[0.06]	[0.18]	[0.06]	[0.06]	[0.24]	[0.12]
Mean Dep. Var. in t=-1	17.9	17.9	17.9	2.9	2.9	2.9
Avg. Difference % Change	-31.1	-16.4	-25.9			
Potential Control States	17	17	17	17	17	17
States with Positive Weight	5	5	6	5	5	6

See notes to Appendix Table 6.

Appendix Table 14
Synthetic Control Estimates of Effect of PI Law in South Carolina (1990) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-2.07	-2.06	-1.95	-0.12	-0.12	-0.10
	[0.47]	[0.53]	[0.40]	[0.47]	[0.27]	[0.40]
Difference in t=0	-1.81	-1.69	-1.64	-0.10	-0.10	-0.09
	[0.47]	[0.67]	[0.47]	[0.47]	[0.40]	[0.40]
Difference in t=1	-2.56	-1.99	-1.86	-0.15	-0.11	-0.08
	[0.40]	[0.60]	[0.60]	[0.40]	[0.47]	[0.67]
Difference in t=2	-1.84	-2.49	-2.34	-0.11	-0.15	-0.12
	[0.67]	[0.47]	[0.60]	[0.60]	[0.53]	[0.67]
Mean Dep. Var. in t=-1	19.0	19.0	19.0	2.9	2.9	2.9
Avg. Difference % Change	-10.9	-10.9	-10.3			
Potential Control States	15	15	15	15	15	15
States with Positive Weight	5	3	3	5	3	3

See notes to Appendix Table 6.

Appendix Table 15
Synthetic Control Estimates of Effect of PI Law in Tennessee (1993) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-0.54 [0.71]	-1.50 [0.59]	-0.33 [0.82]	-0.10 [0.47]	-0.12 [0.41]	-0.02 [0.71]
Difference in t=0	-0.58 [0.71]	-1.70 [0.59]	-0.39 [0.82]	-0.11 [0.47]	-0.13 [0.41]	-0.03 [0.71]
Difference in t=1	-0.01 [1.00]	-1.39 [0.76]	0.16 [0.82]	-0.07 [0.82]	-0.11 [0.65]	0.02 [0.71]
Difference in t=2	-1.02 [0.59]	-1.39 [0.71]	-0.75 [0.76]	-0.13 [0.41]	-0.11 [0.65]	-0.07 [0.65]
Mean Dep. Var. in t=-1	14.1	14.1	14.1	2.6	2.6	2.6
Avg. Difference % Change	-3.8	-10.6	-2.3			
Potential Control States	17	17	17	17	17	17
States with Positive Weight	4	3	4	4	3	4

See notes to Appendix Table 6.

Appendix Table 16
Synthetic Control Estimates of Effect of PI Law in Texas (2000) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-1.55 [0.21]	-3.32 [0.11]	-3.36 [0.07]	-0.16 [0.14]	-0.36 [0.11]	-0.36 [0.11]
Difference in t=0	-1.24 [0.29]	-3.89 [0.07]	-2.66 [0.07]	-0.12 [0.32]	-0.40 [0.07]	-0.30 [0.11]
Difference in t=1	-1.71 [0.32]	-3.17 [0.11]	-3.91 [0.11]	-0.17 [0.32]	-0.35 [0.07]	-0.40 [0.00]
Difference in t=2	-1.71 [0.29]	-2.91 [0.07]	-3.52 [0.11]	-0.18 [0.32]	-0.33 [0.11]	-0.38 [0.00]
Mean Dep. Var. in t=-1	9.8	9.8	9.8	2.3	2.3	2.3
Avg. Difference % Change	-15.8	-33.9	-34.3			
Potential Control States	28	28	28	28	28	28
States with Positive Weight	5	5	4	5	5	4

See notes to Appendix Table 6.

Appendix Table 17

Synthetic Control Estimates of Effect of PI Law in Virginia (1997) on Abortions Among Women 15-17

	Abortion Rate per 1000 Women			Log Abortion Rate per 1000 Women		
	Match Method 1	Match Method 2	Match Method 3	Match Method 1	Match Method 2	Match Method 3
Average Diff. Post Law	-1.31	0.00	-0.54	-0.09	-0.01	-0.04
	[0.55]	[1.00]	[0.80]	[0.65]	[1.00]	[0.90]
Difference in t=0	-0.25	0.81	-0.20	-0.01	0.10	0.00
	[0.90]	[0.65]	[0.90]	[0.95]	[0.60]	[1.00]
Difference in t=1	-1.98	-0.62	-0.84	-0.14	-0.08	-0.06
	[0.20]	[0.70]	[0.50]	[0.30]	[0.65]	[0.70]
Difference in t=2	-1.69	-0.19	-0.58	-0.13	-0.05	-0.05
	[0.30]	[0.95]	[0.70]	[0.40]	[0.95]	[0.70]
Mean Dep. Var. in t=-1	15.0	15.0	15.0	2.7	2.7	2.7
Avg. Difference % Change	-8.7	0.0	-3.6			
Potential Control States	20	20	20	20	20	20
States with Positive Weight	20	5	5	20	4	5

See notes to Appendix Table 6.