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Family planning funding cuts and teen childbearing☆

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ABSTRACT

Publicly funded family planning clinics provide low-cost and free contraception to nearly 1.5 million teens each year. In recent years, several states have considered legislation to defund family planning services, although little is known about how these cuts affect teen pregnancy. This paper fills this knowledge gap by exploiting a policy change in Texas that reduced funding for family planning services by 67% and resulted in over 80 clinic closures. I estimate the effects of the funding cuts on teen health outcomes using a difference-in-differences approach that compares the changes in teen birth rates in Texas counties that lost family planning funding to changes in counties outside of Texas with publicly funded clinics. I find that reducing funding for family planning services in Texas increased teen birth rates by approximately 3.4% over four years with effects concentrated 2–3 years after the initial cuts.

1. Introduction

For over four decades, publicly funded family planning clinics have provided free or nearly-free contraception, sexually transmitted disease (STD) screenings, and counseling services to low-income women. Many women rely on these clinics as a primary source of health care, and 85% of clients adopt or receive contraceptives at these facilities (Frost et al., 2013; US HHS, 2013).

Women's health centers rely on substantial public funding at both the federal and state levels.[1] While family planning programs have historically held bipartisan favor, support for family planning services has become an increasingly controversial policy issue. In the last five years, over 630 bills related to women's health, family planning and contraception have been introduced in Congress, and the number of newly enacted sexual and reproductive health provisions nearly tripled (GovTrack, 2015; Nash et al., 2015).

Much of the current debate on the provision of family planning services focuses on government funding for clinics. Critics of publicly funded family planning often cite clinic affiliations with abortion providers as political motivation to defund clinics.[2] And while no federally funded family planning clinic may legally provide abortion services, Texas, as well as four other states – New Jersey, Montana, New Hampshire, and Maine – have recently enacted measures to limit spending for family planning services, with many states considering similar legislation (Cadei, 2015). But by far, Texas policymakers approved the most drastic cuts to family planning services to date, with budget cuts totaling $73 million, or $50 million more than the other four states combined. Moreover, the sizable reductions in funding induced 25% of Texas family planning facilities to close.

This paper is the first to address to what extent reductions in funding for family planning services affect teen childbearing in the U.S. In the following discussion and analysis I focus specifically on the effects of the Texas funding cuts, given the scale of the policy change and its considerable impact.[3] Using restricted county-level Natality data, I utilize a difference-in-differences model to empirically analyze the effects of the defunding policy in Texas and find that teen birth rates increased significantly as a result of the family planning funding cuts. I further investigate how the policy change differentially affected younger teens and low-income teens.

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[1] Public expenditures for family planning services totaled $2.37 billion in 2010 (Sonfield and Gold, 2012).

[2] For example, Governor Rick Perry declared in 2012 that outlawing all abortion is the ultimate policy "goal", and that the Texas legislature would continue to "pass laws to ensure abortions are as rare as possible under existing law" (Bassett, 2012).

[3] Since four other states (New Jersey, Montana, Maine, and New Hampshire) passed similar legislation between 2010 and 2012, any estimates based on specifications that include counties in these states may understate the true effects of the funding cuts on teen birth rates. Therefore for the main estimates, I include additional specifications that exclude these states.

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0167-6296/

In doing so, this paper informs a fervent policy debate over the efficacy of family planning clinics and fits into a broader literature on the effects of government intervention on teenage pregnancy.

Although many states have approved or considered legislation to limit funding for family planning services, little is known about how these policies affect women's access to low-cost contraception and, in turn, childbearing. For example, nearly all unintended pregnancies are attributable to women who do not use contraception or use it inconsistently, implying that funding cuts to family planning clinics may indirectly increase unintended pregnancy rates through its effect on contraception use (Guttmacher, 2015). Given that teenagers are twice as likely as older women to have an unplanned pregnancy (Finer, 2010), and are less likely to seek contraception when low-cost options are unavailable (Frost et al., 2013), we may expect teens to be disproportionately affected by defunding policies.

Teen pregnancy is often cited as a policy target by the US Department of Health and Human services and is widely thought of as a public health concern for multiple reasons. First, teen motherhood is associated with poor life outcomes including low graduate rates, poverty, low wages and dependence on government services (Hoffman and Maynard, 2008; Geronimus and Korenman, 1992; Bronars and Grogger, 1994). Second, teens may not be well-positioned to take care of children. More than 75% of teen pregnancies are unintended, implying that sexually active teens may not fully internalize the expected cost of their decision and have children "too often" from a social welfare standpoint. Therefore, teen mothers may be unprepared to take on the responsibility of raising a child and impose external costs on family, friends, and taxpayers (Mosher et al., 2012).[4] Thus, there is scope for family planning policies to both improve teenagers' welfare and decrease negative externalities associated with teen childbearing.

There is a long history of U.S. policies aimed at reducing unintended pregnancy, especially among teens. Such approaches have typically aimed to delay the onset of sexual activity and/or reduce risky sexual behavior through three main avenues: sex education, legal access to contraception, and the provision of family planning services. Since the 1980s, the federal government has granted over $1.5 billion in funding to promote sexual health in schools (SIECUS, 2010). As of 2015, 36 states mandate some form of sex education, and 96% of teens report having received some form of sex education training before they turned 18 (Guttmacher, 2015; Martinez et al., 2010). Although millions of dollars are spent each year on sex education, there is little evidence that these programs alter teen sexual behavior (Kirby, 2008; Carr and Packham, 2016).[5] One potential reason for the lack of effectiveness of sex education programs is that some teens may be myopic in their unwillingness to abstain from risky sexual behavior. Moreover, while receiving information on how to practice safe sex is relatively costless, implementing these tactics may not be.

Other policies to prevent unintended pregnancy address the legal and financial barriers of obtaining effective contraceptive methods. For example, several states expanded confidential access to birth control pills in the 1960s and 1970s. However, these policies did little to reduce teen childbearing (Guldi, 2008; Bailey, 2009; Myers, 2012). To date, the most effective government programs for reducing teen pregnancy rates appear to be those that provide low-income women with free long-acting reversible contraceptives (LARCs), which include intrauterine devices (IUDs) and implants. Although LARCs have very high rates of effectiveness compared to traditional contraceptive methods (99.9% versus 82% for condoms), and eliminate user-compliance error, they are the most expensive contraceptive devices to date, ranging upwards of $400 (Planned Parenthood).

The price of LARCs may explain why only 5% of teens in the US choose these methods (US HHS, 2013). Indeed, when clinics provide these devices to young women for free, uptake is relatively high, ranging from 19% to 70% (Ricketts et al., 2014; Mestad et al., 2011). Moreover, policies that reduce the cost of LARCs are effective at reducing teen pregnancy. Lindo and Packham (2017) use a difference-in-differences design to analyze an initiative in Colorado that provided free LARCs to low-income women at Title X clinics, and find that increasing access to LARCs decreases teen childbearing by 5%. These findings suggest teens face substantial financial barriers to obtaining highly effective contraceptive methods.

Publicly funded family planning clinics address these barriers by providing free or low-cost contraceptives to low-income women. There is a large body of work on the association between expanding clinic access and women's well-being. Overall, findings indicate that the rollout of Title X services from 1964 to 1973 resulted in fewer "unwanted" babies, higher family income, and higher educational attainment for children (Bailey, 2012, 2013). Moreover, increased family planning clinic access has reduced teen childbearing. For example, Bailey (2012) utilizes county-level variation in timing of access to Title X clinics and estimates that family planning services are responsible for reducing teen childbearing by up to 3% over time. Kearney and Levine (2009) use a difference-in-differences design to determine that expanding family planning services to women in the 1990s and 2000s reduced teen childbearing by over 4% as a result of increased contraception use.

While the studies described above indicate that expanding family planning services has historically been a useful policy tool for preventing unintended pregnancy, there is much less work on the effects of recent policies that *restrict* access to family planning services. One such study, Lu and Slusky (2016), uses zip-code-level survey data matched to a national network of women's health centers to examine the effects of recent clinic closures in Texas and Wisconsin on preventative care, and report that increasing distance to a clinic is associated with women receiving fewer annual mammograms, pap smears, and breast exams.[6] Moreover, Stevenson et al. (2016) analyze a more recent 2013 policy change in Texas that excluded Planned Parenthood affiliates from the Texas Women's Health Program. Using claims data from 2011 to 2014, they find that excluding clinics from the Medicaid fee-for-services program leads to reduced contraceptive use and increased Medicaid-covered childbirth in Texas counties with Planned Parenthood clinics. While my paper serves as a complement to these recent studies, the defined treatment, data, and empirical approach differ. Specifically, this paper studies the first major funding cuts in Texas and is concerned with how these cuts affected client caseload, contraceptive choices, and birth rates. This analysis thus expands upon the existing literature by considering effects of funding cuts to *all* types of publicly funded clinics.

My paper is the first to estimate a causal effect of large-scale family planning funding cuts on childbearing. Specifically, this study focuses on effects on teen childbearing and, consequently, speaks to an important public health policy target. Therefore, this paper fills an important gap in the literature, by addressing the question: How much can reducing funding for family planning services affect teen birth rates? To answer this question, I analyze a

[4] The National Campaign to Prevent Teen and Unplanned Pregnancy estimates that the taxpayer costs for teen childbearing amounted to $9.4 million in 2010.

[5] See Kirby (2008) for a comprehensive review of this literature. Out of 56 studies a majority indicate no effect on initiation or frequency of sex, number of partners or contraception use.

[6] A more recent working paper, Lu and Slusky (2017) expands this analysis to examine the effects on overall birth rates and report that an increase of 100 miles to the nearest clinic results in a 1.2% increase in birth rates.

2011 policy change in Texas that reduced funding for family planning services by two-thirds. The goal of this paper is to shed light on how funding cuts to family planning services can alter teenage contraceptive use and unintended pregnancy.

Texas politicians have pointed to a reduction in teen birth rates and abortion rates in recent years as affirmation for defunding family planning clinics.[7] However, the fact that teen birth rates fell significantly across the US over the same time period suggests that other factors likely contributed to the decline. To separate the effects of the defunding policy from other factors that affect teen birth rates, I utilize a difference-in-differences method that compares changes in teen birth rates in Texas counties with publicly funded family planning clinics to counties with clinics outside of Texas. The results of this analysis indicate that defunding Texas family planning clinics led to a 3.4% increase in teen birth rates over four years. These effects are driven by increases in teen childbearing 2–3 years following the initial funding cuts and are concentrated in relatively high poverty counties.

The remainder of this paper is organized as follows. In the next section I provide background information on family planning services in Texas and describe the state's 2011 funding cuts in greater detail. I then discuss the data and methods used for analyzing the causal effects of the funding cuts on teen health outcomes and present the results of the analysis. Lastly, I conclude and provide a discussion on the implications of current and pending family planning policies.

2. Background

The Texas Department of State Health Services Family Planning Program funds clinics across the state that provide low-cost reproductive health services to women and men. Funding includes federal and state grants from Title V, Title X, and Title XX. Services available at clinic sites include pregnancy tests and health screenings, sexually transmitted disease testing, preventative care, such as pelvic exams and pap tests, and contraception services. By statute, publicly funded clinics do not provide abortion services or emergency contraceptives nor may they transfer funds to affiliated clinics that do so.

Since its inception, the Texas Family Planning Program has been targeted towards low-income women. Clients may qualify for free or low-cost family planning services if they live in Texas, are not sterilized or pregnant, and have income below 250% of the federal poverty level. A large majority of clients at Texas family planning clinics are considered "very poor"; over 75% of Texas clients have income levels below 101% of the federal poverty line, and 79% have no health insurance. Nearly all of the clients are women (94%), and almost half are under the age of 25 (US HHS, 2013).

In 2011, the Texas State Legislature restructured government funding for family planning services in two main ways. The first measure reduced the family planning budget by 67%, from $111 million per biennium to $37.9 million for the following two years. The second measure formed a three-tiered system that allocates more of the remaining funding to clinics with comprehensive services over those that provide only family planning services. Tier 1 clinics include public agencies that provide family planning services, such as public health departments and federally qualified health centers. Specialty clinics, such as Planned Parenthood facilities, are classified as third-tier clinics, and faced the brunt of the funding cuts.[8] All remaining non-public entities that provide

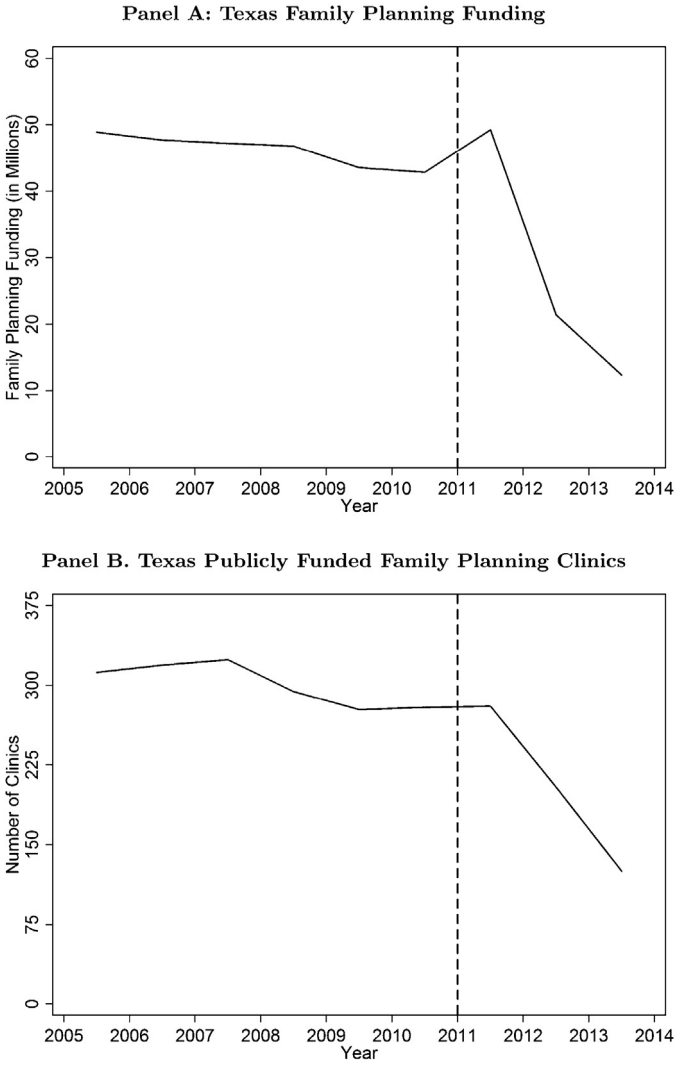

Fig. 1. Texas family planning funding and number of publicly funded clinics over time. Notes: Author's calculation based on funding data and clinic addresses provided by the Texas Department of State Health Services. The vertical line, drawn at 2011, represents the first year of funding cuts to publicly funded clinics.

comprehensive preventive and primary care in addition to family planning are classified as Tier 2 centers.[9]

The first funding cuts took place on September 1, 2011. Fourteen family planning clinics lost funds immediately. By the end of 2012, 25% of clinics shut down, 18% reduced service hours, and nearly 50% fired staff (White et al., 2015). Many providers began implementing a fee-for-service system for services that had previously been free or low-cost, such as well-woman exams and oral contraceptives (White et al., 2015).[10]

Fig. 1 Panel A displays the total amount of federal and state funding over time for Texas family planning clinics according to

[7] In 2015 Texas Governor Greg Abbott wrote, "After Texas defunded Planned Parenthood, both the Unintended Pregnancy & Abortion Rates Dropped" (Selby, 2015).

[8] By 2013, no Texas Planned Parenthood facilities received public funding.

[9] Notably, Tier 1 organizations and organizations with no other providers in the service area were issued temporary funding extensions after the initial measure. However, clinics in all tiers lost funding, and funding cuts were heterogeneous even within tier. See White et al. (2015) for more details on the differences in funding across clinic tiers.

[10] There is growing evidence that increasing the costs for such services drastically reduces the client caseload at family planning clinics. Recent survey data shows that after 2011 Texas experienced unmet demand for contraceptive services, indicating that public clinics do not fully crowd out family planning services in the private sector (White et al., 2015; Frost et al., 2016; Potter et al., 2014; Stevenson et al., 2016).

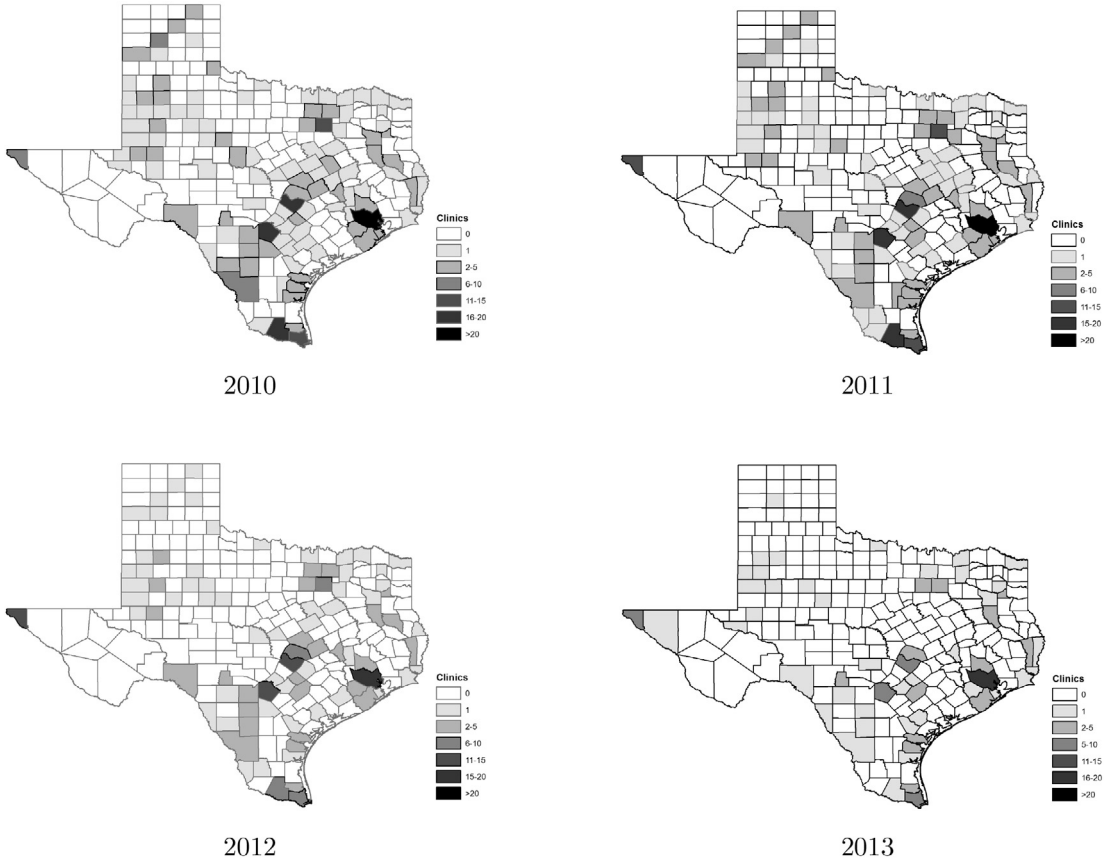

Fig. 2. Texas publicly funded family planning clinic locations over time. Notes: Author's calculation based on geocoded clinic location data provided by the Texas Department of State Health Services.

data from the Texas Department of State Health Services. Funding totaled nearly $43 mil in 2010. However, by 2012 and 2013, funding levels dropped to merely $21 mil and $12 mil, respectively. Although the legislation was enacted in 2011, a large majority of the funding cuts occurred in 2012 and 2013. Because of this delayed rollout of budget cuts and clinics' reactions to the reduction in funding, we may expect more women to be affected by this policy in the latter two years.

By the end of 2013, over 160 clinics had lost all funding, including 82 Texas clinics that closed as a result of the funding cuts. Fig. 1 Panel B displays the number of publicly funded family planning clinics over time. Notably, the number of clinics experienced a lagged response to the initial funding cuts. In the two years following the cuts, the number of publicly funded clinics dropped from 287 to 126.[11] The reduction in family planning facilities is mirrored in Fig. 2, which maps the number of publicly funded clinics by county from 2010 to 2013. Few changes are observed from 2010 to 2011. However, over 56% of clinics lost all funding for family planning services by 2013. Geographically, the Panhandle and South Texas regions, which have large low-income and Hispanic populations, experienced the greatest changes in clinic funding and access, indicating that the budget cuts were not randomly distributed and may have had disproportionately large effects on low-income women and Hispanic women.[12]

It is possible that although many family planning clinics closed as a result of the funding cuts, remaining clinics were able to absorb the excess demand for services. I explore this possibility in Fig. 3, which shows the total clients visiting a family planning clinic over time. After the funding cuts, client caseload for publicly funded family planning services dropped dramatically. From 2011 to 2013, the client caseload dropped by nearly 164,000 clients, or 77%, suggesting that there was little to no substitution effects within the public sector.[13]

Importantly, because many clinics after 2011 began charging for contraceptives that were previously offered at no cost, it may be the case that funding cuts to family planning clinics affect contraception usage. Fig. 4 shows how the primary method of contraception used by Texas family planning clinic clients has evolved over time. I note that these statistics may overstate the degree to which contraception use has decreased in Texas, because these data are based only on publicly funded clinic visitors. Fig. 4 Panel A displays the total number of family planning clients receiving

[11] It is important to note that although many clinics lost public funding, not all had to shut down. This implies that many entities were able to stay open by supplementing funding through private donors or other outside means.

[12] See Table A1 for estimated effects of family planning funding cuts on Hispanic women. Columns 3–5 indicate that the 2011 funding cuts increased birth rates by approximately 4% over four years, although positive and statistically significant estimates for the leading indicator variables in Columns 6 and 7 imply that birth rates for Hispanic women in Texas counties were increasing relative to that of other counties prior to the funding cuts. These effects are mirrored for Hispanic teens, which experience much larger increases in teen birth rates of about 12%. However, these models similarly estimate positive and statistically significant leading indicator variables, suggesting that Hispanic teen birth rates in Texas counties were also increasing prior relative to other US counties to the funding cuts.

[13] Below I discuss potential substitution effects into the private sector, and note that while I cannot directly measure the extent to which family planning clients switch doctors, I provide some data on Texas Planned Parenthood donations in Table A2 that suggests some switching is likely to have occurred as a result of the funding cuts.

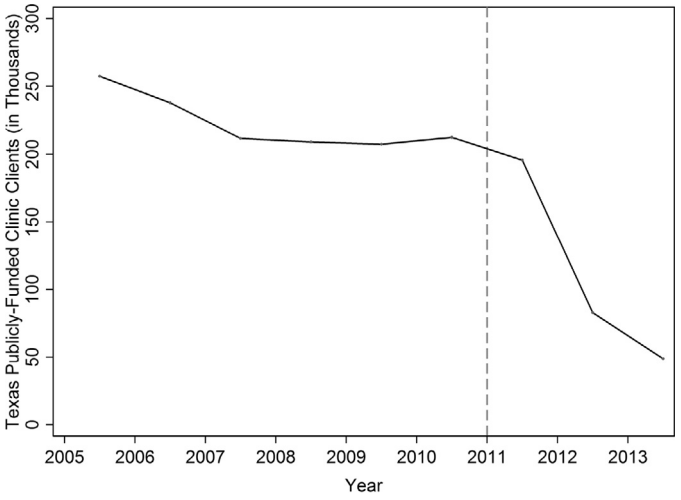

Fig. 3. Texas family planning clinic clients over time. Notes: Author's calculation of the total number of clients based on annual data provided by the Texas Department of State Health Services. The vertical line, drawn at 2011, represents the first year of funding cuts to publicly funded clinics.

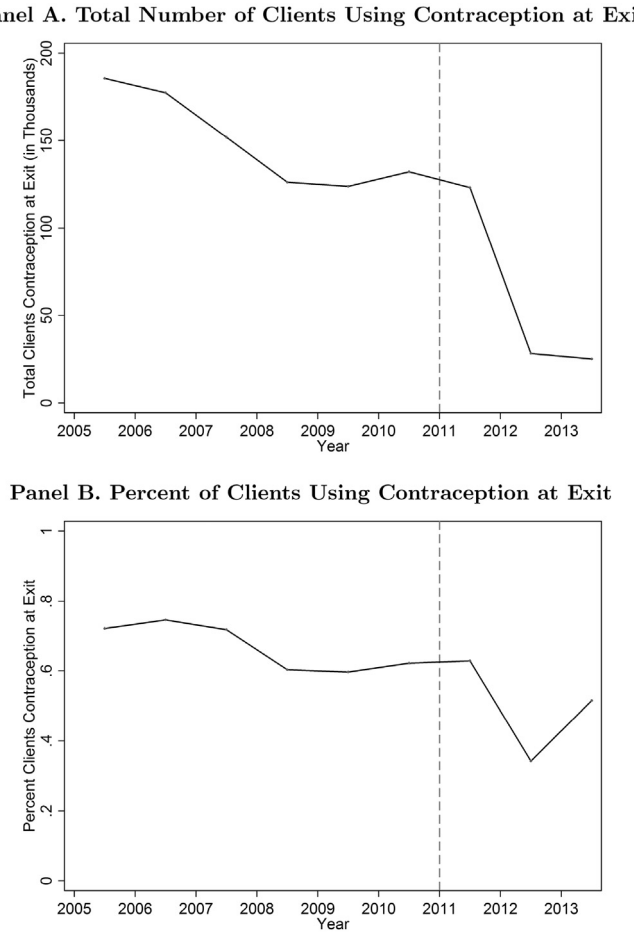

Fig. 4. Contraception use by clinic clients. Notes: Author's calculation of family planning clients using or obtaining contraceptive devices (intrauterine devices, implants, injections, oral contraceptives, patches, rings, cervical caps) at exit, based on annual data provided by the Texas Department of State Health Services. The vertical line, drawn at 2011, represents the first year of funding cuts to publicly funded clinics.

moderately effective or highly effective contraception at exit.[14] As expected, the total number of clients using contraceptives declines sharply after 2011, closely mirroring the reduction in clients shown in Fig. 3. Notably, the reduction in clients does not account for women that obtained contraceptives at privately funded facilities after a public clinic closure, meaning it is possible that the fraction of women using contraception was unchanged after the funding cuts. That said, Panel B presents to what extent the% of clients at publicly funded clinics obtain moderately effective or highly effective contraceptives. In 2010, before the funding cuts, uptake is 62%, although it drops to 34% and 52% in 2012 and 2013, respectively. These statistics support the notion that the 2011 funding cuts reduced contraceptive usage among Texas women.[15]

3. Empirical approach

This section describes the data and approach I use to estimate the causal effects of Texas's family planning funding cuts on teen childbearing.

3.1. Data

In Texas, the Department of State Health Services (DSHS) facilitates the funding and organization of the family planning program. For this study, the Texas DSHS provided yearly data on Texas health clinic agency funding, contraceptives obtained at publicly funded clinics, clinic addresses, and client caseload from 2005 to 2013. Because this analysis focuses on teens living in Texas counties with family planning clinics, I geocode the clinic addresses to identify which Texas counties were offering family planning services before the 2011 funding cuts to serve as the treatment group. All of these 113 counties contain at least one clinic that experienced a reduction in family planning funds due to the policy change. To identify counties with clinics outside of Texas, which form the comparison group for this study, I utilize the Guttmacher Institute's data on publicly funded family planning clinics. These data include county-level counts on the total number of federally qualified health centers, health departments, hospitals and Planned Parenthood clinics that receive government funding as of 2010. A map of treatment and control counties is shown in Fig. 5. These counties represent 80% of the total number of U.S. counties, and account for 96% of the female teenage population.

To measure the effect of the funding cuts on teen births, I utilize restricted-use Natality data from the Center for Disease Control and Prevention (CDC) from 2005 to 2014, which contain individual-level counts of births as well as mother's age and county of residence. Combining these data with population data from the National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER), I construct teen birth rates (the number of teen births per 1000 teen females) for the analysis.

While nearly all of the analysis focuses on teen birth rates, I also consider effects of family planning funding cuts on teen abortion rates. Data on teen abortions is from the annual Centers for Disease Control and Prevention (CDC) Abortion Surveillance, and is discussed in further detail below.

[14] Moderately effective or highly effective contraceptive devices include intrauterine devices, implants, injections, oral contraceptives, patches, rings, and cervical caps.

[15] Fig. A1 presents the% of women receiving contraceptives at publicly funded clinics by type of method over time. In 2012, the number of clients choosing injectible contraceptives sharply declined. This may be due to the fact that these methods require the user to receive subsequent injections every 3 months, and clinic closures prevented or discouraged women from receiving subsequent injections. See Stevenson et al. (2016) and Woo et al. (2016) for an in-depth analysis of the reasons behind the decline in contraceptive use in Texas clinics from 2011 to 2014.

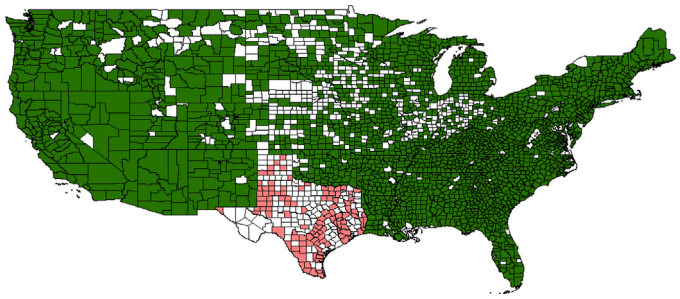

Fig. 5. Counties with publicly funded family planning clinics. Notes: Highlighted above are all U.S. counties that contain one or more publicly funded family planning clinics as of 2010. Texas counties comprise the treatment group for the main analysis and are highlighted in red. Clinic locations for Texas counties is identified from geocoded data provided by the Texas Department of State Health Services. Clinic data for U.S. counties outside Texas is from the Guttmacher Institute. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Additionally, I utilize demographic information constructed from the population data to control for time-varying county characteristics such as the fraction of teen females by age and race/ethnicity. To account for changing county-level economic conditions over time, I use data from the Bureau of Labor Statistics on the unemployment rate as well as data from the Census Small Area Income and Poverty Estimates to control for median family income and child poverty rates at the county level. Finally, I construct two policy indicator variables to help capture the broader policy environment surrounding contraceptive access in a given state and year using data collected from the National Conference of State Legislatures, National Survey of Family Growth, the National Women's Law Center and Zuppann (2011). Specifically, these policy controls are state-by-year indicator variables that account for legal over-the-counter access to emergency contraceptives and whether private insurance plans that cover prescription drugs are required to cover FDA-approved contraceptives.[16]

Summary statistics are shown in Table 1. Means are separately reported for Texas counties with family planning clinics and other U.S. counties with clinics in the periods before and after the funding cuts. Before 2011 teen birth rates in Texas average nearly 69 births per 1000 teens, compared to 45 births per 1000 teens outside of Texas. For both groups, teen birth rates fell after 2011. As such, the analysis below can be viewed as estimating to what extent teen births rates could have declined further in the absence of family planning funding cuts.

3.2. Identification strategy

I estimate the effects of the 2011 family planning funding cuts in Texas using a difference-in-differences approach. Specifically, I use all of the counties within Texas with at least one publicly funded clinic that received state and/or federal funds in 2010 as the treatment counties, since all of these 113 counties experienced budget cuts to at least one clinic after the policy change. I compare the changes in teen birth rates in these counties to all other counties in the US with publicly funded clinics. The identifying assumption underlying this approach is that changes in teen birth rates in Texas counties with family planning clinics would have matched the changes in teen birth rates in other counties with publicly funded clinics, absent the funding cuts. In the next section, I provide further discussion, as well as visual and statistical evidence, to support this assumption.[17]

Although it is typical for difference-in-differences models to estimate the average effect of a policy change across all post years, this approach is less appropriate in this context. For example, we may expect the funding cuts to have a delayed effect on teen pregnancy if clinics were slow to respond to the budget changes and/or shut down. Although the initial funding cuts took place near the end of 2011, many clinics did not lose funding until 2012, and it is feasible that there was little interruption to services until then. Finally, while there may have been a more immediate change in contraception availability, childbearing is a naturally lagged pro-

Table 1
Summary statistics.

	Treated counties	Comparison counties
Pre-treatment (2005–2010)		
Births per 1000 females aged 15–19	69.30	45.22
Fraction teens 15 year-olds	0.20	0.20
Fraction teens 16 year-olds	0.20	0.20
Fraction teens 17 year-olds	0.20	0.21
Fraction teens 18 year-olds	0.20	0.20
Fraction teens 19 year-olds	0.20	0.19
Fraction black teens	0.10	0.14
Fraction Hispanic teens	0.44	0.08
County unemployment rate	5.91	6.92
Median family income	40,695.24	42,111.21
Percent under age 18 in poverty	26.81	22.54
Emergency contraceptive OTC	0.83	0.85
Contraceptive insurance mandate	0.00	0.40
Post-treatment (2011–2014)		
Births per 1000 females aged 15–19	53.34	35.05
Fraction teens 15 year-olds	0.20	0.20
Fraction teens 16 year-olds	0.20	0.20
Fraction teens 17 year-olds	0.20	0.20
Fraction teens 18 year-olds	0.20	0.20
Fraction teens 19 year-olds	0.21	0.20
Fraction black teens	0.10	0.14
Fraction Hispanic teens	0.48	0.09
County unemployment rate	6.50	8.02
Median family income	45,508.40	44,892.17
Percent under age 18 in poverty	27.23	25.26
Emergency contraceptive OTC	1.00	1.00
Contraceptive insurance mandate	0.00	0.45

Notes: Births per 1000 teen females are based on data from the National Center for Health Statistics, Division of Vital Statistics Natality Files and SEER population data. Population data including race, ethnicity, sex and age are from SEER. County-level unemployment rates are from the Bureau of Labor Statistics. Median family income and child poverty rates are from the Census Bureau Small Area Income and Poverty Estimates. State-level policy data on over the counter emergency contraception laws and insurance mandates are from the National Conference of State Legislatures, National Survey of Family Growth, the National Women's Law Center and Zuppann (2011). Column 1 presents means for treated counties, which include the counties in Texas that have publicly funded health clinics and experienced funding cuts in 2011. Column 2 shows the means for counties outside of Texas that have family planning clinics, which represent the comparison group for this analysis.

[16] While the Affordable Care Act set federal guidelines for health insurance coverage for the full range of contraceptive methods used by women, many states never required prescription or over-the-counter coverage and 20 states allow exemptions to employers and insurers. Notably, Texas, along with several other states, does not require insurers to cover any type of contraceptive. However, employers must be offered the option to include coverage of contraceptives within a health plan. See https://www.guttmacher.org/state-policy/explore/insurance-coverage-contraceptives for a full description of current state laws and policies regarding insurance coverage of contraceptives.

[17] I have also considered using several alternative comparison groups, including a broader group comprised of all US counties as well as more narrow comparison groups comprised of Texas counties, counties in Southern states, or counties in states bordering Texas. None of these groups appear to track the Texas counties' teen birth rate trend as closely as the chosen comparison counties prior to the funding cuts, suggesting they would provide a less reliable counterfactual. Finally, I have considered using only counties that experience a clinic closure, with all other counties with a publicly funded clinic serving as the comparison group. The point estimates from this approach are similar to the main results (average effect of 0.042, as compared to an average effect of 0.034), but because these counties are relatively sparsely populated, such an approach yields estimates that are much less precise.

cess. For these reasons, we can expect that changes in teen birth rates will be most concentrated in later years.

To identify the effects of family planning funding cuts I exploit within-county variation, controlling for state-level policy shocks and time-varying county characteristics. Formally, I estimate the following county-level model using weighted least squares:

$$\ln(teenbr_{ct}) = \sum_{k=1}^{4} \theta_k fundcuts_{c,t-k} + \alpha_c + \alpha_t + \beta X_{ct} \quad (1)$$

where $teenbr_{ct}$ measures teen birth rates for county c in year t, $fundcuts_{c,t-k}$ is an indicator variable that takes a value of one for Texas counties k years after the initial family planning funding cuts began and zero otherwise, α_c are county fixed effects to control for any time-invariant systematic differences across counties, α_t are year fixed effects to control for shocks to teen birth rates that are common to all counties in a year, and X_{ct} includes time-varying county control variables for demographics, economics conditions, and state-level contraception policies. I note that my main results are based on regressions that weight by the relevant population size to improve efficiency.[18]

Since birth data is discrete and there exist some county-year cells with zero teen births, I also report results from a fixed effects Poisson model.[19,20] In particular, I estimate Poisson models of the following form:

$$E[teenbr_{ct}|fundcuts_{c,t-k}, \alpha_c, \alpha_t, X_{ct}] = \exp\left(\sum_{k=1}^{4} \theta_k fundcuts_{c,t-k} + \alpha_c + \alpha_t + \beta X_{ct}\right) \quad (2)$$

where $teenbr_{ct}$ is the teen birth rate for county c in year t, $fundcuts_{c,t-k}$ is an indicator variable that takes a value of one for Texas counties k years after the initial family planning funding cuts began and zero otherwise, α_c are county fixed effects to control for any time-invariant systematic differences across counties, α_t are year fixed effects to control for shocks to teen birth rates that are common to all counties in a year, and X_{ct} includes time-varying county control variables for demographics, economics conditions, and state-level contraception policies.

Importantly, this model can alternatively be expressed as one that estimates the natural log of the expected count of births while controlling for the population of teen females and constraining its coefficient to be equal to one. Therefore, estimates from the above model will be comparable to estimates from a weighted least squares model that estimates the effects of the funding cuts on logged teen birth rates and allows standard errors to be correlated within counties over time.[21]

Finally, to show that the analysis is robust to the selection of control counties, I additionally estimate propensity score matching models to determine a control group, then derive difference-in-differences estimates that correspond to the WLS and Poisson models detailed above. In doing so, I restrict the sample of comparison counties to those most similar on observable characteristics to the counties in Texas with publicly funded clinics. Specifically, I replicate the main findings using a data-driven process to determine the set of control counties for each year using nearest-neighbor matching with the full set of non-treated counties as potential donors.[22]

While I present estimates of the average effects of funding cuts on teen childbearing for all specifications, I also include estimates from a set of post-period indicator variables to study how childbearing is affected over time. The nature of contraceptive choice, coupled with the lengthy process of childbearing, suggest that effects of clinic funding cuts are unlikely to be immediate. Specifically, given that a majority of clinics experienced funding cuts in 2012, and gestation is 40 weeks, any treatment effects are likely to appear in 2013 and 2014, or 2–3 years after initial funding cuts.

4. Main results

Before presenting regression results, I first provide a graphical analysis of the trends in teen birth rates across treatment and comparison counties. Fig. 6 Panels A, B and C respectively plot teen birth rates, logged teen birth rates, and differences in logged teen birth rates for Texas counties with family planning clinics against all other US counties with family planning clinics over time. In Fig. 6 Panels A and B, the trends in teen birth rates and logged teen birth rates for counties in Texas with clinics and counties outside of Texas with clinics appear to similarly track each other prior to 2011, lending some visual support to the validity of the assumption that changes in birth rates for the comparison counties provides a good counterfactual for Texas counties.

However, given that the baseline levels in birth rates are so different, it is difficult to visually distinguish if the trends diverge after 2011. Therefore, Fig. 6 Panel C presents the difference in logged teen birth rates for Texas counties and counties outside of Texas over time. Teen birth rates in Texas counties after the funding cuts increases relative to the comparison counties, providing some initial evidence that the policy change increased teen childbearing. Below I present a more rigorous statistical analysis of the apparent effects of the funding cuts on teen birth rates and provide further evidence to support the common trends assumption.

Table 2 shows the difference-in-differences estimates from the weighted least squares (WLS) model described in Eq. (1). I additionally present the estimated average effect for 2011–2014 and the average effect for the latter two years. Column 1 presents results from a WLS model with no controls while Columns 2, 3 and 4 show results from models that progressively add controls for demographics, economic condition, and state-level contraception policies. Specifically, these controls include the fraction of teens of each age and race/ethnicity, the county unemployment rate, county poverty rate, and state-level policy indicators for emergency contraception access and contraceptive insurance mandates.

In Column 1, estimates indicate that family planning funding cuts increased teen birth rates in 2013 and 2014 (2–3 years after cuts). Estimates in Columns 2–4 indicate that funding cuts to family planning services increase teen birth rates from 3.7% to 4.7% two years later and 10.3% to 11.2% three years later, or 3.4–4.3%, on average. Effects on birth rates across all columns in the first two years of funding cuts are statistically insignificant at the 5% level; although, given the delayed nature of childbearing and the lagged

[18] Specifically, I use analytic weights where the weight for teen birth rate is the county teen female population and the weight for birth rates by age is the corresponding county female population by age.

[19] Specifically, there are 191 county-year observations out of 25,200 that have a teen birth rate of zero.

[20] Like linear models, the Poisson model is not subject to the incidental parameters problem associated with fixed effects because they can be eliminated from the model. I relax the assumption of equality between the conditional mean and variance by calculating sandwiched standard errors.

[21] While it is usually useful to also present ordinary least squares estimates (OLS) for comparison with WLS estimates, as described in detail in Solon et al. (2015), OLS is likely to be unreliable in this context because of the weight it gives to small counties for which the outcome variable is disproportionally affected by any ad hoc solution to addressing cells with zero births. Nevertheless, when estimating an OLS model, I find that the funding cuts led to a 4.2% increase in teen birth rates 2–3 years after the policy change, and a 2% increase in teen birth rates overall, although the latter estimate is statistically insignificant.

[22] I find statistically similar results using kernel weights with a bandwidth of 0.06, as suggested by Heckman et al. (1997).

Table 2
Weighted least squares estimates of the effect of funding cuts on logged teen birth rates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effect of cuts in first year	−0.005	0.004	−0.002	−0.003	−0.003	−0.001	0.003
	(0.010)	(0.016)	(0.016)	(0.016)	(0.016)	(0.018)	(0.020)
Effect of cuts in second year	−0.002	0.009	0.000	−0.001	−0.001	0.001	0.005
	(0.012)	(0.018)	(0.018)	(0.018)	(0.018)	(0.020)	(0.022)
Effect of cuts in third year	0.033*	0.047**	0.038*	0.037*	0.037*	0.039*	0.043*
	(0.017)	(0.021)	(0.021)	(0.021)	(0.021)	(0.023)	(0.025)
Effect of cuts in fourth year	0.088*	0.112**	0.104**	0.103**	0.104**	0.106**	0.111**
	(0.049)	(0.047)	(0.046)	(0.047)	(0.049)	(0.049)	(0.049)
One-year lead						0.009	0.013
						(0.013)	(0.015)
Two-year lead							0.017
							(0.011)
Average effect	0.028	0.043	0.035	0.034	0.034	0.036	0.041
P-value (test average effect = 0)	0.096	0.008	0.022	0.028	0.029	0.042	0.039
Average effect in years 3–4	0.060	0.080	0.071	0.070	0.071	0.073	0.077
P-value (test average effect in years 3–4 = 0)	0.032	0.002	0.004	0.006	0.007	0.008	0.007
Observations	25,008	25,008	25,008	25,008	24,225	24,225	24,225
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Economic controls	No	No	Yes	Yes	Yes	Yes	Yes
Policy controls	No	No	No	Yes	Yes	Yes	Yes
Restricted sample	No	No	No	No	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. Demographic controls include the fraction of teens aged 15–19 by age, ethnicity and race, economic controls include county unemployment rates, median family income and child poverty rates, and policy controls include state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

rollout of the budget cuts, it is unsurprising that these effects are concentrated in later years.

To investigate the extent to which policy changes in other states affect the main estimates, Column 5 replicates estimates from Column 4, using a more refined set of comparison counties that omits counties in states outside of Texas with major funding cuts to family planning services from 2010 to 2012. These states include New Jersey, New Hampshire, Montana and Maine. Results are robust to the exclusion of these observations, and indicate that the Texas funding cuts increased teen birth rates by 3.4%, on average, or 7.1% 2–3 years after the funding cuts.

Columns 6 and 7 separately add one- and two-year indicator variables for Texas counties prior to the funding cuts to check that the teen birth rate in the Texas counties closely tracked the trend in other US counties before the policy change and serve as a good comparison group for this study. Indeed, the estimates for the leads are statistically insignificant and close to zero. Moreover, the results of the estimated effects of the funding cuts are statistically similar to those of Column 5 and are robust to the inclusion of the lead terms which lends further evidence to support the validity of the research design.

In Table 3, I report the difference-in-differences estimates from the fixed effects Poisson model described above. Estimates across Columns 1–7 mirror those for Table 2. These results indicate that the funding cuts to family planning services increase teen birth rates by 3.5% two years after the initial cuts and 8.2% three years later when controlling for demographics, unemployment rate and state-level contraceptive policies. Similarly, the overall average effects and average effects 2–3 years later are 2.9% and 5.9%, respectively.

To show that the effects described above are not sensitive to the selection of the comparison group, I additionally calculate a propensity score for each observation to find a set of counties that provides a good match on observables for each treatment county. To do so, I utilize a nearest-neighbor matching model with replacement that matches Texas counties with clinics to comparison counties based on the full set of county-level controls described above. Table 4 displays the WLS estimates for a smaller set of counties that include only the treated counties and their closest matches. Across Columns 3–6 estimates for the initial year of funding cuts are statistically insignificant, however, estimates for the second and third years are positive and range from 5.1% to 8.5%. Estimates in the fourth year are much less precise. Overall, estimates are larger than the main results, and indicate that family planning funding cuts increased teen birth rates by 6.0% over four years, or 7.5% 2–3 years later.

It is important to note that because of funding exclusion restrictions imposed on Planned Parenthood affiliates in 2013, estimated effects of the funding cuts in the fourth year may be overstated if counties with publicly funded clinics experienced additional Planned Parenthood closures. However, when omitting the most recent year of data, results indicate that family planning funding cuts increased teen birth rates by approximately 6% in 2013. Below I discuss the potential to which teens in counties with Planned Parenthood clinics are driving these results.

5. Differential effects of funding cuts on teen birth rates

In this section I discuss results from several alternative models that analyze the extent to which there were heterogeneous treatment effects across populations. Specifically, I present estimates for teens by age, and investigate effects for teens in counties without a publicly funded clinic, teens in more centrally located Texas counties, teens in counties with one or more Planned Parenthood clinics, and teens in low-income areas.[23]

[23] It is possible that changes in family planning policies also have differential effects based on race and ethnicity. Average effects for white and black teens 3–4 years after funding cuts are statistically significant at the 10% and 5% level, respectively, and range from 5.9% to 8.6%, with larger effects for black teens. However, when estimating effects of funding cuts on teen birth rates by ethnicity, I find that while Hispanic teens face large increases in birth rates after the funding cuts, trends in Hispanic teen birth rates increase in Texas counties with clinics relative to other

Table 3
Poisson estimates of the effect of funding cuts on teen birth rates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effect of cuts in first year	−0.011	0.008	−0.003	−0.004	−0.004	−0.003	0.001
	(0.010)	(0.015)	(0.014)	(0.014)	(0.014)	(0.016)	(0.019)
Effect of cuts in second year	−0.001	0.022	0.005	0.004	0.004	0.005	0.009
	(0.013)	(0.017)	(0.015)	(0.015)	(0.015)	(0.018)	(0.020)
Effect of cuts in third year	0.028	0.055***	0.036*	0.035*	0.035*	0.037*	0.041*
	(0.019)	(0.021)	(0.019)	(0.019)	(0.019)	(0.022)	(0.025)
Effect of cuts in fourth year	0.065***	0.100***	0.083***	0.082***	0.082***	0.084***	0.088***
	(0.020)	(0.022)	(0.021)	(0.021)	(0.021)	(0.023)	(0.025)
One-year lead						0.008	0.012
						(0.014)	(0.018)
Two-year lead							0.014
							(0.014)
Average effect	0.020	0.046	0.030	0.029	0.029	0.031	0.035
P-value (test average effect = 0)	0.142	0.006	0.050	0.062	0.062	0.091	0.101
Average effect in years 3–4	0.047	0.077	0.060	0.059	0.059	0.061	0.064
P-value (test average effect in years 3–4 = 0)	0.009	0.000	0.001	0.002	0.002	0.004	0.007
Observations	25,200	25,200	25,200	25,200	24,410	24,410	24,410
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Economic controls	No	No	Yes	Yes	Yes	Yes	Yes
Policy controls	No	No	No	Yes	Yes	Yes	Yes
Restricted sample	No	No	No	No	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. Demographic controls include the fraction of teens aged 15–19 by age, ethnicity and race, economic controls include county unemployment rates, median family income and child poverty rates, and policy controls include state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

Table 4
Weighted least squares estimates of the effect of funding cuts on teen birth rates, difference-in-differences using propensity score matching to determine comparison counties.

	(1)	(2)	(3)	(4)	(5)	(6)
Effect of cuts in first year	0.053*	0.072**	0.041	0.040	0.040	0.048
	(0.030)	(0.037)	(0.036)	(0.035)	(0.035)	(0.037)
Effect of cuts in second year	0.036	0.071***	0.051*	0.051*	0.052*	0.061**
	(0.024)	(0.025)	(0.026)	(0.028)	(0.028)	(0.028)
Effect of cuts in third year	0.071***	0.106***	0.085**	0.085**	0.085**	0.092***
	(0.027)	(0.033)	(0.034)	(0.034)	(0.034)	(0.035)
Effect of cuts in fourth year	0.048	0.091**	0.066	0.065	0.066	0.077*
	(0.044)	(0.044)	(0.044)	(0.045)	(0.045)	(0.046)
One-year lead					0.013	0.030
					(0.022)	(0.029)
Two-year lead						0.038
						(0.026)
Average effect	0.052	0.085	0.061	0.060	0.061	0.070
P-value (test average effect = 0)	0.025	0.001	0.023	0.027	0.027	0.015
Average effect in years 3–4	0.059	0.099	0.076	0.075	0.076	0.085
P-value (test average effect in years 3–4 = 0)	0.051	0.003	0.026	0.029	0.029	0.017
Observations	1572	1572	1572	1572	1572	1572
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Economic controls	No	No	Yes	Yes	Yes	Yes
Policy controls	No	No	No	Yes	Yes	Yes
Restricted sample	N/A	N/A	N/A	N/A	N/A	N/A

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. Demographic controls include the fraction of teens aged 15–19 by age, ethnicity and race, economic controls include county unemployment rates, median family income and child poverty rates, and policy controls include state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

5.1. Effects by age

While it is common practice to study birth rates for all teens aged 15–19, it may be the case that younger teens and older teens are affected differentially by changes in family planning policies. That said, it is not clear whether older or younger teens are expected to be affected more by a reduction in family planning services. For example, if teens under the age of 18 are more constrained in terms of transportation and other financial resources, this age group is more likely to be affected by a change in clinic access. However, older teens are more experienced and have sex more frequently

counties with clinics prior to the policy change. Therefore, models that produce estimates on the effects of funding cuts on Hispanic teens will be misspecified.

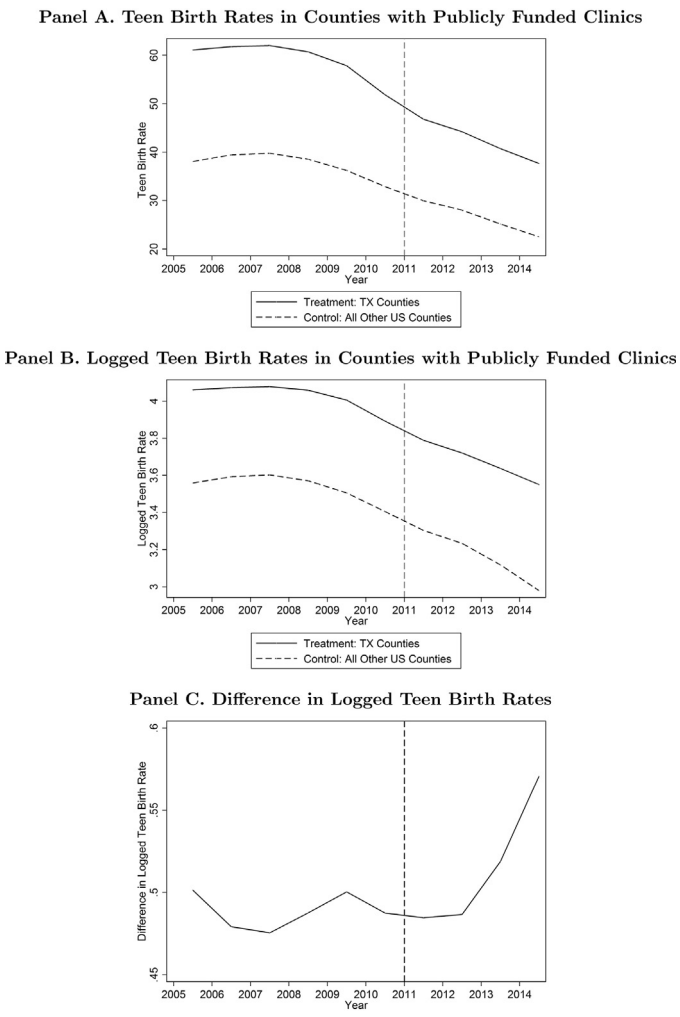

Fig. 6. Trends in teen birth rates in counties with publicly funded clinics. Notes: Teen birth rates are constructed using the National Center for Health Statistics, Division of Vital Statistics Natality Files and SEER population data. The vertical line, drawn at 2011, represents the beginning of funding cuts to Texas family planning clinics.

than their younger counterparts, indicating that a potential reduction in contraception usage as a result of limited clinic access could result in a larger increase in birth rates for the older group (Martinez et al., 2011).

I replicate the main results for teens by age separately to determine if the funding cuts to family planning services affects younger teens and older teens in different ways. Table 5 displays results for teens aged 15, 16, 17, 18 and 19 as well as the younger group, aged 15–17, and the older group, aged 18–19. Estimates across Columns 1–3 indicate that reductions in family planning spending had no effect on 15 year olds, but increased birth rates for 16 and 17 year olds from 2.7% to 3.2%, on average, or 6.0% to 6.2% in the third and fourth years. Estimates for the subgroup of 15–17 year olds, as shown in Column 6, indicate an effect of 3.9% over four years, which is slightly larger than the estimated 3.4% increase in birth rates for all teens.

Effects for 18 and 19 year olds are shown in Columns 4, 5, and 7, and imply that the funding cuts increased birth rates for older teens increased by approximately 3–4% overall, or 6.2–6.4% in the third and fourth years. These findings affirm the idea that cuts to family planning services affect both the younger teens, aged 15–17 and the older teens, aged 18–19. This suggests that while younger teens may face relatively high barriers to obtaining low-cost contraception, there is little evidence to suggest that they are more sensitive to changes in family planning clinic access.

To verify that trends in logged teen birth rates for 15–17 year olds and 18–19 year olds in Texas counties with publicly funded clinics did not deviate from expected levels relative to other US counties with clinics prior to 2011, I additionally estimate effects of funding cuts on childbearing one and two years before the policy change. Table 6 displays the results from WLS models that include indicator variables for Texas counties prior to the initial funding cuts. The coefficient estimates on all lead terms are close to zero and statistically insignificant when estimating effects for all teens as well as younger teens, aged 15–17, and older teens, aged 18–19, supporting the notion that the control counties provide a good comparison group. Moreover, these results show that the estimated effects of the funding cuts are robust to the inclusion of these lead terms, providing additional support for the validity of the research design.

5.2. Analyzing potential spillover effects

Given that over half of counties in Texas did not have a publicly funded clinic in 2010, it is possible that estimates from the main results understate the overall effect of the budget cuts on teen birth rates. One reason is that teens could be traveling to an adjacent county for family planning care prior to the funding cuts but are unable to visit clinics much further away. To investigate this possibility, I estimate the effects of the policy in counties without clinics, which are omitted from the main analysis, and display them in Table 7. Specifically, I replicate Table 2 Column 5 using all counties in Texas without publicly funded clinics as the treatment counties and U.S. counties outside of Texas without clinics as the comparison counties.[24] In all years following the policy change the estimates are statistically insignificant. However, these estimates are relatively imprecise and incapable of ruling out large effects on teen birth rates, perhaps since counties with no publicly funded clinics account for merely 4% of the population of teen females.

Moreover, the main results may also be understated if clients living in Texas border counties cross state lines to receive family planning services after funding cuts. I explore the extent to which funding cuts affected non-border Texas counties in Column 3 of Table 7. Estimates are statistically similar to Column 1 and indicate that funding cuts increased teen birth rates by 2.7% over four years, or 6.2% 2–3 years later.

5.3. Effects on counties with Planned Parenthood

Despite its major role in providing family planning services to thousands of Texas clients, a publicized motivation for the defunding of family planning services in Texas is the goal of eliminating Planned Parenthood.[25] For example, in 2012 Texas governor Rick Perry stated, "I was really proud to be able to sign into legislation that we worked with our legislature to defund Planned Parenthood in the state of Texas" (Summers, 2012). One reason behind defunding Planned Parenthood is that although centers that receive public funding are not legally allowed to provide abortion services, publicly funded Planned Parenthood clinics are affiliated with abortion providers. State rules define abortion clinic "affiliation" as any clinic that shares an organizational name with an entity that performs

[24] Similarly, one could consider estimating a triple difference that compares changes in Texas counties with publicly funded clinics to changes in Texas counties without such clinics relative to what is observed in other states. This approach yields estimates that are positive, albeit much less precise (P-value = 0.733).

[25] Of the 218,000 women receiving care through this funding, 40% obtained services through Planned Parenthood and other tier three agencies prior to 2011.

Table 5
Estimates of the effect of funding cuts on birth rates by age subgroup.

	15 year olds (1)	16 year olds (2)	17 year olds (3)	18 year olds (4)	19 year olds (5)	15–17 year olds (6)	18–19 year olds (7)
Effect of cuts in first year	0.002	−0.012	0.016	0.007	0.006	0.014	0.003
	(0.047)	(0.030)	(0.021)	(0.012)	(0.015)	(0.020)	(0.012)
Effect of cuts in second year	−0.046	−0.002	−0.012	0.028*	0.003	−0.001	0.006
	(0.053)	(0.031)	(0.021)	(0.015)	(0.015)	(0.023)	(0.013)
Effect of cuts in third year	−0.030	0.074***	0.030	0.036*	0.067***	0.046*	0.045**
	(0.049)	(0.028)	(0.025)	(0.021)	(0.021)	(0.024)	(0.018)
Effect of cuts in fourth year	−0.027	0.047	0.093**	0.089***	0.061***	0.097**	0.064***
	(0.060)	(0.029)	(0.040)	(0.020)	(0.017)	(0.049)	(0.016)
Average effect	−0.025	0.027	0.032	0.040	0.034	0.039	0.029
P-value (test average effect = 0)	0.536	0.251	0.088	0.004	0.018	0.085	0.024
Average effect in years 3–4	−0.029	0.060	0.062	0.062	0.064	0.071	0.054
P-value (test average effect in years 3–4 = 0)	0.547	0.011	0.018	0.001	0.000	0.023	0.001
Observations	16,201	20,444	22,535	23,508	23,932	23,309	24,139
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Economic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Policy controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Restricted sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. The outcome variables for Columns 1–5 are births to teens by age from 15 to 19. The outcome variables for Columns 6 and 7 are the births to teens aged 15–17 and 18–19, respectively. Demographic controls include the fraction of teens by age, ethnicity and race. Economic controls include county unemployment rates, median family income and child poverty rates, and policy controls include state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

Table 6
Weighted least squares estimates of lead terms in difference-in-differences model.

	All teens Aged 15–19			Teens Aged 15–17			Teens Aged 18–19		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Effect of cuts in first year	−0.003	−0.001	0.003	0.014	0.019	0.025	0.003	0.004	0.009
	(0.016)	(0.018)	(0.020)	(0.020)	(0.023)	(0.026)	(0.012)	(0.014)	(0.016)
Effect of cuts in second year	−0.001	0.001	0.005	−0.001	0.004	0.010	0.006	0.007	0.012
	(0.018)	(0.020)	(0.022)	(0.023)	(0.025)	(0.028)	(0.013)	(0.015)	(0.017)
Effect of cuts in third year	0.037*	0.039*	0.043*	0.046*	0.051*	0.057*	0.045**	0.046**	0.051**
	(0.021)	(0.023)	(0.025)	(0.024)	(0.027)	(0.030)	(0.018)	(0.020)	(0.022)
Effect of cuts in fourth year	0.104**	0.106**	0.111**	0.097**	0.102**	0.108**	0.064***	0.065***	0.070***
	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.051)	(0.016)	(0.018)	(0.019)
One-year lead		0.009	0.013		0.024	0.030		0.006	0.011
		(0.013)	(0.015)		(0.018)	(0.021)		(0.013)	(0.016)
Two-year lead			0.017			0.023			0.019
			(0.011)			(0.016)			(0.013)
Average effect	0.034	0.036	0.041	0.039	0.044	0.050	0.029	0.031	0.036
P-value (test average effect = 0)	0.029	0.042	0.039	0.085	0.076	0.069	0.024	0.042	0.038
Average effect in years 3–4	0.071	0.073	0.077	0.071	0.077	0.083	0.054	0.055	0.060
P-value (test average effect in years 3–4 = 0)	0.007	0.008	0.007	0.023	0.019	0.017	0.001	0.002	0.002
Observations	24,225	24,225	24,225	23,309	23,309	23,309	24,139	24,139	24,139
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Restricted sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. The outcome variables for Columns 1–3 are births to teens by age from 15-19. The outcome variables for Columns 4–6 and 7–9 are the births to teens aged 15–17 and 18–19, respectively. Demographic controls include the fraction of teens by age, ethnicity and race. Economic controls include county unemployment rates, median family income and child poverty rates, and policy controls include state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

abortions elsewhere. Proponents of policies to defund Planned Parenthood argue that public money can be distributed across clinics in the same organization and can indirectly fund abortions, despite the fact that shifting funds is illegal and all family planning services at publicly funded clinics are billed separately. Nevertheless, based on their affiliation with abortion clinics, Texas Planned Parenthood centers that provide only contraception services, STD screening and other women's health services were a primary target for 2011 funding cuts.

As a result of the Texas funding cuts, 11 Planned Parenthood facilities closed, potentially limiting low-cost contraception access for at-risk teenagers. To measure the change in birth rates in counties with Planned Parenthood facilities, I replicate Column 5 of the main results while limiting the sample to counties with Planned Parenthood clinics in 2010, which represents only 19% of the total counties. Given that in 2013 Texas eliminated Planned Parenthood facilities from the state Women's Health Program, estimates will indicate the extent to which the effects of family planning funding

Table 7
Differential effects of funding cuts on teen birth rates.

	Counties with clinics (1)	Counties without clinics (2)	Counties without TX border (3)	Counties with Planned Parenthood (4)	Counties with poverty rate >TX avg (5)	Counties with poverty rate <TX avg (6)
Effect of cuts in first year	−0.003	−0.053	−0.007	0.011	−0.018	−0.016
	(0.016)	(0.044)	(0.017)	(0.017)	(0.015)	(0.028)
Effect of cuts in second year	−0.001	−0.017	−0.009	0.007	0.010	−0.021
	(0.018)	(0.087)	(0.019)	(0.019)	(0.017)	(0.025)
Effect of cuts in third year	0.037*	−0.050	0.029	0.044*	0.050***	0.016
	(0.021)	(0.057)	(0.021)	(0.024)	(0.016)	(0.025)
Effect of cuts in fourth year	0.104**	0.042	0.095*	0.068***	0.060***	0.090
	(0.049)	(0.065)	(0.050)	(0.025)	(0.018)	(0.061)
Average effect	0.034	−0.019	0.027	0.032	0.025	0.017
P-value (test average effect = 0)	0.029	0.712	0.100	0.109	0.070	0.368
Average effect in years 3–4	0.071	−0.004	0.062	0.056	0.055	0.053
P-value (test average effect in years 3–4 = 0)	0.007	0.944	0.022	0.019	0.000	0.125
Observations	24,225	5526	24,045	4853	9384	21,150
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Restricted sample	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. Estimates in Column 1 include all US counties with a publicly funded family planning clinic, while Column 2 includes all counties without a publicly funded clinic. Column 3 excludes counties in Texas with a publicly funded clinic that border another US state. Estimates in Column 4 include counties containing a Planned Parenthood clinic in 2010, and estimates from Column 5 and Column 6, respectively, are from a subset of counties that have average poverty rates higher, and lower, than the treated Texas counties' average poverty rate in 2010. Controls include the fraction of teens aged 15–17 and 18–19 by age, ethnicity and race, unemployment rates, and state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

cuts are driven by a later policy change in these counties. Table 7 Column 3 displays the effects of the funding cuts on teen birth rates in Planned Parenthood counties. Teen birth rates in these counties increased by 3.2% over four years, or 5.6% in the third and fourth years, which is slightly (but not statistically) smaller than the estimated effect for teens overall.

Although several clinics closed, some Planned Parenthood centers were able to stay open, likely as a result of an increase in private donations. See Table A2 for an annual breakdown of donations to Texas Planned Parenthood facilities from 2011 to 2014. Donations approximately doubled in 2012, suggesting some substitution between public and private funding for family planning services, although the increase in donations over two years represents only 5% of the total funding cuts to family planning clinics. That said, because some of the funding reductions were offset by the private sector, estimates presented in Table 3 may understate the true effects of defunding family planning clinics.[26]

5.4. Effects on low-income women

Since publicly funded family planning services mainly serve low-income women, we may expect funding cuts and clinic closures to have a larger effect on teens in counties with higher concentrations of poverty. I investigate this by separately considering effects for counties with high and low poverty rates and report these results in Table 7. "High" poverty counties are defined as those with poverty rates above the median poverty rate for Texas counties with publicly funded clinics and "low" poverty counties are those with poverty rates below this median.[27]

As shown in Column 5, funding cuts increased teen birth rates by 5.5% in 2013 and 2014. In comparison, Column 6 shows estimates for counties with relatively low poverty rates. Estimates are positive, and indicate smaller average effects of 1.7% in 2014. Notably, the estimated average effects for low poverty counties are not statistically significant and, overall, estimates for high poverty counties are smaller, albeit not statistically different from the full sample. Therefore, there is modest evidence to support the idea that teens in relatively richer communities are less sensitive to changes in access to publicly funded family planning services.

In Table 8 I show estimates from WLS models that include indicator variables for Texas counties prior to the initial funding cuts to support the notion that US counties with publicly funded clinics provide a good counterfactual for Texas counties with clinics. The coefficient estimates on all lead terms are close to zero and statistically insignificant when estimating effects for all counties (Columns 1–3), counties with poverty rates above the Texas median poverty rate (Columns 4–6), and counties with poverty rates below the Texas median (Columns 7–9), which lend additional support for the identification assumption.

6. Analyzing changes in abortion rates

The stated political motivation for defunding family planning services is reducing abortions. Although federally funded clinics are not legally allowed to provide abortions, one argument for limiting family planning resources is that clinics affiliated with abortion providers may distribute government funding across an umbrella organization, thereby indirectly funding abortion services.[28]

Before presenting regression-based estimates, I first provide some visual data to determine the effect of family planning funding cuts on abortion rates in Texas. Unlike most states, the Texas Department of State Health Services releases annual county-level abortion rates. Therefore, while I cannot apply the same difference-in-differences methodology described in Section 3 to present

[26] Importantly, there were no other federal funding sources that replaced the loss in state funding to family planning clinics.

[27] To maintain a balanced panel, I average each county's poverty rate across the sample period, 2005–2014.

[28] The Hyde Amendment prohibits government funding for any clinic that provides abortion services and the transfer of public funds to abortion clinics. Moreover, services at family planning clinics are billed separately, which prohibits large organizations from shifting publicly provided financial resources to affiliated clinics.

Table 8
Weighted least squares estimates of lead terms in difference-in-differences model.

	Counties with clinics			Counties with poverty rate >TX avg			Counties with poverty rate <TX avg		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Effect of cuts in first year	−0.003	−0.001	0.003	−0.018	−0.019	−0.020	−0.016	−0.016	−0.015
	(0.016)	(0.018)	(0.020)	(0.015)	(0.017)	(0.018)	(0.028)	(0.030)	(0.035)
Effect of cuts in second year	−0.001	0.001	0.005	0.010	0.009	0.008	−0.021	−0.021	−0.020
	(0.018)	(0.020)	(0.022)	(0.017)	(0.019)	(0.019)	(0.025)	(0.028)	(0.031)
Effect of cuts in third year	0.037*	0.039*	0.043*	0.050***	0.050***	0.048***	0.016	0.015	0.016
	(0.021)	(0.023)	(0.025)	(0.016)	(0.017)	(0.017)	(0.025)	(0.028)	(0.030)
Effect of cuts in fourth year	0.104**	0.106**	0.111**	0.060***	0.059***	0.058***	0.090	0.089	0.090
	(0.049)	(0.049)	(0.049)	(0.018)	(0.019)	(0.019)	(0.061)	(0.060)	(0.058)
One-year lead		0.009	0.013		−0.003	−0.005		−0.004	−0.003
		(0.013)	(0.015)		(0.013)	(0.014)		(0.017)	(0.020)
Two-year lead			0.017			−0.006			0.005
			(0.011)			(0.011)			(0.019)
Average effect	0.034	0.036	0.041	0.025	0.025	0.023	0.017	0.016	0.018
P-value (test average effect = 0)	0.029	0.042	0.039	0.070	0.116	0.150	0.368	0.445	0.442
Average effect in years 3–4	0.071	0.073	0.077	0.055	0.054	0.053	0.053	0.052	0.053
P-value (test average effect in years 3–4 = 0)	0.007	0.008	0.007	0.000	0.001	0.002	0.125	0.135	0.110
Observations	24,225	24,225	24,225	9384	9384	9384	21,150	21,150	21,150
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Restricted sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. Estimates in Columns 1–3 include all US counties with a publicly funded family planning clinic. Columns 4–6 and Columns 7–9, respectively, include a subset of counties that have average poverty rates higher, and lower, than the treated Texas counties' average poverty rate in 2010. Controls include the fraction of teens aged 15–19 by age, ethnicity and race, unemployment rates, and state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

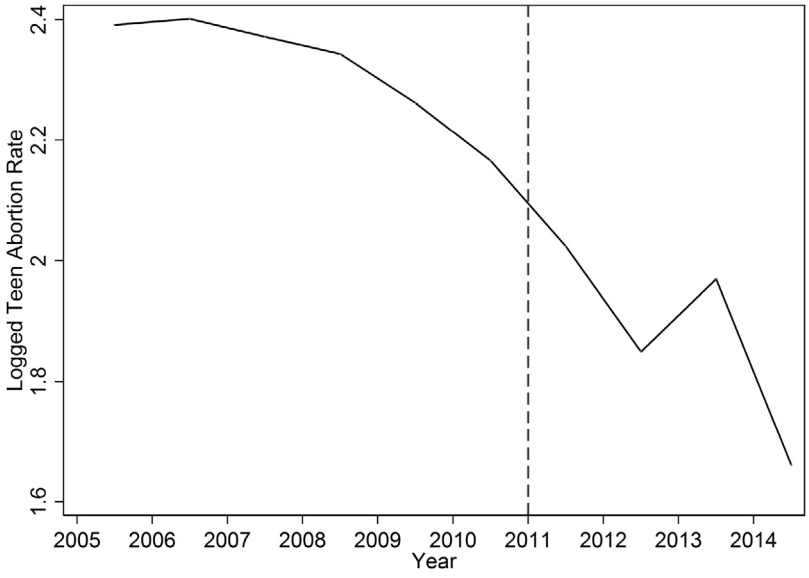

Fig. 7. Logged teen abortion rates in Texas counties with a publicly funded clinic. Notes: Teen abortion rates are constructed using annual county-level data from the Texas Department of State Health Services (using data reported by the Texas DSHS prior to July 21, 2017). The vertical line represents the beginning of funding cuts to Texas family planning clinics.

county-level estimates of the effects of funding cuts on abortion, I can provide some suggestive evidence of how abortion rates in Texas responded to the 2011 family planning budget cuts. Fig. 7 displays the trend in logged teen abortion rates for treated counties (Texas counties with at least one family planning clinic) from 2005 to 2014. Although there are no data on comparison counties to form a counterfactual for the county-level trend in abortion rates, the time series data indicate that abortion rates fell steadily in Texas from 2005 to 2012, and then increased in 2013 before continuing to decrease again in 2014.[29]

[29] Since more restrictive abortion legislation went into effect in 2013, it is possible that the increase in abortion rates is due to an announcement effect of stricter abortion clinic regulations followed by a decrease in 2014 due to restricted clinic access. House Bill 2, signed into legislation in July 2013, prohibits abortions in the 20th week of pregnancy instead of the 24th week, requires abortion doctors to obtain admitting privileges at a hospital within 30 miles of the clinic and places additional regulations on abortion-inducing drugs. The new laws went into effect on November 1, 2013 and led many abortion providers to close within the next year.

While Fig. 7 provides some information on the abortion rates in treated Texas counties over time, these data cannot produce convincing causal estimates. Therefore, I utilize state-level data from CDC on the number of abortions by age group and state of residence, which is the only existing source of annual abortion data, to compare the changes in abortion rates in Texas to changes in abortion rates in other states over time. There are several limitations to this approach. Unfortunately, as of now, abortion data are only available up to 2013. Moreover, because centers are not required by law to submit annual abortion data, these data contain several omissions and inconsistencies (Blank et al., 1996).[30] Finally, these data are not available at the county level, and given that only one state, Texas, is treated in this analysis, inference using a difference-in-differences approach is likely to be incorrect (Bertrand et al., 2004).

To overcome this limitation, I use a synthetic control design to estimate the effects of funding cuts on logged teen abortion rates, comparing the outcomes of Texas to the outcomes of a "Synthetic Texas," as suggested by Abadie et al. (2010). Synthetic control models have several advantages over traditional difference-in-differences models when estimating effects for one treatment unit. First, this procedure allows for a data-driven approach to choosing a control group. Second, unobservables remain constant over time, which minimizes the potential for bias.

Intuitively, I utilize data on teen abortion rates from 2005 to 2010 to identify the weighted average of comparison states that provide the best match for the teen abortion rates observed in Texas prior to the funding cuts. I then estimate a state-level difference-in-differences model which compares teen abortion rates in Texas to teen abortion rates in Synthetic Texas before and after the family planning funding cuts. The identification assumption is that the synthetic Texas provides a good counterfactual for the teen health outcomes that would have been observed in Texas absent the family planning policy change. If this assumption holds, the difference between the teen abortion rates for Texas and the teen abortion rates for the synthetic control provides an unbiased estimate of the causal effect of the funding cuts.

To execute this strategy, I select the non-negative weights for each potential "donor state" to minimize the function:

$$(X_{TX} - X_{SC}W)'V(X_{TX} - X_{SC}W) \quad (3)$$

where X_{TX} is a $(K \times 1)$ vector of variables measuring outcomes from 2005 to 2010, X_{SC} is a $(K \times J)$ matrix containing the outcome variables for other states, W is a $(J \times 1)$ vector of weights summing to one, and the diagonal matrix V contains the "importance weights" assigned to each variable in X. I include the teen birth rates observed in 2005, 2007, and 2009 in X. These particular variables provide a good match for Texas outcomes in both levels and trends without overfitting.[31] I report results using the data-driven regression method as described in Abadie et al. (2010) to assign variables weights in the V matrix, noting that results are similar when assigning equal weights to each variable. The states that comprise Synthetic Texas and their respective weights are presented in Table A3.[32,33]

Table 9
State-level synthetic control estimates of the effects of family planning funding cuts on log teen abortion rates.

Log teen abortion rates	Estimate	*P*-value
Effect of funding cuts in first year	0.004	0.794
Effect of funding cuts in second year	−0.056	0.118
Effect of funding cuts in third year	0.154	0.059
Average effect	0.031	0.059
Average effect for years 2–3	0.049	0.059

Notes: State-level data on abortions are from the CDC Abortion Surveillance data, respectively. Rates are calculated using SEER population data. Synthetic controls are constructed as the weighted average of states that minimize $(X_{TX} - X_{SC}W)'V(X_{TX} - X_{SC}W)$, where X_{TX} is a (3×1) vector of variables corresponding to Texas outcomes observed in 2005, 2007, and 2009; X_{SC} is a (3×32) matrix containing the same variables for states in the donor pool; for the synthetic control; W contains the weight for each state; and the diagonal matrix V contains the "importance weights" assigned to each variable in X based on the data-driven regression based method described in Abadie et al. (2010). The abortion analyses omits 17 states with missing abortion data. Permutation-based *P*-values are based on the distribution of estimated treatment effects obtained by reassigning treatment to each state in the donor pool, estimating the effects using the same synthetic control approach, and calculating the ratio of the post-intervention mean square predicted error to the pre-intervention mean square predicted error. The estimated effects for each state in each period from this process are shown in Fig. 9.

One disadvantage to this approach is that the model does not allow for calculation of standard errors. Therefore, I estimate the distribution of estimated treatment effects under the null hypothesis of a zero treatment effect and reassign treatment separately to each state in the donor pool to estimate a placebo effect for each state. I then construct *P*-values for the estimated effect for Texas, given its rank in this distribution. For example, if Texas had the fifth largest estimate in absolute value, then the *P*-value would be 5/50 = 0.1.[34]

Fig. 8 presents trends for both Texas teen abortion rates and the synthetic control. Evidence of a causal effect is reflected by a relative increase in the gap between the dashed line (synthetic Texas) and the solid line (Texas) after the funding cuts. Visually, the trends for Texas and synthetic Texas appear to track each other fairly well from 2007 to 2010, although they seem to diverge in 2012 and 2013, indicating a modest effect of family planning funding cuts on teen abortion rates. Table 9 displays estimates from the synthetic control model described above. The results indicate that the funding cuts increased abortion rates by 4.9% 1–2 years after the funding cuts and 3.1% over three years.

To determine whether these estimates are statistically significant, I apply the synthetic control model to all additional state-units to construct a placebo analysis and calculate *P*-values, which are shown in Table 9. Additionally, I graph the distance between the

[30] Because of the extent of missing data, I eliminated 17 states that omitted data for one or more years between 2005 and 2013.

[31] In taking a simple approach to find the best match on pre-treatment trends, I utilize only pre-period outcome data and do not account for any control variables. When I include the rich set of control variables from the main difference-in-differences model described above, estimates are similar. However, these synthetic control estimates do not provide a better match on pre-period trends and levels of abortion rates for Texas than the more simplistic model.

[32] Table 9 includes estimates using a donor pool of all states with non-missing abortion rates for the sample period. When estimating a synthetic control model with a donor pool of states representing the "restricted sample" in the other analyses – that is, a donor pool that excludes states with major funding cuts to family planning services from 2010 to 2012 – results are similar and indicate a statistically significant increase in teen abortion rates of 14.8% 2 years later and an average increase of 4.3% 1–2 years later.

[33] I follow this same methodology to analyze effects of family planning funding cuts on teen gonorrhea rates, since clinic closures imply that fewer teens are able to access condoms and other devices that protect against sexually transmitted diseases. Estimates are positive and statistically insignificant. However, data on teen STD rates are relatively noisy, and given the divergence of trends in the pre-period, the synthetic control does not provide a good counterfactual for Texas.

[34] Abadie et al. (2010) suggest using the ratio of the post-intervention mean square predicted error to the pre-intervention mean square predicted error, implying that when there is a preferred pre-period match between the treated unit and synthetic control, greater weights should be placed on estimated treatment effects.

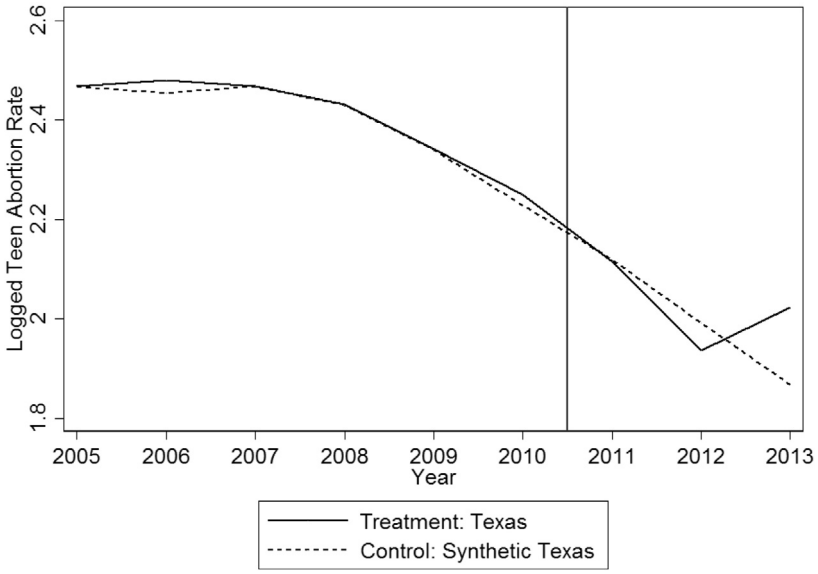

Fig. 8. Teen abortion rates in Texas versus synthetic Texas. Notes: Teen abortion rates are constructed using the annual Center for Disease Control and Prevention Abortion Surveillance and SEER population data. The vertical line represents the beginning of funding cuts to Texas family planning clinics. Synthetic controls are constructed as the weighted average of states that minimize $(X_{TX} - X_{SC}W)'V(X_{TX} - X_{SC}W)$, where X_{TX} is a (3×1) vector of variables corresponding to Texas outcomes observed in 2005, 2007, and 2009; X_{SC} is a (3×32) matrix containing the same variables for states in the donor pool; for the synthetic control; W contains the weight for each state; and the diagonal matrix V contains the "importance weights" assigned to each variable in X based on the data-driven regression based method described in Abadie et al. (2010). The donor pool of states excludes 17 states with missing abortion data.

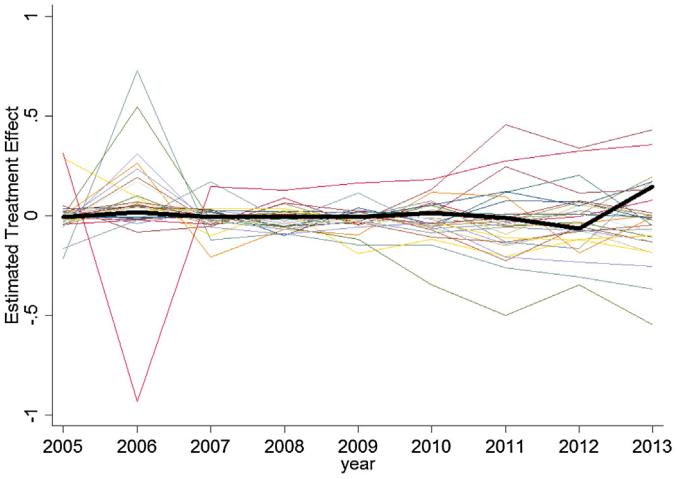

Fig. 9. Synthetic control placebo estimates – teen abortion rates. Notes: The above figure graphs the treatment effect for all states from a synthetic control model. The solid black line represents the estimated treatment effect for Texas. The vertical line represents the beginning of funding cuts to Texas family planning clinics. Teen abortion rates are constructed using the annual Center for Disease Control and Prevention Abortion Surveillance and SEER population data. Synthetic controls are constructed as the weighted average of states that minimize $(X_{TR} - X_{SC}W)'V(X_{TR} - X_{SC}W)$, where X_{TR} is a (3×1) vector of variables corresponding to the "treated" states' outcomes observed in 2005, 2007, and 2009; X_{SC} is a (3×32) matrix containing the same variables for states in the donor pool. For the synthetic control, W contains the weight for each state; and the diagonal matrix V contains the "importance weights" assigned to each variable in X based on the data-driven regression based method described in Abadie et al. (2010). The donor pool of states excludes 17 states with missing abortion data.

"treated" state and its synthetic control and display these estimates in Fig. 9. These estimates do not indicate that a reduction in abortion rates are driving the increase in teen births, but rather suggest that an increase in unintended pregnancies led to both an increase in teen abortion rates in 2013 and an increase in teen birth rates in 2013 and 2014.

Finally, I note that the estimation of the effects of funding cuts at the state level may understate effects in counties that are likely to be most affected by these cuts.[35] Alternatively, estimates for abortion rates two years after funding cuts may be overstated if changes in Texas abortion legislation prompted an increase right before or right after the law took place. Therefore, efforts to obtain more convincing estimates of the effects of the cuts on teen abortion rates could be an important avenue for future research.

7. Conclusion

This paper analyzes the effects of defunding family planning services on teen birth rates. Using a difference-in-differences approach, I estimate that decreasing funding for family planning in Texas by 67% led to an increase in the teen birth rate by 3.4%. These effects were concentrated in the 2–3 years after the initial cuts and in counties with relatively high poverty rates. Although the primary stated objective of the funding cuts was to decrease abortion incidence, I find little evidence that reducing family planning funding achieved this goal.

The estimates suggest that nearly 2200 teens would have not given birth absent the reduction in Texas family planning funding. Given that the National Campaign to Prevent Teen and Unplanned Pregnancy estimates that the average cost of teen childbearing to taxpayers is nearly $27,000 per birth, the estimated costs of the reduction in family planning funding are $81 mil, although this figure does not account for births to older women or births that occurred more recently.[36] Therefore the costs of unintended pregnancy caused by the policy change outweigh the $73 million budget cuts.

[35] When estimating a similar, state-level synthetic control model for teen birth rates, findings indicate an increase in teen birth rates in 2013, with average effects of approximately 2%, although all estimates are statistically insignificant.

[36] For example, see Table A4 for estimated effects of the Texas funding cuts on birth rates for women aged 20–24. Estimates indicate that birth rates for older women increased by 2.4%, on average, or 3.7% 3–4 years after the cuts, suggesting that older women are also affected by such policy changes.

The results of this analysis show that funding cuts to family planning services can have consequences that increase costs for the public sector. As five new states are currently considering legislation to defund family planning, it is important for future research to determine to what extent government policies that reduce access to low-cost contraception can influence teen sexual behavior and unintended pregnancy.

In the past two years, the Texas state legislature has simultaneously restored funding for family planning services by 19% (Texas DSHS, 2014) and implemented new restrictions on abortion providers and clinics affiliated with abortion providers. Given the high fixed costs of establishing a network of health care facilities, few publicly funded clinics have been able to rebuild and achieve funding comparable to previous levels. Moreover, several Texas abortion clinics and other affiliated clinics have closed since the 2013 regulations. It is unclear how these policies will affect childbearing and reproductive health in the years to come, and future work should consider the impacts of the fluctuation of funding on teen health outcomes. Finally, I note this paper provides both important insight on the connection between reductions in family planning funding and teen birth rates and offers motivation for further study of how these policies affect abortion, sexually transmitted diseases, government assistance, educational attainment and labor market outcomes.

Appendix A

Table A2
Annual donations to Texas Planned Parenthood facilities.

Year	Donation
2011	$2,081,122
2012	$4,118,405
2013	$3,733,981
2014	$3,846,217

Data on annual donation by Planned Parenthood region is from yearly, public Form 990s. Donation data are aggregated from Lubbock, Houston, Dallas, Midland, San Antonio, Waco and McAllen facilities.

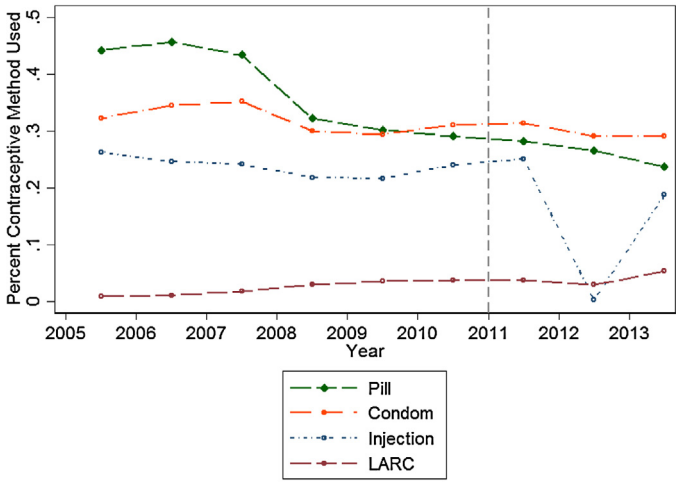

Fig. A1. Contraception use by clinic clients by method. Notes: Author's calculation of family planning clients using or obtaining contraceptive devices (oral contraceptives, condoms, injections, intrauterine devices, implants) at exit, based on annual data provided by the Texas Department of State Health Services. Long-acting reversible contraceptives (LARCs) include intrauterine devices and implants.

Table A1
Weighted least squares estimates of the effect of funding cuts on birth rates for Hispanic women.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effect of cuts in first year	0.018	0.025	0.006	0.006	0.009	0.015	0.031*
	(0.015)	(0.015)	(0.012)	(0.012)	(0.013)	(0.015)	(0.016)
Effect of cuts in second year	0.037**	0.049***	0.019	0.018	0.020	0.026	0.044**
	(0.017)	(0.018)	(0.015)	(0.016)	(0.016)	(0.018)	(0.019)
Effect of cuts in third year	0.063***	0.079***	0.042***	0.042**	0.044***	0.051***	0.068***
	(0.019)	(0.020)	(0.016)	(0.016)	(0.017)	(0.019)	(0.020)
Effect of cuts in fourth year	0.075***	0.095***	0.061***	0.061***	0.063***	0.070***	0.087***
	(0.020)	(0.021)	(0.019)	(0.020)	(0.020)	(0.021)	(0.022)
One-year lead						0.028**	0.045***
						(0.012)	(0.014)
Two-year lead							0.060***
							(0.012)
Average effect	0.048	0.062	0.032	0.032	0.034	0.040	0.057
P-value (test average effect = 0)	0.005	0.001	0.038	0.042	0.030	0.023	0.002
Average effect in years 3–4	0.069	0.087	0.051	0.051	0.054	0.060	0.077
P-value (test average effect in years 3–4 = 0)	0.000	0.000	0.004	0.004	0.003	0.002	0.000
Observations	23,572	23,572	23,572	23,572	22,820	22,820	22,820
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Economic controls	No	No	Yes	Yes	Yes	Yes	Yes
Policy controls	No	No	No	Yes	Yes	Yes	Yes
Restricted sample	No	No	No	No	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. Demographic controls include the fraction of women by age, ethnicity and race, economic controls include county unemployment rates, median family income and child poverty rates, and policy controls include state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

Table A3
State weights for synthetic control model.

Log teen abortion rate			
State	Weight	State	Weight
AL	0.027	NE	0.023
AZ	0.034	NV	0.036
AR	0.031	NJ	0.024
CO	0.029	NM	0.039
CT	**0.067**	NY	0.030
GA	0.026	NC	0.031
IN	0.028	OH	0.029
IA	0.031	OK	0.026
KS	0.035	OR	0.032
KY	0.034	SC	0.031
MA	**0.046**	TN	0.030
MI	0.026	**UT**	**0.050**
MN	0.033	VA	0.028
MS	0.029	WA	0.038
MO	0.028	WI	0.024
MT	0.025		

Notes: The synthetic control for Texas for estimating the effect on each outcome is constructed as the weighted average of states that minimize $(X_{CO} - X_{SC}W)'V(X_{TX} - X_{SC}W)$, where X_{TX} is a (3×1) vector of variables corresponding to Texas outcomes observed in 2005, 2007, and 2009; X_{SC} is a matrix containing the same variables for states in the donor pool; for the synthetic control; W contains the weight for each state; and the diagonal matrix V contains the "importance weights" assigned to each variable in X based on the data-driven regression based method described in Abadie et al. (2010). The three states with the highest weights are highlighted in bold. The analysis omits the 17 states that have no annual data for any year between 2005 and 2013. The estimated effects for each state in each period from this process are shown in Fig. 9.

References

Abadie, A., Diamond, A., Hainmueller, J., 2010. Synthetic control methods for comparative case studies: estimating the effect of California's tobacco control program. J. Am. Stat. Assoc. 105 (490), 493–505.

Bailey, M.J., 2009. More power to the pill: erratum and addendum. Q. J. Econ. 121 (1), 289–320.

Bailey, M.J., 2012. Reexamining the impact of family planning programs on US fertility: evidence from the war on poverty and the early years of title X. Am. Econ. J. Appl. Econ. 4 (2), 62–97.

Bailey, M.J., 2013. Fifty years of family planning: new evidence on the long-run effects of increasing access to contraception. Brook. Papers Econ. Activity Econ. Stud. Program Brook. Inst. 46 (1), 341–409.

Bassett, L., 2012. Rick Perry: Banning Abortion is 'My Goal' (accessed 07.08.15) www.huffingtonpost.com/2012/12/11/rick-perry-abortion_n_2279734.html.

Bertrand, M., Duflo, E., Mullainathan, S., 2004. How much should we trust differences-in-differences estimates? Q.J. Econ. 119 (1), 249–327.

Blank, R.M., George, C.C., London, R.A., 1996. State abortion rates: the impact of policies, providers, politics, demographics, and economic environment. J. Health Econ. 15 (5), 513–553.

Bronars, S.G., Grogger, J., 1994. The economic consequences of unwed motherhood: using twin births as a natural experiment. Am. Econ. Rev. 84 (5), 1141–1156.

Bureau of Labor Statistics, U.S. Department of Labor, 2004–2013. Local Area Unemployment Statistics (accessed 19.11.14) http://www.bls.gov/lau/#data.

Cadei, E., 2015. The War on Planned Parenthood Is in the States (accessed 21.09.15) http://www.newsweek.com/war-planned-parenthood-states-359225.

Carr, J.B., Packham, A., 2016. The effects of state-mandated abstinence-based sex education on teen health outcomes. Health Econ. 26 (4), 403–420.

Centers for Disease Control and Prevention, 2005–2013. Abortion Surveillance (accessed 21.03.17) http://www.cdc.gov/reproductivehealth/data_stats/index.htm.

Finer, L.B., 2010. Unintended pregnancy among U.S. adolescents: accounting for sexual activity. Adolesc. Health 47 (3), 312–314.

Frost, J.J., Frohwirth, L.F., Zolna, M.R., 2016. Contraceptive Needs and Services, 2014 Update. Guttmacher Institute, New York (accessed 30.06.17) https://www.guttmacher.org/report/contraceptive-needs-and-services-2014-update.

Frost, J.J., Zolna, M.R., Frohwirth, L., 2013. Contraceptive Needs and Services. Guttmacher Institute, New York (accessed 21.07.15) http://www.guttmacher.org/pubs/win/contraceptive-needs-2013.pdf.

Geronimus, A., Korenman, S., 1992. The socioeconomic consequences of teen childbearing reconsidered. Q. J. Econ. 40 (4), 463–471.

GovTrack, 2015. Family Planning and Birth Control (accessed 05.08.15) http://www.govtrack.us/congress/bills/subjects/family_planning_and_birth_control/6150.

Guldi, M., 2008. Fertility effects of abortion and birth control pill access for minors. Demography 45 (4), 817–827.

Table A4
Weighted least squares estimates of the effect of funding cuts on birth rates for 20–24 year olds.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effect of cuts in first year	−0.018**	−0.016	−0.020	−0.021*	−0.020*	−0.020	−0.021
	(0.009)	(0.012)	(0.012)	(0.012)	(0.011)	(0.013)	(0.014)
Effect of cuts in second year	−0.004	0.009	0.007	0.006	0.007	0.007	0.007
	(0.010)	(0.013)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)
Effect of cuts in third year	0.028**	0.055***	0.056***	0.055**	0.055**	0.055**	0.054**
	(0.011)	(0.017)	(0.021)	(0.023)	(0.023)	(0.023)	(0.024)
Effect of cuts in fourth year	0.111*	0.124**	0.129**	0.128**	0.128**	0.129**	0.128**
	(0.060)	(0.056)	(0.062)	(0.063)	(0.065)	(0.065)	(0.065)
One-year lead						0.001	0.001
						(0.010)	(0.012)
Two-year lead							−0.003
							(0.014)
Average effect	0.029	0.043	0.043	0.042	0.043	0.043	0.042
P-value (test average effect = 0)	0.107	0.013	0.028	0.044	0.049	0.052	0.054
Average effect in years 3–4	0.069	0.089	0.092	0.092	0.092	0.092	0.091
P-value (test average effect in years 3–4 = 0)	0.031	0.009	0.020	0.026	0.030	0.030	0.031
Observations	25,176	25,176	25,176	25,176	24,387	24,387	24,387
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Economic controls	No	No	Yes	Yes	Yes	Yes	Yes
Policy controls	No	No	No	Yes	Yes	Yes	Yes
Restricted sample	No	No	No	No	Yes	Yes	Yes

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Estimates are based on annual county-level Natality data from 2005 to 2014. Demographic controls include the fraction of women aged 20–24 by age, ethnicity and race, economic controls include county unemployment rates, median family income and child poverty rates, and policy controls include state-by-year indicator variables for over-the-counter emergency contraception access and private insurance mandates for contraceptive coverage. The restricted sample omits counties in states with major funding cuts to family planning services: New Jersey, New Hampshire, Montana, and Maine. Robust standard errors are clustered at the county level and are shown in parenthesis.

Guttmacher Institute, 2015a. State Policies in Brief: Sex and HIV Education. Updated Monthly (accessed 07.08.15) http://www.guttmacher.org/statecenter/spibs/spib_SE.pdf.
Guttmacher Institute, 2015b. Unintended Pregnancy in the United States, Fact Sheet (accessed 15.09.15) http://www.guttmacher.org/pubs/FB-Unintended-Pregnancy-US.html.
Heckman, J.J., Ichimura, H., Todd, P.E., 1997. Matching as an econometric evaluation estimator: evidence from evaluating a job training programme. Rev. Econ. Stud. 64 (4), 605–654.
Hoffman, S.D., Maynard, R.A., 2008. Kids Having Kids: Economic Costs and Social Consequences of Teen Pregnancy, 2nd ed. Washington, DC.
Kearney, M.S., Levine, P.B., 2009. Subsidized contraception, fertility, and sexual behavior. Rev. Econ. Stat. 91 (1), 137–151.
Kirby, D.B., 2008. The impact of abstinence and comprehensive sex and STD/HIV education programs on adolescent sexual behavior. Sexual. Res. Soc. Policy 5 (3), 18–27.
Lindo, J.M., Packham, A., 2017. How much can expanding access to long-acting reversible contraceptives reduce teen birth rates? Am. Econ. J. Econ. Policy 9 (3).
Lu, Y., Slusky, D.J., 2016. The impact of family planning funding cuts on preventative care. Am. Econ. J. Appl. Econ. 8 (3), 100–124.
Lu, Y., Slusky, D.J., 2017. The Impact of Women's Health Clinic Closures on Fertility. Mimeo.
Martinez, G., Abma, J., Copen, C., 2010. Educating Teenagers About Sex in the United States, No. 44. National Center for Health Statistics, Hyattsville, MD.
Martinez, G., Copen, C.E., Abma, J.C., 2011. Teenagers in the United States: sexual activity, contraceptive use, and childbearing. 2006–2010 Natl. Surv. Fam. Growth Natl. Center Health Stat. Vital Health Stat. 23 (31).
Mestad, R., Secura, G., Allsworth, J.E., Madden, T., Zhao, Q., Peipert, J.F., 2011. Acceptance of long-acting reversible contraceptive methods by adolescent participants in the contraceptive CHOICE project. Contraception 84 (5), 493–498.
Mosher, W.D., Jones, J., Abma, J.C., 2012. Intended and unintended births in the United States: 1982–2010. Natl. Health Stat. Rep. 55, 1–28.
Myers, C.K., 2012. Power of the Pill or Power of Abortion? Re-Examining the Effects of Young Women's Access to Reproductive Control. IZA Discussion Paper No. 6661.
Nash, E., Gold, R.B., Rathbun, G., Vierboom, Y., 2015. Laws Affecting Reproductive Health and Rights: 2014 State Policy Review (accessed 28.08.15) http://www.guttmacher.org/statecenter/updates/2014/statetrends42014.html.
National Campaign to Prevent Teen and Unplanned Pregnancy, 2013. Counting It Up: The Public Costs of Teen Childbearing: Key Data (accessed 19.11.14) https://thenationalcampaign.org/resource/counting-it-key-data-2013.
National Center for Health Statistics. Natality Files, 2005–2014. As Compiled From Data Provided by the 57 Vital Statistics Jurisdictions Through the Vital Statistics Cooperative Program.
National Conference of State Legislatures, 2012. Insurance Coverage for Contraception Laws (accessed 05.08.15) http://www.ncsl.org/issues-research/health/insurance-coverage-for-contraception-state-laws.aspx.
National Women's Law Center, 2010. Contraceptive Equity Laws in your State: Know Your Rights-Use Your Rights, A Consumer Guide (accessed 05.08.15) http://nwlc.org/resources/contraceptive-equity-laws-your-state-know-your-rights-use-you-ights.
Planned Parenthood, 2014. How Much Does an IUD Cost? (accessed 24.03.15) www.plannedparenthood.org/learn/birth-control/iud.
Potter, J.E., Hopkins, K., Aiken, A.R., Hubert, C., Stevenson, A.J., White, K., Grossman, D., 2014. Unmet demand for highly effective postpartum contraception in Texas. Contraception 90 (5), 488–495.
Ricketts, S., Klingler, G., Schwalberg, R., 2014. Game change in Colorado: widespread use of long-acting reversible contraceptives and rapid decline in births among young, low-income women. Perspect. Sexual Reprod. Health 46 (3), 125–132.
Selby, W.G., 2015. Greg Abbott: Defunding Planned Parenthood Preceded Drops in Abortion, Unintended Pregnancy Rates (accessed 14.09.15) http://www.politifact.com/texas/statements/2015/sep/13/greg-abbott/greg-abbott-defunding-planned-parenthood-preceded-/.
Sexuality Information and Education Council of the United States (SIECUS), 2010. A History of Federal Funding for Sex Education and Related Programs (accessed 07.08.15) www.siecus.org/index.cfm?fuseaction=page.view&pageid=134&nodeid=1.
Solon, G., Haider, S., Wooldridge, J., 2015. What are we weighting for. J. Hum. Resour. 50 (2), 301–316.
Sonfield, A., Gold, R., 2012. Public Funding for Family Planning, Sterilization and Abortion Services, FY 1980–2010 (accessed 19.01.15) http://www.guttmacher.org/pubs/Public-Funding-FP-2010.pdf.
Stevenson, A.J., Flores-Vazquez, I.M., Allgeyer, R.L., Schenkkan, P., Potter, J.E., 2016. Effect of removal of planned parenthood from the Texas women's health program. N. Engl. J. Med. 374 (9), 853–860.
Summers, J., 2012. Rivals Hit Absent Mitt on Abortion (accessed 05.08.15) http://www.politico,com/story/2012/01/romney-is-punching-bag-on-abortion-071644?o=1.
Surveillance, Epidemiology, and End Results (SEER, Program), 1969–2013. Populations Single Ages to 85+ – Linked to Country Attributes, Released October 2014 (accessed 19.11.14) http://seer.cancer.gov/popdata/download.html.
Texas Department of State Health Services, Presentation to Senate Committee on Health and Human Services: Texas Women's Health and Family Planning Programs, 2014, (accessed May 19, 2015).
U.S. Department of Health and Human Services, 2013. Title X Family Planning Annual Report (accessed 19.11.14) www.hhs.gov/opa/title-x-family-planning/research-and-data/fp-annual-reports/.
White, K., Hopkins, K., Aiken, A., Stevenson, A., Hubert, C., Grossman, D., Potter, J.E., 2015. The impact of reproductive health legislation on family planning clinic services in Texas. Am. J. Public Health 105 (5), 851–858.
Woo, C.J., Alamgir, H., Potter, J.E., 2016. Women's experiences after planned parenthood's exclusion from a family planning program in Texas. Contraception 93 (4), 298–302.
Zuppann, A., 2011. The Impact of Emergency Contraception on Dating and Marriage. Mimeo.