Evaluation of the Teen Pregnancy Prevention Program on Teen Birth in the U.S. Using a Synthetic Control Approach

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Abstract

The Teen Pregnancy Prevention (TPP) program was implemented by the Office of Adolescent Health in 2010 with the aim to fund evidence-based programs in order to reduce teen-births. This paper evaluates the effect of the TPP program on teenage births using panel natality data from 2004 to 2015. Applying a synthetic-control approach to compare trends in counties receiving TPP grants to similar counties not receiving TPP grants, and controlling for time-variant factors, the analysis shows that the TPP program reduced teen births by 3 per 100,000 female teenagers ages 15-19 in the U.S. Every dollar spent on the TPP program saved $0.02 over a three-year period compared with the medical and economic support that the government would have provided to a teenager mother during her pregnancy and the child's first year of infancy. We conclude that while the TPP program has had an impact, the return on investment is small.

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INTRODUCTION

In spite of continuing declines, teen births in the U.S., remain the highest among industrialized counties. In 2015, a total of 229,715 babies were born to females ages 15-19 in the United States, amounting to 22.3 out 1,000 females in this age group becoming a teenage mother (Center for Diseases Control and Prevention, CDC, 2017). Roughly 1 in 4 girls will become pregnant at least once before age 20 (National Conference of State Legislatures, 2018).

Adolescent pregnancy and parenthood are associated with large educational, health and financial costs to teenage parents and families. A teenage birth can seriously disrupt adolescents' education and career goals, affecting earning potential and future family finances. Only 50 percent of teen mothers will graduate from high school by age 22, compared with 90 percent of women without a teen birth (National Conference of State Legislatures, 2018). Teen mothers tend to be more socially isolated, have mental health problems, and have fewer employment opportunities compared with older mothers (Langille, 2007). Compared to the babies of older mothers, babies born to teenagers are more likely to have lower birth weights, increased infant mortality, and increased risk of hospitalization in early childhood (Langille, 2007). For the children of teenage mothers, most of them tend to live in less supportive home environments, have poorer cognitive and mental development, have lower school achievement, and have a higher risk of becoming pregnant and teenage mothers themselves, if they are female (Langille, 2007).

At least part of the explanation for the high teen birth rate in the US may stem from the types of sexuality education that students in US schools receive. For the last several decades, school districts across the country have faced pressures from the federal government to implement abstinence-only sexuality education (Haffner, 1997). However, starting in 2010, federal funding for abstinence-only education was sharply reduced and a new initiative, the Teen Pregnancy Prevention (TPP) program, was implemented by the Office of Adolescent Health, aiming to fund evidence-based programs in order to reduce teen pregnancy and birth.

The TPP was an initiative adopted under President Obama, which budgeted $110 million for a two-tiered evidence-based program to support efforts to more effectively target teen pregnancy prevention funds (Kappeler & Farb, 2014). The budget request redirected funding from abstinence-only until marriage education programs to evidence-based and promising teen pregnancy prevention programs. Under this new initiative, Tier 1 funding (the majority of funds) were directed towards programs using models whose effectiveness has been demonstrated through rigorous evaluation. A small portion of "Tier 2" funds was directed towards developing and testing promising or innovative teen prevention programs (Kappeler & Farb, 2014). A much smaller portion of "Other Types" of funds was directed toward scientific and health research (includes surveys), which could be seen at the website of Tracking Accountability in Government Grants System.

The TPP program has funded diverse organizations which operate to reduce teen pregnancy. Grant recipients include county departments of health, behavioral health centers, non-profit organizations, city youth services, community action partnerships, and medical schools among others (OAH (b), 2016). The TPP program also funds organizations such as Planned Parenthood, the Adolescent Pregnancy Prevention Campaign, and Partnerships for Children, among others (OAH (b), 2016). To give a more specific example of the type of program that might be funded from TPP funds, the University of South California has directed its funds towards the Keeping It Real Together (KIR-T) program to reduce sexual risk behaviors among low-income youth in Los Angeles County (OAH (b), 2016). The KIR-T program seeks to increase youth's sexual health knowledge, favorable attitudes toward not having sex, and self-efficacy and behavioral skills to delay sex (OAH (b), 2016). More specific examples can be found on the Office of Adolescent Health website.

The TPP program has multiple funding ranges which allow a wide array of evidence-based programs to be implemented by a diverse set of grantees that have varying capacity to implement large-scale or small-scale projects (Office of Adolescent Health (a), OAH (a), 2010). The applicant could apply to replicate one of the programs in the OAH's list of previously validated programs, or seek to implement a program model which is not in the list of the OAH (OAH (a), 2010). The applications are reviewed by an Objective Review Committee, which includes both expert peer reviewers and federal staff (OAH (a), 2010). The applicant, once granted the TPP fund, will be closely monitored by the OAH to ensure the fidelity and quality of the program (OAH (c), 2017). Being granted the eligibility of the TPP fund does not mean that the applicant could receive the fund every year in the first (or specific) five-year term, continued funding is contingent on satisfactory progress and the availability of funds (OAH (a), 2010).

The top 10 grants, together with receiver organizations, from 2010 to 2014 are listed in **Table 1**. The funds are adjusted for inflation in 2017 dollars. The TPP Program was designed to reach adolescents from 10 to 19 years old with a focus on populations with the greatest need in order to reduce disparities in teen pregnancy and birth rates (OAH (c), 2017). During its first five years from 2010 to 2015, the OAH TPP Program gave funds to 102 grantees and reached about half a million youth across 39 states and Washington D.C. (Health Teen Network, 2017). The TPP Program trained more than 6,100 new facilitators and established partnerships with over 3,800 community-based organizations across the U.S. at that time (Health Teen Network, 2017). The TPP Program also funded 41 rigorous evaluations studies to build a body of evidence about where, when, and with whom specific programs are most effective (Health Teen Network, 2017).

Previous studies that have evaluated the impact of such programs have found no effect of abstinence education at reducing teen pregnancy, but found comprehensive sex education interventions to be effective at delaying or reducing sexual activity and increasing condom/contraceptive use (Chin et al, 2011; Kirby, 2007). A systematic review of abstinence-only interventions by Chin et al found no effect of abstinence funding across all the studies reviewed in spite of the billions of dollars spent on the program over the last two decades (Chin et al, 2011). While a great deal of research attention has been placed on the relationship between abstinence-funding and teen births (or the lack of an effect), as a relatively new program, the impact of the TPP on teen births has not previously been evaluated. While we know that individually all Tier 1 programs have been found to be effective and "evidence-based" in randomized trials, previous studies have not evaluated the cumulative real-world impact of the program in grant receiving areas. To date only one paper (still under peer review) has evaluated the impact of the TPP and found significant effects on births in conservative states with the highest teen birth rates (Fox, Himmelstein, Khalid, & Howell, 2018).

This paper aims to evaluate the effects of the TPP Program on teen birth during its first five years from 2010 to 2014 using county-level data and a synthetic control approach. The Synthetic Control Method (SCM) allows for a better comparison of trends of exposed units to "synthetic" counterfactual unexposed units (Abadie, Diamond, Hainmueller, 2010). SCM generates a weighted average of the controlled units to closely match the treated ones over the pre-treatment period and then impute counterfactuals for each treated unit in the post-treatment period using the weights identified from the pre-treatment comparison (Abadie et al., 2010). In this regard, the study aims to tease out more precisely what teen births would have been in counties had they not received the TPP funds for an evidence-based teen pregnancy prevention intervention.

METHODS

Data and Sample

County-level teenage births data for this study was drawn from Center for Disease Control and Prevention (CDC), and data on TPP Program funds was derived from the Tracking Accountability in Government Grants System (TAGGS).

Dependent variable. Data on the annual birth rate of female teenagers ages 15-19 (per 1,000 female teenagers) for each county in the U.S. between 2004-2015 was accessed through data.gov via the CDC. The dataset covers a total of 3,136 counties across the 50 states and Washington, D.C. The underlying population estimates were provided by the Nation Center for Health Statistics. The top 10 counties with the highest average annual teen birth rate from 2004 to 2015 can be found in **Table 3**. The information about the bottom 10 counties is in **Table 4**.

Independent variable. Data on TPP Program funds from 2010 to 2014 were derived from the TAGGS system, which contains detailed information about each TPP grants regarding the receiver organization, year, action amount, fund type, city, and state. Information on the location of specific grants provided at the city-level was manually matched to the county by the researchers. From 2010 to 2014, 51 counties received and only received the Tier 1 funding, 15 counties received and only received other types (other than Tier 1) of funding, 16 counties and the district received both the Tier 1 and other types of funding. To ensure the comparability between the Tier-1-treated and Tier-1-untreated counties, the 15 counties which only received other types of funding, rather than Tier 1, were excluded from the dataset. This leaves us 67 counties from 32 states and Washington D.C. We coded the TPP program as a dummy variable for the sake of a parsimonious analysis. The county-year equals 1 if the county received funds in that year and 0 otherwise. The top 10 grants and the receivers from 2010 to 2014 can be found in **Table 1**. **Table 2** contains information on the top 10 counties which received the largest total TPP grants from 2010 to 2014.

Control variables. In order to assess the impact of the TPP on birth outcomes, we adjust for a number of time-variant control variables. Control variables included the proportion of the population that is non-Hispanic Black or Hispanic, the poverty rate among children age 5-17, median household income, unemployment rate, and citizen ideology. They are all measured at the county-level and are available from 2003 to 2014. The demographic data, together with the data about poverty rate and median household income, were all collected from U.S. Census Bureau. The median household income was recoded to a unit of $5,000 per year for better interpretability. Data on the unemployment rate by county was derived from the Bureau of Labor Statistics website. The dataset has the number of the civilian labor force, the number of the employed person, the unemployment population, and the unemployment rate at each year.

From the Data World website, we collected longitudinal data on presidential election results at the county level, which was built by the Data for Democracy Team to promote election transparency (Data for Democracy, 2017).[1] We generated the average of the election results across the years from 2003 to 2014. Based upon the validated measures of state government and citizen ideology conducted by Berry et al., the counties which have 57% or more than 57% votes, on average across those years, going to the Democratic candidate were coded as liberal by ideology, those with less than 45% votes going to the Democratic candidate were coded as

[1] The data was recoded as the citizen ideology without using other county-level data about congressional, state, and local election results, which are all hard to get and would be incomplete. For each presidential election year, we expanded the election result two years backward and one year forward since there would be the midterm election in the second year after the general election and the electorate would change the voting preference since the midterm.

conservative, and those somewhere in the middle range were coded as moderate. Other potential control variables, including abortion-related statistics and laws, were not readily available or accessible at the county-level. The summary statistics for all variables can be seen in **Table 5**.

The final master sample data, summarized in Table 5, includes the teen birth rate from 2004 to 2015 and all independent variables from 2003 to 2014 (since each independent variable is included as a lagged measure). The sample size is 37,450 county-year observations. Since SCM will conduct placebo estimation on all the untreated units over the same treatment period, it is computationally impossible to use the entire sample of untreated counties. We therefore shrank the master sample according to which counties had similar annual teen birth rates. For each treated county, we preserved the untreated counties which had a difference of less than 0.002 standard deviations from the treated in terms of the annual teen birth rate. This leaves us a smaller comparable sample of a total of 2,832 observations, with the ratio between treated and untreated counties set as 1: 2.5.[2]

Analysis

We opted to use Synthetic Control Method for this study due to advantages of this approach compared with related approaches including difference-in-difference analysis, two-way fixed effects models and case studies as discussed in the literature on this topic. Unlike the difference-in-difference approach, SCM does not give a unified weight to all the controlled units for the comparison (Galiani & Quistorff, 2016). Instead, it generates a weighted average of the controlled units to closely match the treated ones over the pre-treatment period by using a few predictors, thus enabling the method to impute counterfactuals for each treated unit in the post-treatment period using the weights identified from the pre-treatment comparison (Abadie et al., 2010; Xu, 2017). The principal advantage of SCM compared with related approaches like DiD is that SCM does not strictly require the average outcomes of treated and controlled units to follow parallel paths in the absence of treatment. It thus relaxes the "common trends assumption," which is often not met in practice.

Since the earliest applications of synthetic control, the approach has become more flexible to allow the treatment to be given to multiple units and possibly at multiple time periods. Furthermore, SCM can split the pretreatment period into training and validation samples, thus avoiding specification searches and model overfitting. Finally, it conducts placebo estimations within itself (estimations on all the untreated

[2] As a robustness test, we experimented with gradually expanding the sample size and conducting the estimation again through SCM, with the alternative sample sizes and estimated results available in the appendix.

units for the same treatment period) which facilitates inference through p-values that compare the estimated main effect to the distribution of placebo effects.

This paper was not a good candidate for DiD because the average outcomes of treated and untreated units diverge significantly over time. In addition, selection bias here could be potentially serious since the OAH would choose to fund those programs which have a high likelihood of effectiveness in reducing births (OAH (a), 2010).

We hypothesize that counties receiving TPP funds in the prior year would experience steeper declines in teen births than would the otherwise comparable "synthetic control" county.

RESULTS

Descriptive comparisons of counties that received TPP grants and control counties, displayed in **Table 5**, yield some interesting contradictions. The average teen birth rate across county-years was approximately 40 per 1,000 in untreated counties and about 27 per 1,000 in treated counties – perhaps implying that TPP funds were not successfully targeted to geographic regions with the highest need. In untreated counties, non-Hispanic Whites account for about 79.3 percent of the total population while Non-Hispanic Black and Hispanics comprised about 8.6% and 7.9% of the population respectively. In treated counties, non-Hispanic Black account for about 20.6% of the total population and the proportion of Hispanics in the total population was about 16.4%, both of which were much higher that of untreated counties.

Also presented in Table 5, the average annual median household income was $42,275 in untreated counties and $51,895 in treated counties. The highest household income was 7.4 times that of the lowest in untreated counties and 4.4 times in treated counties, implying greater income inequality in untreated counties. The percentage of the teen population in poverty was 20.3% in untreated counties and 23.0% in treated counties. The average unemployment rate was 6.8% and 8.4% in untreated and treated counties respectively. In general, the untreated counties were conservative by ideology while the treated counties were predominantly liberal. In sum, it appears that counties receiving TPP funding tended to be more urban, diverse, and economically advantaged.

Graph 1 shows the average teen birth rate plotted against year for the counties that received the TPP grants (the treatment group), and the counties that did not receive the grants (the control group). From this graph, we can see that the average annual teen birth rate of the treated counties was always significantly lower than that of the untreated counties. The visualized trends in teen birth rates were similar between treated and untreated counties both before and after the initial implementation of TPP program in 2010.

The results from the SCM are presented in **Graph 2**. The synthetic control units do closely match the treated units over the pre-treatment period, with the line of teen birth rate in the real treated counties slightly above that of the synthetic control counties. The two lines began to diverge in 2011, the second year after the introduction and implementation of the TPP program, and differed significantly even though both were on a descending trend. The teen birth rate in the treated counties was lower than that of the counterfactuals over the post-treatment period, with the gap continuing to widen slightly as time passed by. This indicates that the effect of the TPP program was accumulative. Statistical inference in the table below **Graph 2** confirms that the treated counties did experience a steeper decline in the teen birth rate than the counterfactuals, and that this difference was not due to random chance. The p-values, which compare the estimated main effect to the distribution of placebo effects, shows that the estimated effects of the TPP program were non-spurious. Robustness tests with expanding the pool of potential control counties are provided in an appendix.

From **Graph 2**, we can see that the gap between the treated and the counterfactuals accounts for about 30% of one vertical delta unit, which is the smallest range within the vertical axis, at the end of the post-treatment period, which is the year 2015. This indicates that the TPP program, which appears to induce moderate, cumulative impacts, reduced 3 teen births per 100,000 female teenagers age 15-19 in the treated counties in 2015. If this gap between the counties implementing TPP programs and the synthetic control counties were to continue to grow over time, then the program may still prove to generate large, meaningful benefits.

We can use the gap between the treated and the counterfactuals in 2015 (with 3 teen births reduced per 100,000 female teenagers) to assess the short-term monetary return of the TPP program. For the treated counties as a whole, the total population of female teenagers age 15-19 was 2,447,784 on average from 2011 to 2015. We can say that the TPP program reduced 73 teen births in the treated counties in 2015. Since on average, supporting a teenage mother during the pregnancy and the first year of infancy for every teen birth costs $16,000, the TPP program has saved $1.168 million of taxpayers' money in this regard in 2015 (National Conference of State Legislatures, 2018). From 2010 to 2014, the annual spending of the TPP program, on average, was $77.39 million, yielding a ratio between short-term monetary output and input of 0.02 for the TPP program. Based on this estimate, we can say that every dollar spent on the TPP program saved 2 cents of taxpayers' money regarding the immediate social and medical assistance provided by the government to teen mothers during the first three years. This ratio and the short-term monetary return would increase in the following years if the TPP program were to continue its cumulative effects on teen birth.

In addition to the impact of the TPP program, the race-ethnic composition of an area, median household income and unemployment rate each had a significant impact on the teen birth rate across sample counties (**Table 8**). With the exception of an increase in teen births around the time of the recession, there has been a steady secular decline in teen births nationally.

DISCUSSION

Between 2010-2014, about $386.95 million dollars was allocated across 67 US counties and the district towards Tier 1 TPP programs aimed at scaling-up teen prevention programs shown to be effective through randomized trials. Using an SCM approach, we find that the TPP program reduced 3 teen births per 100,000 in the treated counties in 2015 compared with what would otherwise have been the case. The findings are significant and robust to different iterations of synthetic control sample selection. Moreover, it is likely that this cumulative impact will become stronger with the passage of time as the widening of the divergence in birth trends between control and intervention counties appears to indicate. Since the SCM approach can effectively address selection bias and provides placebo estimation within itself, we have strong confidence in these results.

However, contextualizing this finding in broader trends in the decline of teen pregnancy, it is clear that the TPP-induced reduction in teen births has been a relatively minor contributor to the overall decline in teen births in the treated area over this time period. Even before introduction of the TPP program, the teenage birthrate had dropped from 61.8 births per 1,000 women in 1991 to 34.4 births per 1,000 women in 2010– a decline of 44% (Kost & Henshaw, 2013). Although the underlying causes of this drop in teenage birthrate are still somewhat uncertain, changes in contraceptive practices among teens are the most commonly cited reason (Finer et al, 2012). Moreover, economic trends have consistently shown to be predictive of teenage births. Any gains from the TPP interventions should be contextualized within the broader demographic trends of teenage fertility, for instance, the well-known increase in teen births following the Great Recession (Schneider, 2017).

There may be several reasons for this. First, as we previously noted, while TPP funds were intended to go to the “neediest” counties with the highest teen birth rates, in reality the target counties were closer to the US average in terms of their teen birth rates. There may be less room for improvement in counties with more modest teen birth rates. If the counties where these programs were implemented differed substantially demographically or otherwise from the areas where they were originally tested, the “transferability” of these programs to other locales may be questionable. This has broader implications regarding the scalability of “evidence-based” interventions and the degree to which local context matters in all programs (Parkurst, 2017).

A second reason could be an insufficiency of funding towards these programs and competing funding from other sources. While federal funding for abstinence-education fell over this period, ultimately the amount of funding put towards sexuality education and its type and content is determined at a local school district level. Competing influence from non-evidence based programs could crowd out the impact of evidence-based programming. Though a relatively small return on investment the impact of these programs may be muted by competing trends.

Finally, as other research has noted, the secular decline experienced in teen births over the last several decades can be explained by various broad social and economic trends including changes in childbearing norms, the broader acceptance of contraceptive use and introduction of long acting contraceptives, the AIDS epidemic raising attention to contraception and sexual health among other structural explanations (Boonstra, 2014). To summarize, while we found the TPP to have had a significant impact, its effect on the whole is relatively small compared with other factors contributing to the decline in teen births. This raises questions regarding the cost-effectiveness of bringing to scale evidence-based interventions that address easily modifiable factors versus investment in broader structural interventions.

CONCLUSION

This paper used a synthetic control approach to evaluate the effects of the TPP program on teenage births between 2004-2015. We find that the TPP program reduced teen births by 3 per 100,000 female teenagers ages 15-19 in the U.S. saving taxpayers $0.02 over a three-year period compared with the medical and economic support that the government would have provided to a teenager mother during her pregnancy and the child’s first year of infancy. We conclude that the effect, though significant, is relatively small compared with other factors contributing to the decline, and suggest further research into efforts to scale evidence-based interventions.

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TABLES AND GRAPHS

Table 1: Top 10 the TPP Grants and Receivers in the United States from 2010 to 2014

Recipient Name	Year	State	County	Grant
FL ST DEPT OF HLTH	2011	FL	Leon	$7,770,326
HENNEPIN CTY CMMTY HLTH DEPT, HLTH SVCS BLDG - LEVEL 3	2011	MN	Hennepin	$7,164,675
UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT HOUSTON	2014	TX	Harris	$6,212,400
PLANNED PARENTHOOD OF THE GREAT NORTHWEST	2010	WA	King	$4,496,400
CHICAGO PUBLIC SCHOOLS	2010	IL	Cook	$4,433,009
PLANNED PARENTHOOD OF THE GREAT NORTHWEST	2011	WA	King	$4,358,800
CHICAGO PUBLIC SCHOOLS	2011	IL	Cook	$4,297,349
PLANNED PARENTHOOD OF THE GREAT NORTHWEST	2012	WA	King	$4,270,400
CHICAGO PUBLIC SCHOOLS	2012	IL	Cook	$4,210,195
PLANNED PARENTHOOD OF THE GREAT NORTHWEST	2013	WA	King	$4,208,800

Note: The data in this table are from the sample used in later analysis model. Since the TPP variable will be lagged, the observations for 2015 are not included in this table. There are 442 TPP grants received by 82 organizations across U.S. from 2010 to 2014. The 82 organizations locate across 67 counties from 32 states and the district. The data source is the Tracking Accountability in Government Grants System (TAGGS). N = 442.

Table 2: Top 10 Counties with the Biggest Total TPP Grants from 2010 to 2014

County	State	Grant
Cook	IL	$24,789,143
Orleans	LA	$21,627,189
King	WA	$21,476,000
Hennepin	MN	$17,650,335
Harris	TX	$16,056,600
Leon	FL	$15,231,395
Fulton	GA	$11,036,930
Miami-Dade	FL	$9,606,281
Clark	NV	$8,359,952
Richland	SC	$8,203,513

Note: The grant in this table is the sum of the grants received by counties from 2010 to 2014. The table is based upon the dataset used in later analysis model. Since the TPP variable will be lagged, the observations for 2015 are not included in this table. There are 67 counties from 32 states, together with the district, received the TPP grants from 2010 to 2014. The data source is the Tracking Accountability in Government Grants System (TAGGS). N = 68.

Table 3: Top 10 Counties with the Highest Average Birthrate in the United States from 2004 to 2015

State	County	Teen Birth Rate	Black Percentage	Hispanics Percentage	Median Household Income	Unemployment Rate
TX	**Brooks**	120.025	0.285	90.903	4.900	8.033
SD	**Todd**	114.191	0.172	3.052	5.087	7.225
SD	**Oglala Lakota**	107.347	0.079	2.454	5.211	11.075
TX	**Zapata**	105.426	0.137	92.179	5.941	7.225
ND	**Sioux**	104.959	0.145	2.222	5.770	5.617
MS	**Tunica**	104.277	73.393	2.325	5.772	11.308
MT	**Roosevelt**	98.161	0.135	1.658	6.275	6.542
AK	**Kusilvak**	97.094	0.090	0.445	6.104	21.050
MT	**Bighorn**	96.983	0.227	4.367	6.754	10.067
TX	**Jim Hogg**	96.670	0.387	91.940	6.492	6.158

Note: This table is for 3,121 counties of 50 states and the district in the U.S. The data for teen birth rate is from 2004 to 2015. Other variables are from 2003 to 2014 since the effects of the TPP program is lagged. All the independent variables are lagged one year in the later analysis model. Those observations in this table are the master samples used in later analysis. The median household income is by one unit of $5,000/year. The data source can be found in this paper text. N = 37,450.

Table 4: Bottom 10 Counties with the Lowest Average Birthrate in the United States from 2004 to 2015

State	County	Teen Birth Rate	Black Percentage	Hispanics Percentage	Median Household Income	Unemployment Rate
NJ	**Hunterdon**	4.001	2.380	4.848	19.535	4.933
WA	**Whitman**	4.567	1.755	4.509	7.235	5.292
MA	**Hampshire**	4.803	2.284	4.561	11.012	5.017
NY	**Putnam**	5.391	2.082	10.796	16.949	5.175
NJ	**Morris**	5.641	2.894	10.914	18.408	5.142
MA	**Norfolk**	5.879	5.242	3.124	15.522	5.375
PA	**Centre**	5.956	3.010	2.365	9.072	4.708
CT	**Tolland**	5.961	3.028	4.205	14.559	5.508
WI	**Ozaukee**	6.195	1.287	2.163	14.611	4.917
NJ	**Bergen**	6.252	5.219	15.315	15.387	5.658

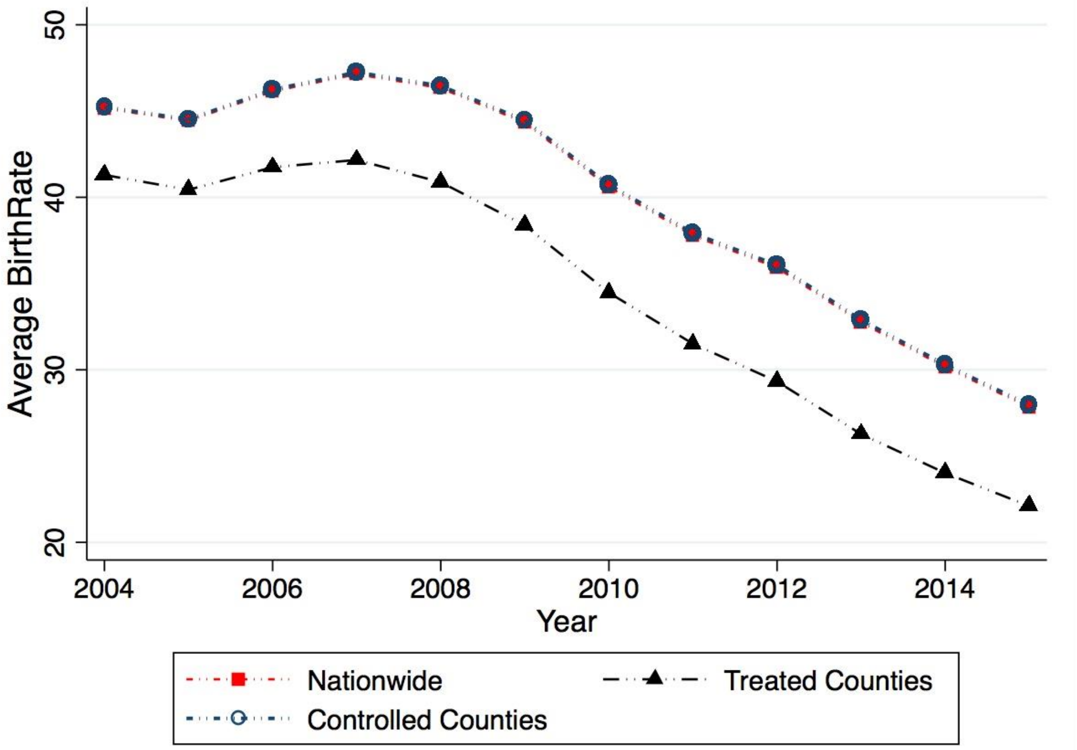
Note: The data for teen birth rate is from 2004 to 2015. Other variables are from 2003 to 2014. Since all the independent variables are lagged one year, so, those observations in this table are the master samples used in later analysis. The data source can be found in this paper text. N = 37,450.

Table 5: Summary Statistics on Models Variables in the United States by Counties

	Controlled	Treated	Controlled	Treated	Controlled	Treated	Controlled	Treated
	Mean		Standard Deviation		Min		Max	
Birth Rate per 1,000 Teens	39.929	26.947	19.504	12.573	2.869	4.931	135.231	74.294
Hispanic Percentage in the Population	7.909	16.442	12.977	15.246	0.000	0.661	96.946	66.573
White Percentage in the Population	79.333	53.535	19.278	21.637	2.480	9.685	99.400	96.221
Black Percentage in the Population	8.626	20.558	14.261	18.854	0.000	0.487	85.922	82.032
Percentage of Teens from 5-17 Years Old in Poverty	20.313	23.044	8.726	9.189	1.800	3.300	75.000	57.400
Median Household Income	8.455	10.379	2.224	2.602	3.374	4.823	25.127	21.450
Unemployment Rate	6.765	8.357	2.873	2.705	1.100	3.000	28.900	18.000
Percentage of Conservative Counties	0.701	0.249	0.458	0.433	0.000	0.000	1.000	1.000
Percentage of Moderate Counties	0.204	0.213	0.403	0.410	0.000	0.000	1.000	1.000
Percentage of Libertarian Counties	0.095	0.538	0.293	0.499	0.000	0.000	1.000	1.000

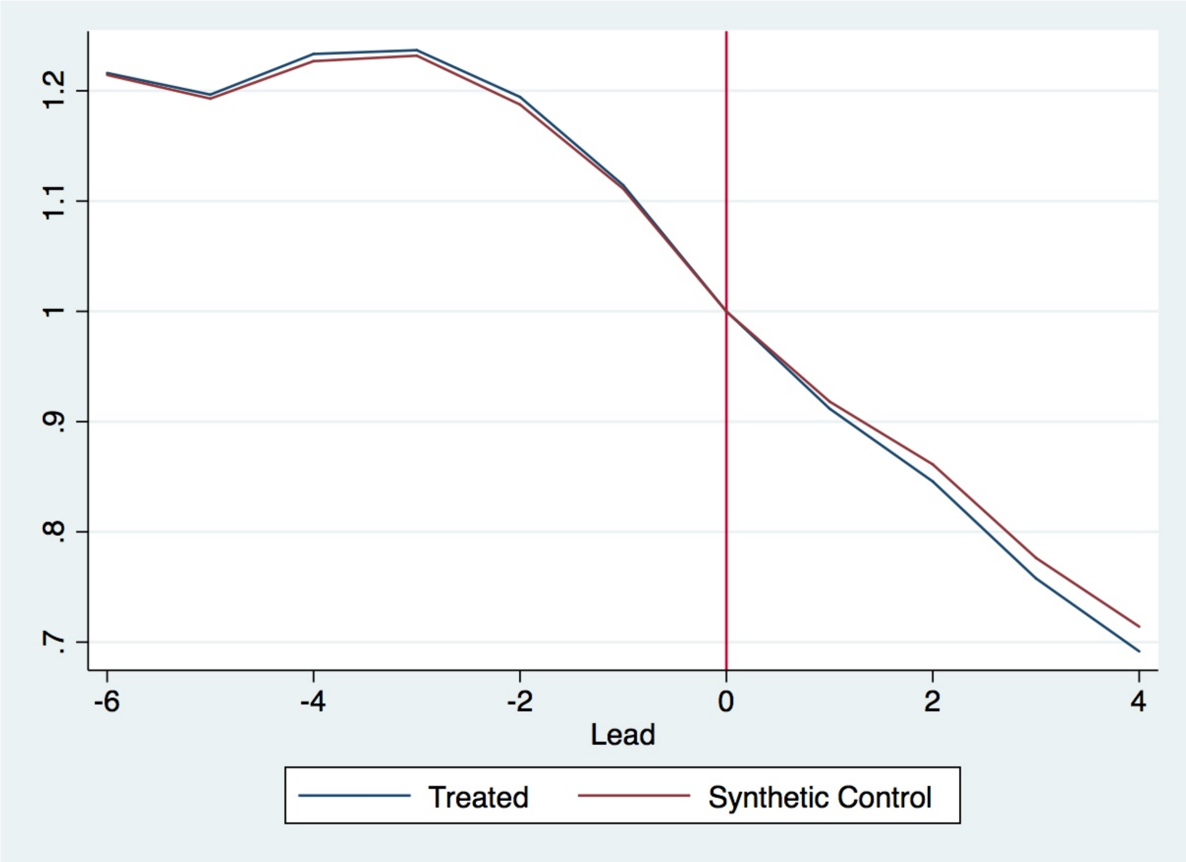
Note: This table is for 3,121 counties of 50 states and the district in the U.S. The data for teen birth rate is from 2004 to 2015. All other variables are from 2003 to 2014 and are lagged one year behind (the lagged ones are from 2004 to 2015). The percentage of Conservative, Moderate, and Libertarian counties are all dummies. This is the master sample used in later analysis (the master sample will be shrunk to be analyzed by using Synthetic Control). The median household income is by one unit of $5,000/year. The data source can be found in this paper text. For controlled counties, N = 36,865; for treated counties, N = 329. The total sample size here is less than that of Table 4 or Graph 1since the table here covers multiple variables so that all the variables here are made equal regarding the number of observations. No missing observations are included

Graph 1: Annual Average Teenage Birth Rate in the United States from 2004 to 2015 by the TPP Treatment



Note: This is the annual average teen birth per 1,000 teenagers age from 15-19 years in the United States (3,121 counties of 50 states, plus the DC). The treated counties are those received the TPP funds from 2010-2014 (with the effects lagged by one year), which include 67 counties from 32 states and the district (the 68 local authorities consistently received the TPP funds from 2010-2014). The controlled counties are those did not receive the fund, which include 3,054 counties from 50 states. N = 37,450. The data source is Center for Disease Control and Prevention (CDC).

Graph 2: Trends in Teen Birth Rate in the U.S.: the TPP Treated Counties vs. Synthetic Counties



	Estimated Effects	P-values	Standardized P-values
C1	-0.007	0.004	0.189
C2	-0.017	0.000	0.026
C3	-0.021	0.000	0.012
C4	-0.025	0.000	0.021

Note: The upper figure is the trends in teen birth rates of the TPP treated counties and synthetic counties in the U.S. from 2005 to 2015. The threshold here is 2011 since the effect of the TPP program is lagged. The donor pool here contains controlled counties which have a difference of 0.002 standard deviations from the TPP treated counties in terms of teen birth rates. The ratio between treated and controlled counties is about 1: 2.5. The bottom figure is the inference (p-values) in terms of comparing the estimated main effect to the distribution of placebo effects. N = 2,832