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### Universal Preschool and Maternal Labor Force Participation: Evidence from Florida and Vermont

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**Universal Preschool and Maternal Labor Force Participation:**

**Evidence from Florida and Vermont**

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## **Abstract**

The United States lags far behind other developed countries in terms of preschool provision and access. Because subsidized preschool effectively serves as childcare for enrolled students, preschool policies have ramifications in the labor market; namely, whether or not parents return to work after having children. This paper investigates the only two state-wide universal pre-k programs in the country, those of Florida and Vermont. I use a synthetic controls approach in order to address the impact these programs have had on maternal labor force participation rates in each state. I find that while Vermont's pre-k policy may have produced a significant increase in maternal labor force participation, the results from Florida's policy are insignificant. This outcome suggests that differences in how the policies have been implemented drive whether or not the policy has meaningful impacts on mothers' decisions to rejoin the labor force. Vermont offers more full-day options than Florida, although both programs are only free for half-day provision; additionally, Florida offers programming for children ages 4 and up, while Vermont offers programming for children 3 and up. Finally, I suggest other routes to explore which may aid pre-k policies in making it more accessible for mothers to return to work: these include more targeted programs, more full-day options, and subsidized (rather than free) provisions.

## **Introduction**

A free and equal public education is one of the most essential rights guaranteed to US citizens. This free, compulsory education spans from when a child enters kindergarten at the age of 5 through to the end of high school. However, many children in the US attend preschool starting at the ages of 3 or 4 (with a 61% attendance rate for 3-5 year olds being the national average in 2019) (National Center for Education Statistics, 2019). Initially, this pre-kindergarten attendance was provided only by private actors and was not guaranteed or subsidized in any way. To this day, the US is still far behind other developed countries when it comes to preschool provision and access (Herman et al, 2013). But in the past 25 years, some states have begun to offer free publicly provided or subsidized pre-k options to families. The implementation of different universal preschool policies across the country provides the opportunity to analyze the impact these policies have on a wide variety of factors, including the topic of interest for this paper: maternal labor force participation.

While the primary benefits of a universal pre-k program are to supplement, enhance, and make more equitable and accessible children's early academic instruction and achievement, researchers have noted many potential secondary benefits these programs may contribute as well. Universal pre-k programs act not only as an educational opportunity for children but as subsidized childcare for families. This childcare subsidization has the potential to increase family incomes, ease family life, increase gender equality, and aid the parent primarily responsible for childcare (typically, the mother in a heterosexual couple) in reentering the workforce (Miller, 2021). Thus, this paper considers the effects of two states' universal pre-k programs on maternal labor force participation.

The Education Commission on the States currently reports that only two states, Vermont and Florida, have truly universal pre-k programs. These programs are designated as such because they are not capped by funding amounts, enrollment numbers, or enrollment deadlines (Alliance for Early Success, 2022). Other states that have near-universal programming are Georgia, Oklahoma, West Virginia, Illinois, Iowa, New York, and Wisconsin (and Washington, DC has fully universal pre-k). There are various reasons why these states' programs are near (rather than fully) universal; some offer universal programming in most but not all counties, some have caps on their enrollment numbers, et cetera. This paper will focus on Florida and Vermont given the fully universal nature of the programs, as opposed to some of the accessibility restrictions present in other states' programs.

This paper uses a synthetic controls approach to investigate the effect each of these programs has had on maternal labor force participation in each of these states. Using American Community Survey (ACS) public-use data, I extract information about maternal labor force participation and other control variables, including the percentage of mothers married, highest maternal educational attainment, and more.

Variables concerning family composition, educational attainment, population size, and political affiliation are used to construct synthetic control versions of both Florida and Vermont to compare to the true data of each state in each year. The true maternal labor force participation rate is compared to the rate within the synthetic control state each year, with any gap between the two indicating a possible effect of the universal pre-k policy. This comparison to the state's true maternal labor force participation helps determine whether the provision of universal preschool has had a significant effect on the maternal labor force participation rate. I compare these results to placebo tests run on every other state in order to examine whether the results I find in each

state are likely to be significantly different from what the statistical model would predict in every other state, had these states been the ones to have a universal pre-k policy passed in the same year.

I find that Florida's universal pre-k policy has had no discernable effect on maternal labor force participation, and the small change in the maternal labor force participation rate which I observe in the years since the program can easily be attributed to random chance or other extraneous factors. Meanwhile, Vermont's data suggest significant effects of the program, although these results are more difficult to decipher. I find that maternal labor force participation has increased since the universal pre-k policy has taken effect, although there is no widely-used significance test that can be utilized to fully corroborate an analysis of how significant this rise in maternal labor force participation is. Due to the tests I am able to perform, and the limitations of the data pool, I determine that it is likely that Vermont's program has had a significant effect on maternal labor force participation in the state. Appendices A and B discuss alternative interpretations of the data given slightly different control variables; these results are not far off from those presented in the main text of the paper.

Finally, I discuss some alternative strategies for implementing preschool programs that may more effectively aid mothers in returning to work.

My contribution to the literature will consist of being both the first paper within this strain of literature to analyze both Florida and Vermont's programs, and one of the only papers within this strain of literature to utilize the synthetic controls method thus far.

## **Background: Florida and Vermont Universal Pre-K Programs**

Florida introduced their Voluntary Prekindergarten Education Program (VPK) in 2005. The program serves children through a network of private, public, and charter schools that offer VPK, and in the 2019-2020 school year the program served 71% of 4 year olds in the state. VPK provides completely free and universally accessible half-day pre-k to Florida 4 and 5 year olds—no registration fees, purchase of supplies, or any other payment is required.

In 2019, there were 6,501 facilities offering VPK, ranging from public, private, and charter schools to private child care centers. Providers are only responsible for providing 540 instructional hours during the school year (i.e. half-day instruction under a typical school schedule), but providers are allowed to flexibly structure their daily hours a week to meet this 540 hour requirement—meaning that providers can offer fewer school days with more hours a day if they so choose. Parents are allowed to select the program which is the best fit for their child (for example, there are secular and faith-based options, Montessori versus traditional instruction, or they may choose primarily based on location) (Division of Early Learning, 2022).

If parents want to send their child to full-day and/or full-year preschool instead, some VPK providers offer extensions to their programming at an additional cost so that parents can still reap the benefits of the initial pre-k subsidy by enrolling their children in a VPK program that will only charge them for the instructional time exceeding 540 hours. For example, First Baptist Brandon Christian Academy offers Monday-Thursday instruction from 9:00 am to 1:30 pm, August-March for free as part of VPK. Parents can elect to pay extra to add on Fridays, spring months, and/or earlier or later instructional hours (VPK options, 2022).

Vermont's universal pre-k program came into effect through Act 166 in 2014. This program offers free pre-k for all 3, 4, and 5 year olds in the state. It is also composed of both

private and public providers (State of Vermont Agency of Education, 2022). Only 10 hours of programming a week for the 35 week school year is guaranteed under the policy, although 68% of providers offer full-day programming. Similar to the Florida policy, parents who would like to send their children for more hours of instruction a week can elect to pay tuition for the hours past what the law grants them for free. Parents can choose from a list of pre-approved schools and select one that is the best fit for their child (Franchino, 2020). Vermont's universal pre-k is funded by resident school districts, and the cost of pre-k is part of a school district's budget as approved by district voters (State of Vermont Agency of Education, 2022).

## **Literature Review**

Previous findings on subsidized childcare or universal pre-k and maternal labor supply are mixed. There are, on the one hand, plenty of studies that suggest that subsidized childcare or preschool should have a meaningful impact on maternal labor supply. Studies from other countries (Quebec's \$5 daycare program and other subsidized universal childcare) typically find that subsidized and easily accessible childcare or pre-k increases maternal labor force participation (Baker et al, 2008; Carta, 2018; Ryu, 2020). Most significantly, Quebec's \$5 a day daycare program had a very large effect on maternal labor force participation; in a study by Baker et al. (2008), female employment was found to rise by 7.7 percentage points relative to the rest of Canada, or 14.5 percentage points from baseline participation.

Additionally, Malik's (2018) synthetic control analysis focused on Washington, DC's universal pre-k program finds very large effects on maternal labor force participation following the introduction of the policy. It reports that the city's maternal labor force participation rate has increased by about 12 percentage points since universal pre-k was instituted, with about 10



percentage points attributable to preschool expansion. This increase in the labor force participation rate represents mothers from both low and high-income families (although no significant effect on middle-income families). This study also includes a difference-in-differences analysis and finds similar results across difference-in-differences and synthetic controls analysis (Malik, 2018).

However, there are also plenty of studies that suggest that universal preschool is not the right policy to target increasing maternal labor supply. Casico (2006) studies the introduction of US subsidized kindergarten in the 1960s and finds using difference-in-differences estimates that the effect of free public school on maternal labor force participation for single mothers with no younger children was large (associated with a significant 7.3 to 7.6 percentage point increase in employment and a significant 3.1 to 3.3 hour increase in weekly hours worked). However, for single mothers with other, younger children and for married mothers, there were no significant effects. Casico suggests these results point towards the increased efficiency of programs that specifically target underprivileged families, as opposed to universal programs.

Similarly, Fitzpatrick (2008) looks at the effects of Georgia and Oklahoma's near-universal pre-k policies and finds using a regression discontinuity framework that the policies significantly increased pre-k enrollment, but did not find more than small effects on maternal labor force participation. The only exception was mothers in rural areas, whose probability of employment increased by around 20%. Sall (2013) likewise finds that the effects of different pre-k programs across the country vary depending on whether the mother was married (larger in magnitude) and whether the mother had other children younger than 4 as well (larger for mothers with no younger children).

Li (2019) reanalyzes Georgia and Oklahoma's programs using a synthetic control method and finds some small positive effects on maternal labor force outcomes for mothers in Georgia, but little to no effect in Oklahoma. Li suggests that the most likely reason for this difference is that Georgia offers full-day programming, while Oklahoma did not at the time these data were collected. Contradicting Fitzpatrick (2008), in this study the impact was heterogeneous across subsamples stratified by marital status, poverty status, education level, and ages of children in the household (i.e. if there are other younger or older children present in the household).

Overall, the literature is somewhat mixed. Many studies find or suggest that maternal labor force participation rises or should rise meaningfully when universal pre-k is provided, while many others find it does not. Further, those studies which find that labor force participation is only increased for single mothers with no younger children suggest that a more efficient allocation of resources would be to expand programs like Head Start which provide pre-k access to children specifically from low-income families. This paper seeks to provide further input and clarity on whether universal programs can meaningfully impact maternal labor force participation, or if a more targeted approach is required.

### **Summary of Data**

The data for this paper come from the American Community Survey (ACS) Public Use Microdata Sample (PUMS) 1-year files. Data have been collected and appended for the years 2001-2019 to work with the labor force outcomes of Florida's pre-k policy (which went into effect in 2005), and for the years 2008-2019 to analyze the results of Vermont's pre-k policy (which took effect in 2014).

The data provide information on individual and household characteristics, including age, sex, marital status, and presence and age of related children (aggregated into the categories of under 6 years old only, from 6-17 only, and both under 6 and 6-17 year olds). Further, variables have been generated for labor force participation, educational attainment beyond associate's degrees and beyond Bachelor's degrees, and marital status of mothers of preschool children, as well as the percentage of grandparents living with their grandchildren, the number of families with preschool children in a given state, and the percentage of each state which voted Republican in the 2016 election.<sup>1</sup>

The maternal labor force participation rate, in this paper, refers to the labor force participation rate for mothers with children under the age of 6. Mothers whose children are all over the age of 6 are not counted; an appropriate way to think of the maternal labor force participation rate in this paper would be to think of it as the labor force participation rate for mothers with preschool-aged children and below. Other variables dealing specifically with “mothers” similarly refer only to mothers with children under the age of 6.

This paper utilizes the synthetic control method developed by Abadie and Gardeazabal (2003) to estimate the effects of Florida and Vermont's universal pre-k programs on maternal labor force participation and employment. The synthetic control method, much like difference-in-differences, is a statistical technique that allows one to analyze the effects of policy intervention. Rather than selecting a single other state to serve as the control to which to compare Vermont and Florida, a weighted average of multiple states is constructed to form a synthetic Florida and synthetic Vermont. These counterfactuals more closely resemble the data of Florida and Vermont before the policy intervention and give a clearer representation of what would have happened had the universal pre-k policies not been implemented. Then, in order to estimate the

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<sup>1</sup> One additional control, race, is added into my analysis and explored in Appendix B.

significance of the results, a test is performed wherein each other state serves as a placebo, and the regression is re-run on each other state as if that state had been the one to pass a universal pre-k policy. From here, further analysis is required to determine whether the results of Florida and Vermont stand out enough to be considered significant.

Before Florida's universal pre-k policy, the average maternal labor force participation in Florida was 64.78% for the years 2001 to 2004. In the years following the policy, from 2005 to 2019, the average maternal labor force participation was 68.41%. Vermont's maternal labor force participation rate is higher than Florida's both before and after the pre-k program, with an average of 74.16% before the program (in the years 2008 to 2013) and 76.80% in the years after the program (2014 to 2019).

Table 1 below outlines the variables used and summary statistics across all states to provide a country-wide overview; tables representing these variables specifically in Florida and Vermont during the periods of study are included in the results section. Note that LFPR stands for labor force participation rate.

	(1) Mean	(2) Standard Deviation
<b>Maternal LFPR</b>	<b>0.666</b>	<b>0.472</b>
<b>Percentage of Mothers Married</b>	<b>0.765</b>	<b>0.424</b>
<b>Percentage of Mothers with Associates degree</b>	<b>0.613</b>	<b>0.487</b>
<b>Percentage of Mothers with Bachelors degree</b>	<b>0.392</b>	<b>0.466</b>
<b>Average Age of Mothers</b>	<b>32.32</b>	<b>6.48</b>
<b>Percentage of Grandparents Living with Grandchildren</b>	<b>0.0114</b>	<b>0.106</b>
<b>Number of Mothers with Children Under 6</b>	<b>2307.311</b>	<b>2871.843</b>
<b>Percentage of Vote for GOP in 2016</b>	<b>0.578</b>	<b>0.283</b>

**Table 1: Summary Statistics for Independent and Control Variables Measured Across all States**

## **Summary of Methodology**

For both Florida and Vermont, a synthetic control unit is composed of weighted data from multiple states that match the treated unit as closely as possible on each of my control variables, with the lagged labor force participation rate having the largest effect on the control unit. Maternal labor force participation is the dependent variable, with 7 additional variables serving as the controls which are used to construct the control unit: percentage of mothers who are married, age of mothers, the percentage of mothers with an associate degree and beyond, the percentage of mothers with a Bachelor's degree and beyond, the number of grandparents living with grandchildren, the number of families with preschool-aged children, a lag of the maternal labor force participation rate the first year in the sample and the year the policy took effect (with one additional lag for a year in the middle of the sample for Vermont), and (for Vermont only) the percentage of each state which voted Republican in 2016.

The following states are omitted from the pool due to their preschool programs being near-universal to the point that they may interfere with results if included in the control unit: Georgia, Oklahoma, Illinois, New York, Iowa, West Virginia, DC, and Wisconsin (Alliance for Early Success, 2022). If these states were to be included, the effect of the policies would likely be underestimated. Because these states also have near-universal pre-k policies, if they were to be used in constructing the synthetic control states they would likely lead to inflated predictions of what would have happened to maternal labor force participation without the institution of a universal pre-k policy.

The main assumption necessary to extrapolate results from these synthetic control tests is that the institution of the universal pre-k policies in each state is the only exogenous variable that could be altering maternal labor force participation. Threats to this identification would include

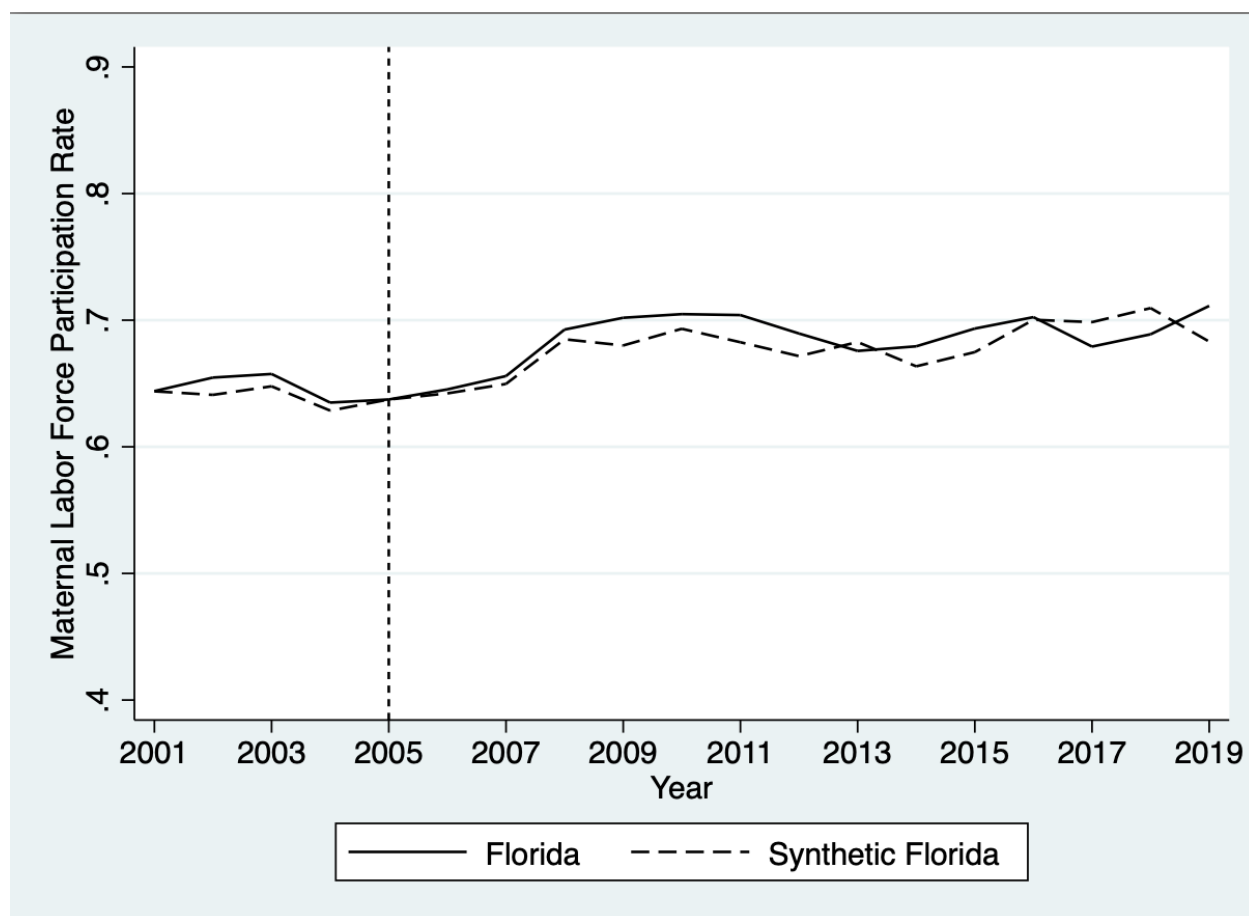
any other policies passed during this period that may have had a meaningful positive impact on maternal labor force participation. The only policy during this timeframe I have discovered which may have impacted maternal labor force participation is an expansion of Vermont's Medicaid program in the same year as Act 166 went into effect—which, if anything, would likely have a negative impact on mothers joining the labor force (Norris, 2021). The labor force participation of women overall in both states has been stable since the first *Status of Women in the States* report was published in 2004—Florida's female labor force participation rate was 55.7% in 2005, and 53.7% in 2016, and Vermont's female labor force participation rate was 66.5% in 2004 and 63.9% in 2016 (both deemed “no progress”).

Once the initial synthetic control tests are complete, I conduct a series of placebo tests wherein every other state is considered the treated state and receives its own synthetic control state. The placebos are treated as though they also had a universal pre-k policy passed in 2005 or 2014, and the difference between the maternal labor force participation rate for each year in the treatment and synthetic groups is found and plotted on a graph. A visual aid shows the results of all of the placebo tests alongside the results from Florida and Vermont to demonstrate the degree to which these results could have occurred due to random chance, as opposed to being a true representation of an increase in maternal labor force participation due to the universal pre-k policies. As will be elaborated on further in the results section, p-values for the Vermont results are estimated using the percentage of placebo states for which Vermont displays larger versus smaller differences than between the true and synthetic units.

## **Results**

### Florida

I find no evidence that the universal pre-k policy in Florida had a meaningful impact on maternal labor force participation. Figure 1 plots maternal labor force participation in Florida over time, comparing the true maternal labor force participation rate in Florida before and after the universal pre-k program started (the “treatment” group) to the maternal labor force participation in the “synthetic” Florida, constructed to replicate Florida in the pre-treatment period based on the selected controls. The control unit is composed of California (31.6%), Hawaii (10.1%), Maine (24.5%), Mississippi (8.8%), Montana (2.9%), Nevada (6.8%), Rhode Island (3.7%), and South Dakota (11.6%). The results are shown below; as can be seen in the figure, the maternal labor force participation rate in the real Florida does not meaningfully diverge from the synthetic control unit at any time.



**Figure 1: Maternal Labor Force Participation Rate in the Real Versus Synthetic Florida, 2001-2019**

The average value for each control variable matches the true Florida data very closely, with the exception of the number of families with preschool-aged children (which was somewhat smaller in the synthetic Florida than in the actual state). Table 2 shows the match for the average of each control variable used to construct the synthetic Florida to the true Florida.



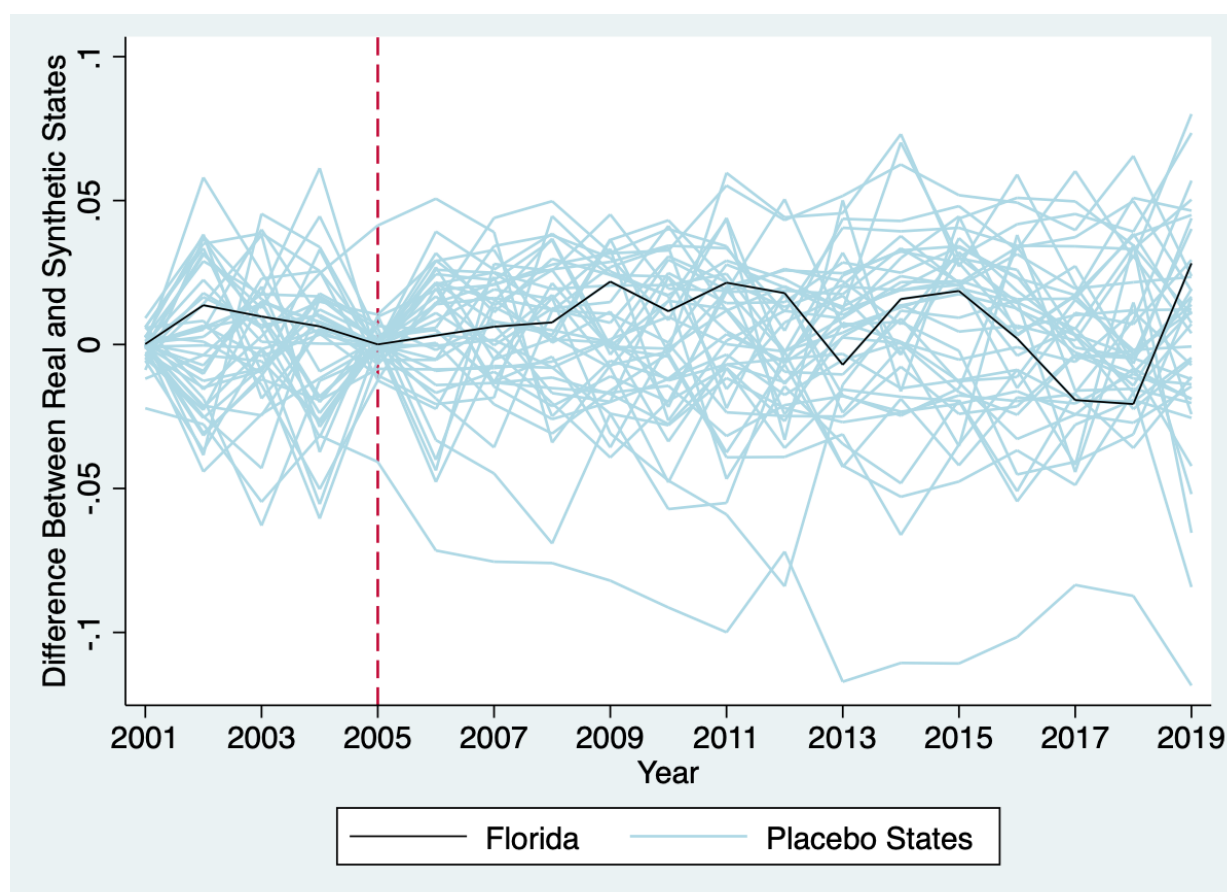
	(1) Treated	(2) Synthetic
Percentage of Mothers Married	0.812	0.836
Percentage of Mothers with Associates degree	0.655	0.653
Percentage of Mothers with Bachelors degree	0.307	0.310
Average Age of Mothers	32.48	32.44
Percentage of Grandparents Living with Grandchildren	0.0184	0.0184
Number of Mothers with Children Under 6	2313	2271.09
Maternal LFPR in 2001	0.644	0.644
Maternal LFPR in 2005	0.637	0.637

**Table 2: Comparison of Control Variables; Real Versus Synthetic Florida**

The control unit thus very closely resembles the true Florida data before the policy and continues to match the true Florida for each control variable after the policy. The control unit does not diverge meaningfully from the true Florida data after the policy was enacted, and the two lines even intersect many times, suggesting that Florida's policy has not had any significant effect on maternal labor force participation. While the overall maternal labor force participation rate in Florida did increase by a few percentage points, the matching rise in the control unit suggests that this slight rise was part of a national trend rather than a shift in the behavior of Florida mothers following the pre-k policy.

Although there is no formal significance test currently in use to verify the results of a synthetic controls model, Abadie, Diamond, and Hainmueller (2010) established a placebo test wherein every other state can be used as a placebo to determine whether the results from Florida diverge meaningfully from a random outcome. The 41 remaining states (excluding the 9 states

not included in the analysis to begin with due to similar pre-k programs) each undergo the same test, treated as though they were the state which instituted a universal preschool policy. The difference between the real and synthetic states for each year in each state is mapped out in a single graphic; the larger the difference between a real and synthetic state relative to the others, the more likely it is that those results are significant (i.e. not due to random chance). Thus, this procedure compares how likely Florida's maternal labor force participation outcome is to come about in a state that did not enact a policy in 2005. Figure 2 below demonstrates the results of the placebo tests compared to Florida's results.



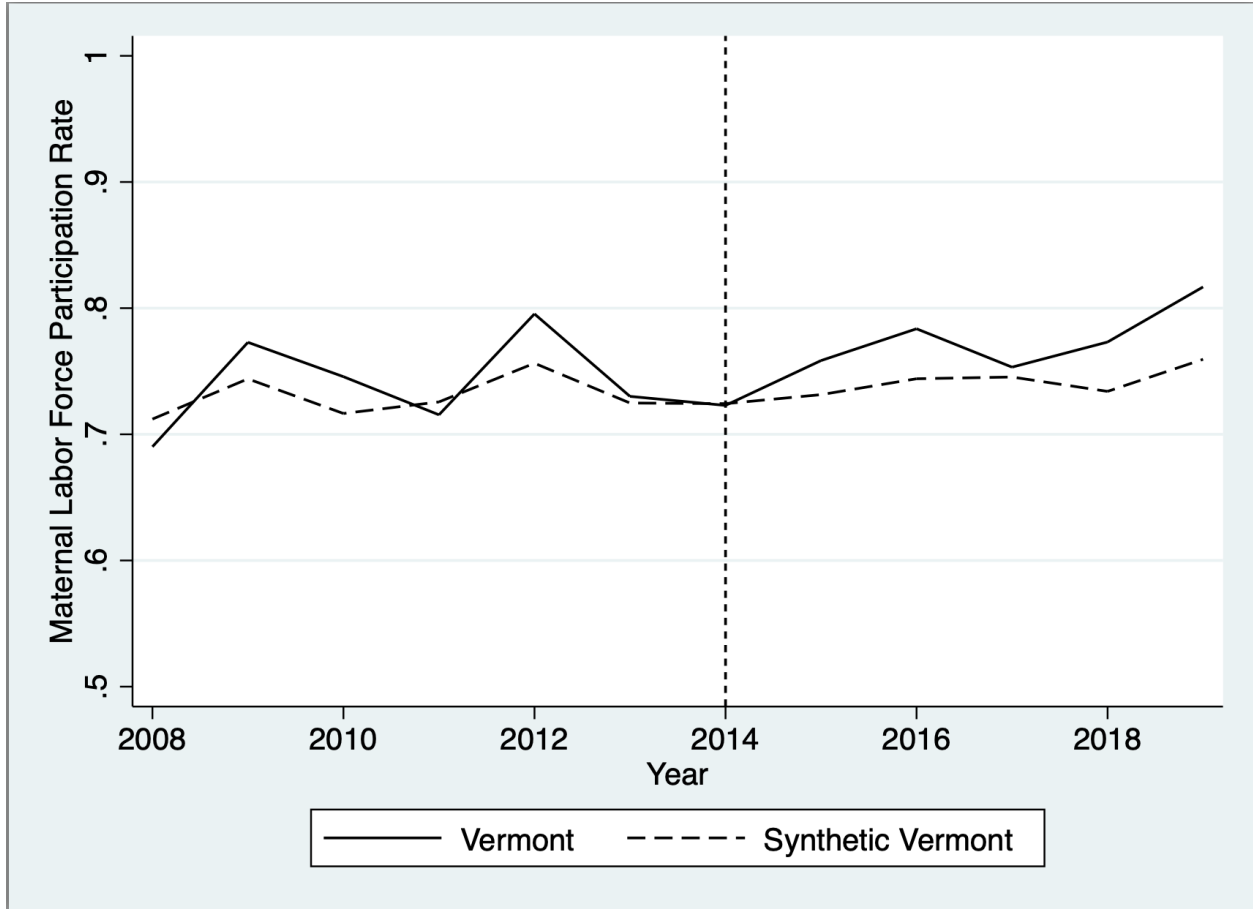
**Figure 2: Difference Between Real and Synthetic States; Florida Versus Placebo States, 2001-2019**

This test adds further evidence to the assertion that the universal preschool program in Florida had no effect on maternal labor force participation. The Florida results fall near the middle of the placebo test results, meaning that if this test were run on the data from any other state as if this state had started a pre-k policy in 2005, a researcher would be likely to come up with a similar change in maternal labor force participation.

### Vermont

I find evidence in the synthetic control test that the universal preschool policy in Vermont has had a positive effect on maternal labor force participation, with evidence of statistically significant effects starting in the second year after its introduction.

In this test, I added one additional year to the labor force participation lags, and the control of the percentage of each state's vote which was Republican in the 2016 election. The additional year's lag was added to help improve the fit of the pre-treatment period line (since Vermont is a smaller state, and thus the maternal labor force participation rate fluctuates more than in Florida). The percentage of the state which voted Republican in 2016 was added as a control in order to help construct a control for Vermont which is more closely aligned politically to Vermont (wherein the synthetic Vermont without this control was made up of many states of very oppositional political compositions to Vermont). Figure 3 plots the results of Vermont's true maternal labor force participation rate as compared to the synthetic control Vermont. The control unit is constructed from Connecticut (32.7%), Rhode Island (51.7%), and Wyoming (15.6%).



**Figure 3: Maternal Labor Force Participation Rate in the Real Versus Synthetic Vermont, 2008-2019**

Due to the smaller sample size of Vermont mothers (only around 200 mothers each year fall into the category of having children under the age of 6 within the ACS dataset), the rate of maternal labor force participation fluctuates more both before and after the policy—a smaller number of mothers can have an impact on the percentage of mothers working. Thus, the control unit does not fit the pre-treatment data quite as closely as it was possible to achieve with the same controls in Florida. However, it is a good approximation of the average maternal labor force participation rate in the pretreatment period and is equal to the real Vermont in the year the policy went into effect. In the post-treatment period, the true Vermont’s maternal labor force participation rate is greater than the synthetic Vermont in every year for which data are available.

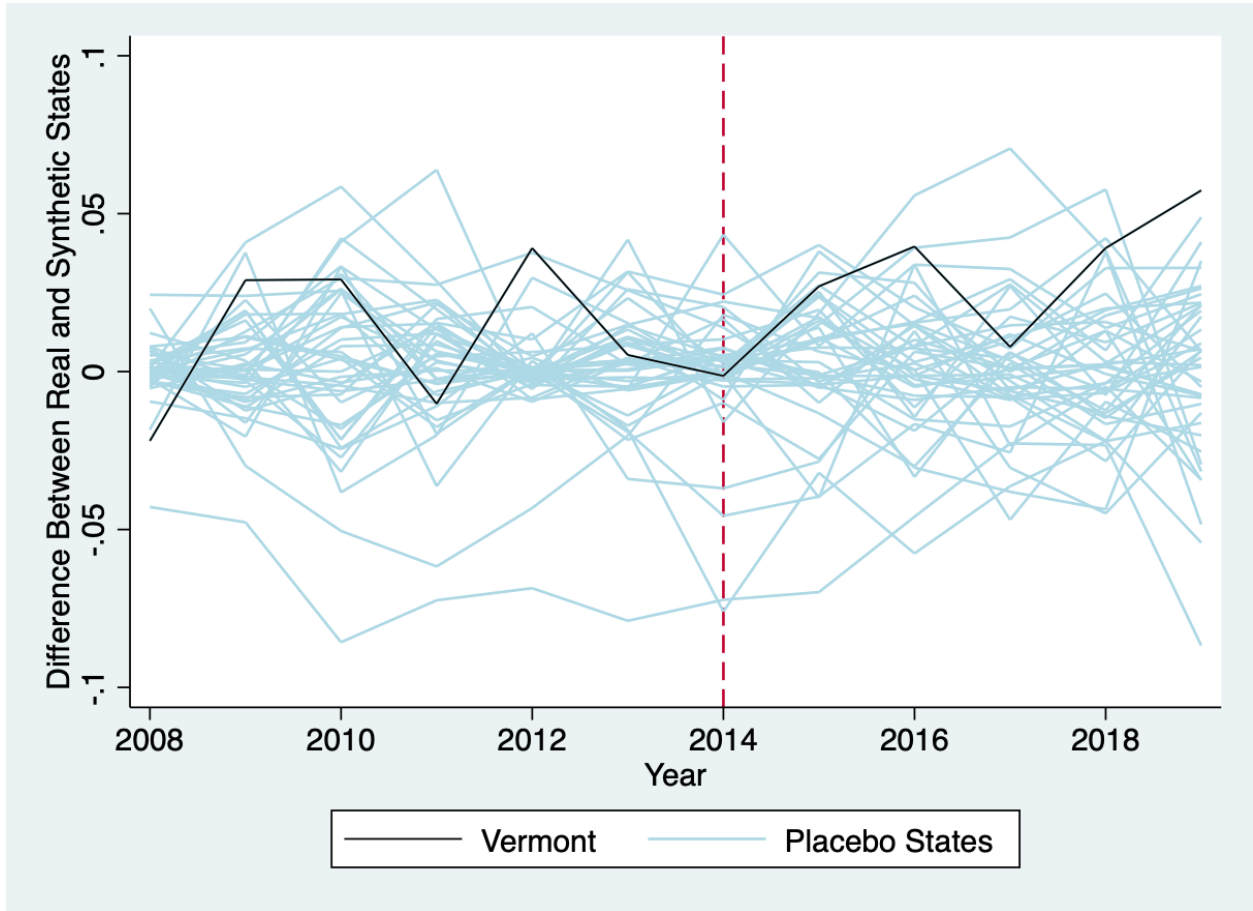
The fact that the control unit is below the true maternal labor force participation rate, even when it dips back down in 2017, suggests that this universal preschool policy has significantly increased Vermont's maternal labor force participation rate. This result is particularly compelling when we consider that this maternal labor force participation rate takes into account all mothers with children under 6 (thus capturing mothers of 0, 1, 2, and 6 year olds who are unaffected by the program). If a significant result can be seen even in this larger group, it is likely that the effect is even greater on the actual mothers affected—those with 3 to 5 year olds.

Once again, the control data matches very closely to Vermont's real data on all dimensions except for the number of families with preschool-aged children, which is above (rather than below) this time. Additionally, the percentage of Republican votes in the 2016 election control does not match quite as closely as many of the others, although it is a considerable improvement from before this control was being used. Table 3 below shows the closeness of the fit for the synthetic Vermont relative to the true data.

	(1) Treated	(2) Synthetic
Percentage of Mothers Married	0.777	0.744
Percentage of Mothers with Associates degree	0.641	0.636
Percentage of Mothers with Bachelors degree	0.371	0.341
Average Age of Mothers	32.98	32.94
Percentage of Grandparents Living with Grandchildren	0.0073	0.0093
Number of Mothers with Children Under 6	226.5	761.11
Maternal LFPR in 2008	0.690	0.712
Maternal LFPR in 2012	0.795	0.756
Maternal LFPR in 2014	0.723	0.724
Percentage of State Voting Republican in 2016	0.370	0.470

**Table 3: Comparison of Control Variables; Real Versus Synthetic Vermont**

Figure 4 plots the placebo paths for the 40 remaining states, where synthetic controls were again constructed treating each state as though they had implemented a pre-k policy in 2014. In every year except 2017, the difference between the true Vermont and the synthetic Vermont is increasing, and is far greater than almost all of the placebo states. In 2019, the final year that data are available, the difference exhibited by Vermont is greater than what is shown in any other state.



**Figure 4: Difference Between Real and Synthetic States; Vermont Versus Placebo States, 2008-2019**

The results I find in Vermont are extremely unlikely to have occurred due to random chance; in 2019, they are greater than any placebo relationship. Using the method from Kurban (2021), I use the proportion of placebo treatment effects that are smaller than the actual treatment effect as a p-value. In using this p-value test on the result from 2019, I find a p-value of 0.025, which does make these results significant at the 5% level. Although Vermont's results are not this extreme every year, most other years also exhibit unusually larger differences between the treatment and synthetic groups--2016 and 2018 both have a p-value of 0.05.

Thus, in contrast to Florida's program, there are statistically significant effects of Vermont's program on maternal labor force participation.<sup>2</sup>

As I have noted already, there are far fewer mothers of preschool-aged children in Vermont than in Florida, meaning that only a small number of mothers deciding to work can lead to a statistically significant change in the maternal labor force participation rate. In 2019, the year with the greatest treatment effect, the difference between the real and synthetic Vermont is about 6.5 percentage points. This difference translates to about 13 additional mothers entering the sample workforce (6.5% of the sample of 202 mothers with children under the age of 6). To expand this difference to the entire state: assuming the ACS data accurately reflects the true percentage of mothers with children under the age of 6 in Vermont's population, there were around 19,264 mothers with children under 6 in Vermont in 2019. A 6.5 percentage point increase in the maternal labor force participation rate within this entire population, then, amounts to 1,252 women across the entire state of Vermont. So despite these results indicating only a meager rise in the number of mothers working in the ACS data sample, they could have much larger effects in other states with larger populations, or even in the context of the total population of Vermont.

### **Discussion: Policy Implications, Future Considerations**

These results suggest that there is a difference between the programs enacted in Florida and Vermont which may be meaningfully influencing whether the policy has a significant impact on maternal labor force participation. The two main differences between the policies which could have caused these results are the ages of children that these programs accept and the number of

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<sup>2</sup> A discussion of alternate ways of treating the lag variables in the synthetic control analysis, and how these differing treatments may alter results, appears in Appendix A.



instructional hours offered. While Florida's VPK program only accepts 4 and 5 year olds, Vermont's Act 166 extends to 3 year olds as well. Additionally, while neither program mandates full-day preschool, Vermont providers are more likely to have add-on plans which allow parents to enroll their children in the initial program for free, and then pay for additional hours to receive full-day care for their children.

The states' programs are otherwise similar in terms of access: Vermont ranked 3 and Florida ranked 4 in terms of pre-k access for 4 year olds in 2019 (Friedman-Krauss et al, 2020). Thus, these two differences are likely the key to understanding why only Vermont's program had a larger effect on maternal labor force participation. In taking children a year younger, Vermont opens the door for mothers of younger children to reenter the workforce than Florida does. And in offering more of these children full-day instruction, Vermont's pre-k program allows for a more normal work schedule, which may make returning to work more convenient for mothers.

Other works (Casico, 2006; Sall, 2013) come to the conclusion that mothers are significantly more likely to return to work earlier when their youngest child is included in the daycare or preschool program in question. This conclusion is logical—it stands to reason that free or subsidized child care would be a more powerful incentive to return to work if all of one's children qualify for the childcare program than if only some do while other children are still at home. Thus, the differences in Vermont and Florida maternal labor force participation rates could certainly be driven by Vermont's taking children a year younger than Florida.

However, neither program gets even close to the results that Malik (2018) finds from the full-day 3-5 year old program in Washington, DC, which produced large increases in maternal labor force participation across both low and high-income households. The results I find in Vermont suggest about a 6.5 percentage point increase in maternal labor force participation

relative to the synthetic Vermont in 2019, the year with the greatest difference between the treated and synthetic units. Meanwhile, Malik finds a much larger 10 percentage point increase in maternal labor force participation attributable to universal preschool. Thus, if money could be found in the budget to provide full-day preschool programs for 3-5 year olds, this policy does indeed seem to provide a much more powerful incentive for mothers to return to work than Florida and Vermont's half-day counterparts.

If universal, free, and full-day provision is out of the question budget-wise, then some of the other literature provides results that can help guide policies that may more meaningfully impact maternal labor force participation. Fitzpatrick (2008), Casico (2006), and Sall (2013) all find that subsidized childcare or education programs have larger effects on lower-income and/or single-parent households. Thus, a less universal and more targeted program like Head Start may be a more efficient way to target specifically the mothers who would most benefit and be the most likely to return to work due to subsidized or free preschool provision for their children.

Additionally, Baker et al. (2008) find that subsidized childcare programs have significant effects on maternal labor force participation, even if there is still some cost to the parents associated with the program. Thus, another viable alternative to providing free and universal programs is to provide universally subsidized, but not free, preschool programs. Rather than giving the first few hours free and then having parents elect to pay for the additional hours, a full-day subsidized program may have a larger effect on maternal labor force participation.

## **Conclusion**

In conclusion, a synthetic control analysis of Florida and Vermont's free and universal preschool programs reveals that while Florida's program has had no impact on maternal labor

force participation, Vermont's program may have provided a large enough incentive for a significant number of mothers to reenter the labor force. Increased maternal labor force participation is an important secondary benefit to universal preschool programs because of the potential it has to help both single and two-parent families increase their household incomes. The fact that only Vermont's program has had a positive impact on the maternal labor force participation rate suggests that one or both of the two key differences between the programs—(1) the wider age range of children accepted in Vermont and (2) additional full-day add-on options in Vermont—is driving this result.

However, there is some ambiguity regarding how great of an increase universal pre-k has produced in Vermont's maternal labor force participation rate. Other programs which have produced more significant results have sacrificed either the free or the universal components of the program in order to provide full-day instruction for children. In designing future programs, these approaches may be better suited to best help mothers reenter the labor force when their children begin preschool.

I affirm that I have adhered to the Honor Code in this assignment. *Hannah Keidan*

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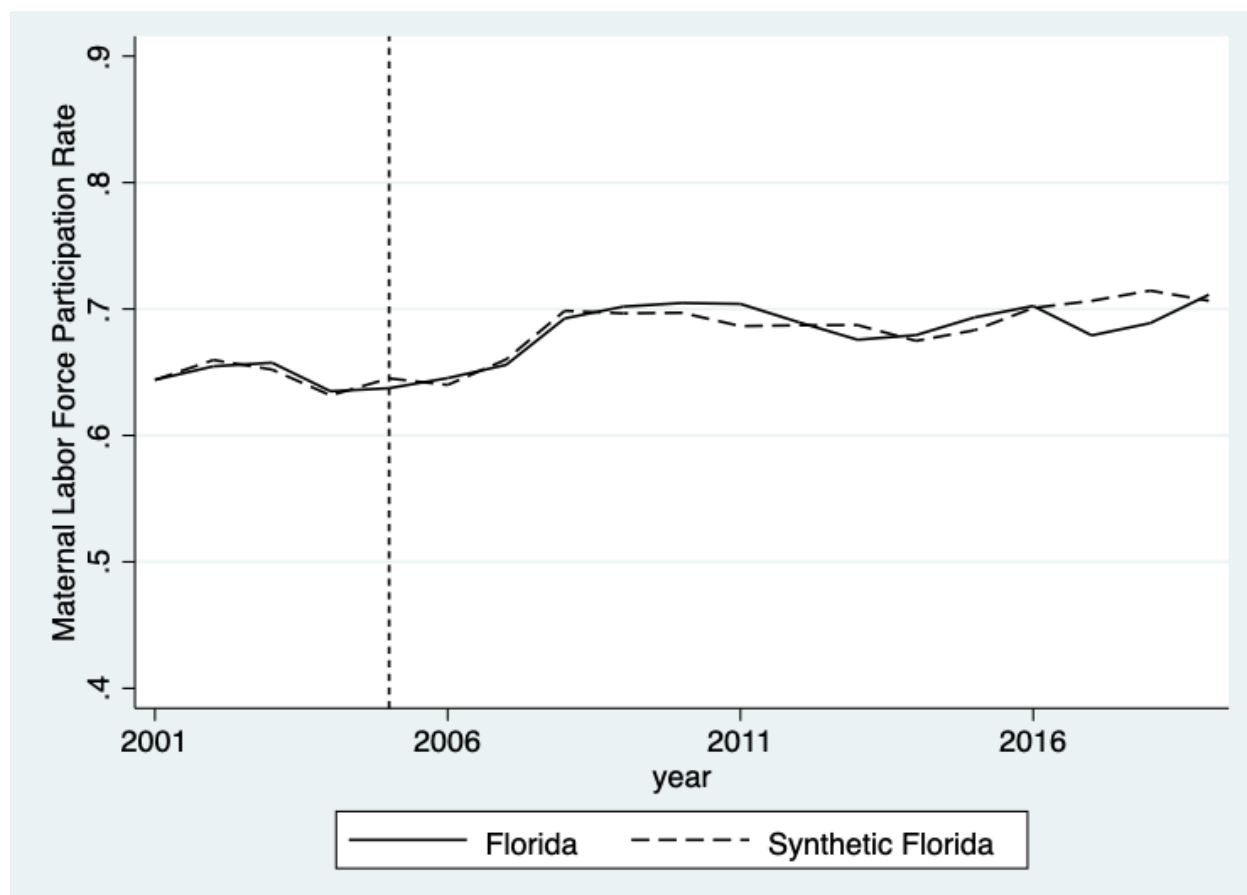
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**Appendix A: Alternate Lags**

One concern I had with my analysis was that selecting individual years to serve as lags for maternal labor force participation may be biasing the results; I have to impose some of my own judgment in selecting which individual years deserve to serve as the lags. I ultimately decided to keep these individual-year lag analyses in the main text of the paper due to the fact that it allows me to select the most relevant years. The alternative, average lags, equally weighs every year in the analysis and forces them all to fall under just one control unit. Further, I had to keep a lag for the maternal labor force participation rate in the year each program went into effect in order to make sure the synthetic and true units were close in the year the program began; thus, 2005 and 2014 were given much more weight than other years. However, I have included the results of using an average lag as well as a lag for just the year each program went into effect below in order to show the differences this approach produces in results. The additional lag of the year the policy went into effect was necessary to make sure that the control and treatment unit matched closely just before the treatment period.

**Florida**

Altering my analysis of Florida to include an average lag of each year in the sample did not change the results in any notable ways; I still find little to no evidence that the universal pre-k policy in Florida had a meaningful impact on maternal labor force participation. Figure 1.A, below, shows the results of the true and synthetic Florida when this control is altered. This control unit is composed of California (25%), Hawaii (6.9%), Maine (13.2%), Mississippi (16.7%), Nevada (9.8%), North Dakota (12%), and Rhode Island (16.4%).



**Figure 1.A: Maternal Labor Force Participation Rate in the Real Versus Synthetic Florida, 2001-2019**

The average value for each control variable once again matches the true Florida data very closely, with the exception of the number of families with preschool-aged children (which was somewhat smaller in the synthetic Florida than in the actual state). Table 1.A below shows the match for the average of each control variable used to construct the synthetic Florida to the true Florida.

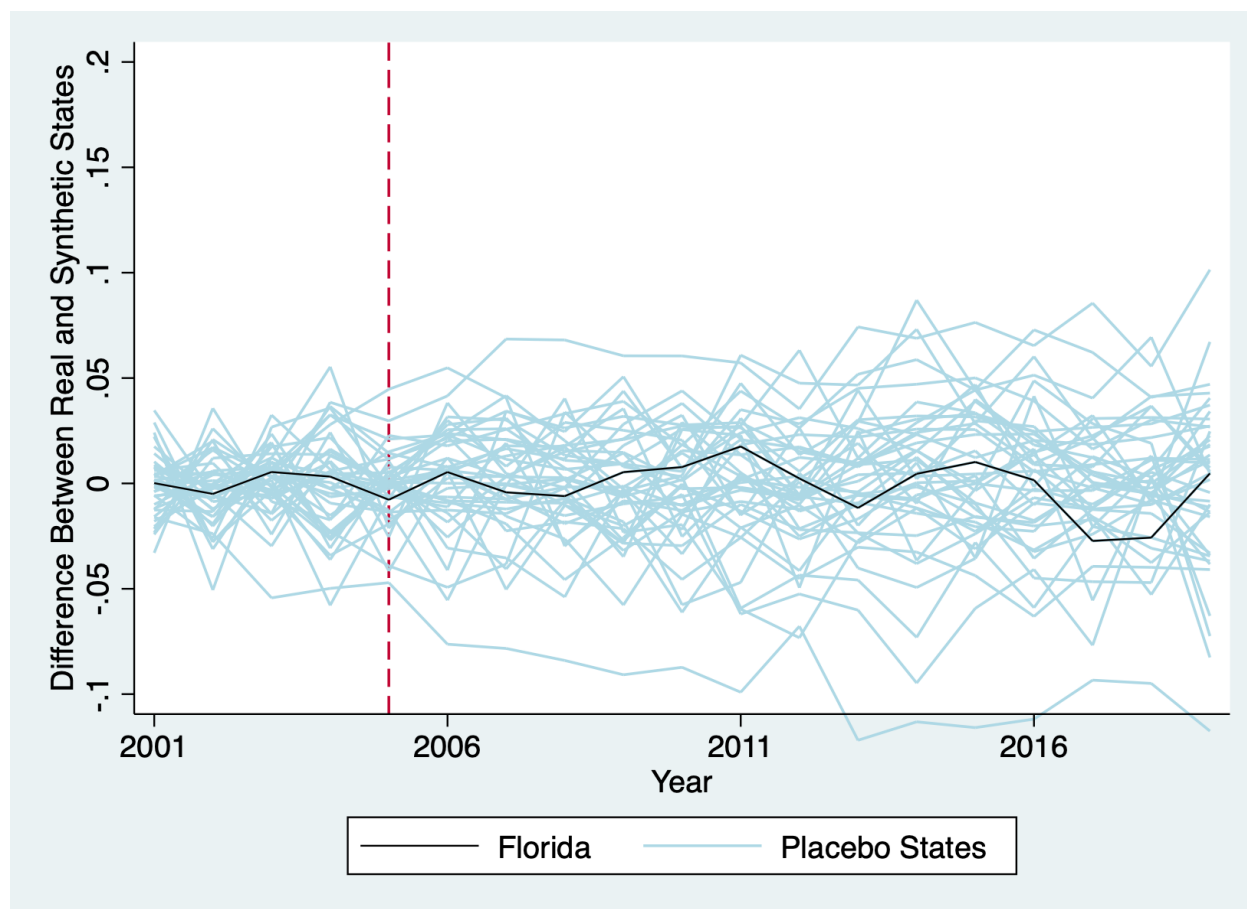


	(1) Treated	(2) Synthetic
Percentage of Mothers Married	0.812	0.823
Percentage of Mothers with Associates degree	0.655	0.657
Percentage of Mothers with Bachelors degree	0.307	0.315
Average Age of Mothers	32.48	32.32
Percentage of Grandparents Living with Grandchildren	0.0184	0.0188
Number of Mothers with Children Under 6	2313	1720.332
Average Maternal LFPR	0.652	0.651
Maternal LFPR in 2005	0.637	0.645

**Table 1.A: Comparison of Control Variables; Real Versus Synthetic Florida**

This control unit also very closely resembles the true Florida data before the policy and continues to match the true Florida for each control variable after the policy. Once again, the control unit does not diverge meaningfully from the true Florida data after the policy was enacted and the two lines intersect many times, suggesting that Florida's policy has not had any significant effect on maternal labor force participation.

The placebo test from Abadie, Diamond, and Hainmueller (2010) further confirms this analysis. Figure 2.A below demonstrates the results of the placebo tests compared to Florida's results.



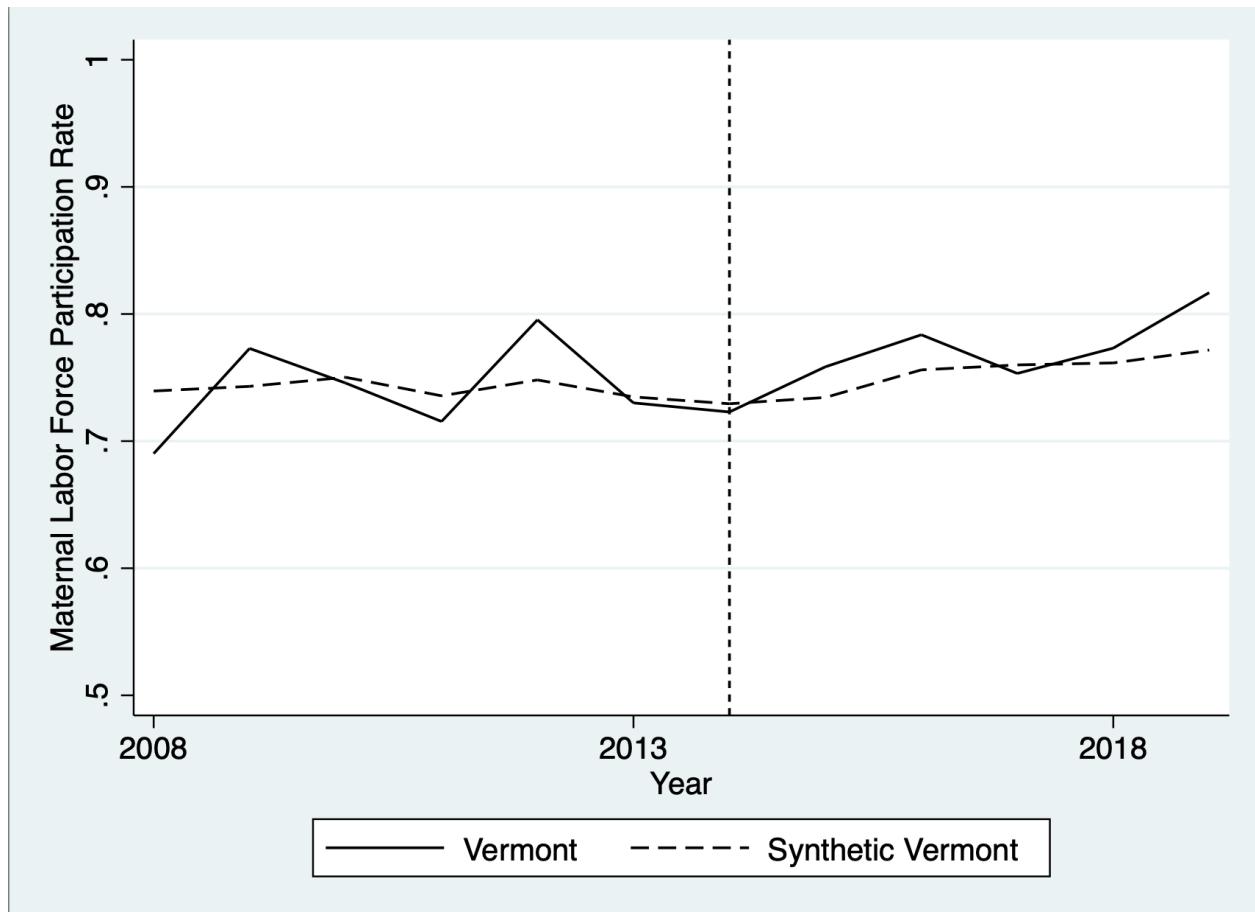
**Figure 2.A: Difference Between Real and Synthetic States; Florida Versus Placebo States, 2001-2019**

This test again adds further evidence to the assertion that the universal preschool program in Florida had no effect on maternal labor force participation. These Florida results similarly fall near the middle of the placebo test results, meaning that if this test were run on the data from any other state as if this state had started a pre-k policy in 2005, a researcher would be likely to come up with a similar change in maternal labor force participation.

### Vermont

Vermont's new results are more difficult to interpret. I find some evidence that the universal preschool policy in Vermont had a meaningful impact on maternal labor force participation, although it is much more difficult than in Florida's case to confirm whether or not

the results are significant. Just as is done in the main text, I keep the additional control of the percentage of each state's vote which was Republican in the 2016 election. Figure 3.A plots the results of Vermont's true maternal labor force participation rate as compared to the synthetic control Vermont. The control unit is constructed from Maine (10.3%), Massachusetts (38.9%), North Dakota (16.3%), and Rhode Island (34.5%).



**Figure 3.A: Maternal Labor Force Participation Rate in the Real Versus Synthetic Vermont, 2008-2019**

Again, this control unit does not fit the pre-treatment data quite as closely as it was possible to achieve with the same controls in Florida due to the smaller sample in Vermont. However, it is a good approximation of the average maternal labor force participation rate in the

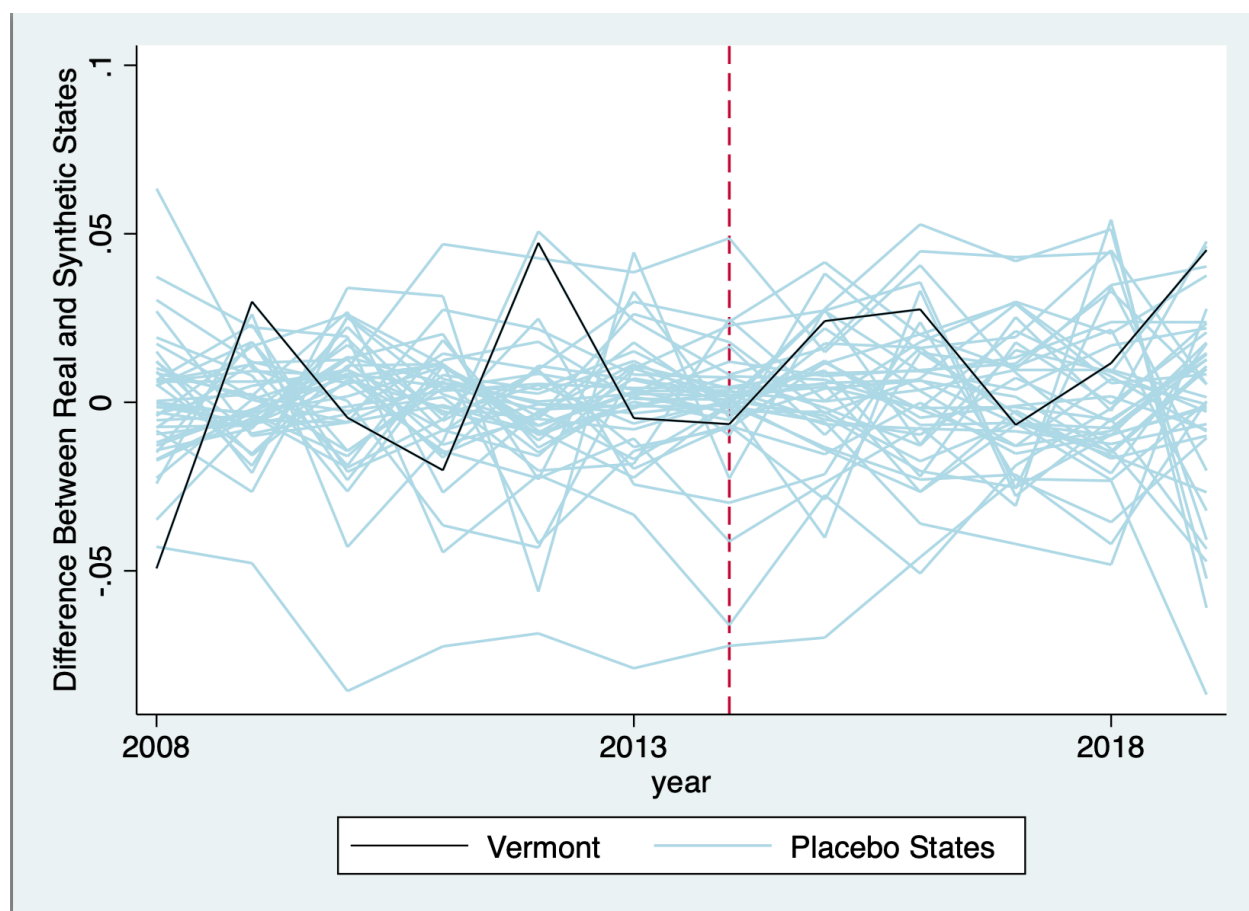
pretreatment period, and closely matches the real Vermont in the year the policy went into effect. In the post-treatment period, the true Vermont's maternal labor force participation rate is greater than the synthetic Vermont for every year except for 2017. Although the true maternal labor force participation dips below the control unit for this one year, it is generally further above the control unit than it was in the pre-treatment period.

Once again, the control data matches very closely to Vermont's real data on all dimensions except for the number of families with preschool-aged children, which is above (rather than below) this time. Additionally, the percentage of Republican votes in the 2016 election control does not match quite as closely as many of the others, although it is a considerable improvement to before this control was being used.

	(1) Treated	(2) Synthetic
Percentage of Mothers Married	0.777	0.760
Percentage of Mothers with Associates degree	0.641	0.651
Percentage of Mothers with Bachelors degree	0.371	0.362
Average Age of Mothers	32.98	33.12
Percentage of Grandparents Living with Grandchildren	0.0073	0.0087
Number of Mothers with Children Under 6	226.5	1353.97
Average Maternal LFPR	0.744	0.743
Maternal LFPR in 2014	0.723	0.730
Percentage of State Voting Republican in 2016	0.370	0.428

Table 2.A: Comparison of Control Variables; Real Versus Synthetic Vermont

The results of the placebo test are similarly difficult to interpret; once again, the 40 remaining states are used as placebos, wherein they also have control units constructed for them and are treated as though they are the state which instituted a universal pre-k policy in 2014. The difference between the real and control states is compiled into a visual aid and displayed in Figure 4.A, shown below.



**Figure 4.A: Difference Between Real and Synthetic States; Vermont Versus Placebo States, 2008-2019**

Thus, although the true Vermont maternal labor force participation rate is not strictly above the synthetic control unit at all times, it is generally greater than the control unit by more than it was in the pre-treatment period. Because the control unit is a stable average that the true

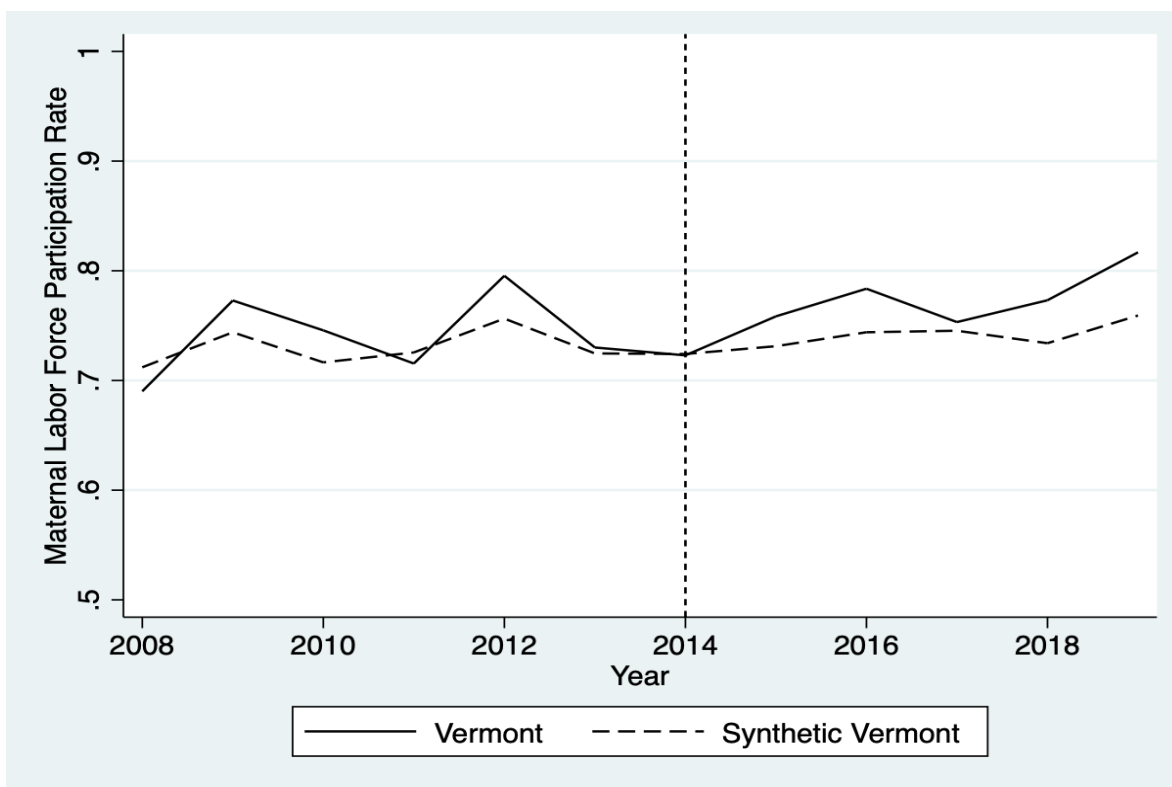
Vermont's data fluctuate around (due to the small sample size), it can be seen as a notable increase in maternal labor force participation that the post-treatment period shows the true Vermont above the control unit for 4 out of the 5 years, and that it is above the control unit by its greatest amount—about 5 percentage points—at the very end of the period of observation (suggesting an increasing trend). Because this pool of mothers includes all mothers with children under the age of 6 (meaning not every mother is impacted by the universal pre-k policy, since only some have the 3-5 year olds who actually qualify for the program), a difference of 5 percentage points from the control unit to the true Vermont data is quite significant. When applying the same p-value calculation as is used in the main text, I do find a p-value of 0.05 for 2019, suggesting that the results, in that year at least, are indeed still significant. Thus, I believe that an analysis of these results wherein the Vermont universal pre-k program is still seen to have had some positive impact on the maternal labor force participation rate is justified.

For the reasons already discussed, I take the main text results to be more representative of the true story. Yet I include this appendix to show that even when the more subjective control variable— the individual year lags—is altered, there are still results which suggest significant increases in Vermont's maternal labor force participation rate after the implementation of Act 166.

## **Appendix B: Controlling for Race**

A major demographic variable that is not included as a control variable in the main body of the text is the racial makeup of mothers in each state. This variable was originally not included because I find no basis for its use in the literature; it appears in this appendix rather than in the main text because it makes almost no changes to the results already presented. I include it here as a robustness check for my previous analysis, and to address comments I received from faculty asking me to use this variable as a control. I performed the test only on Vermont both because I only find significant results in Vermont in the first place (Florida's results have less need for a robustness check), and because of data and time limitations (Florida's data are more difficult to access).

The result of running the model with one additional control variable, “nonwhite” (indicating the percentage of mothers with children under age 6 in each state who are not white), is shown in Figure 1.B below. This synthetic control unit is constructed from 32.3% Connecticut, 51.9% Rhode Island, 15.8% Wyoming (almost identical to the control unit constructed without the nonwhite variable).



**Figure 1.B: Maternal Labor Force Participation Rate in the Real Versus Synthetic Vermont, 2008-2019**

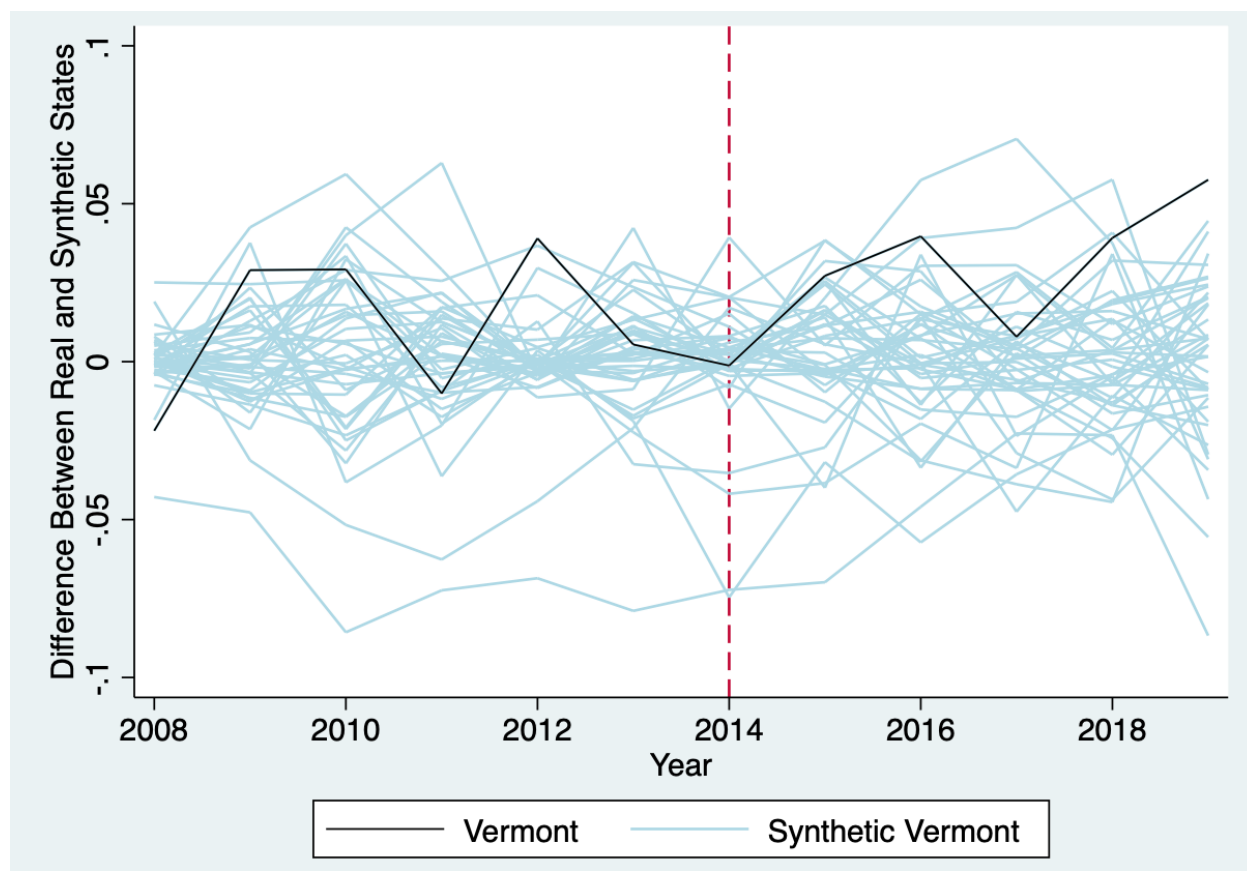
This figure is nearly identical to the figure presented in the main text, due to how similar a synthetic control unit this analysis yields. Additionally, Table 1.B below demonstrates the close fit of the synthetic control data to the data from the true Vermont.



	(1) Treated	(2) Synthetic
Percentage of Mothers Married	0.777	0.743
Percentage of Mothers with Associates degree	0.641	0.635
Percentage of Mothers with Bachelors degree	0.371	0.341
Average Age of Mothers	32.98	32.93
Percentage of Grandparents Living with Grandchildren	0.0073	0.0093
Number of Mothers with Children Under 6	226.5	756.39
Maternal LFPR in 2008	0.690	0.712
Maternal LFPR in 2012	0.795	0.756
Maternal LFPR in 2014	0.723	0.724
Percentage of State Voting Republican in 2016	0.370	0.470
Percent of Mothers Nonwhite	0.249	0.226

**Table 1.B: Comparison of Control Variables; Real Versus Synthetic Vermont**

Finally, Figure 2.B below shows the results of the placebo test, performed now on this synthetic control unit including a race variable. Once again, these results are virtually indistinguishable from those presented in the main text due to the similarity of these two control units.



**Figure 2.B: Difference Between Real and Synthetic States; Vermont Versus Placebo States, 2008-2019**

Analysis for this figure is already provided in the main text, so I do not discuss its significance again here. The addition of the race control is interpreted to have no effect on the predicted outcome of maternal labor force participation in Vermont already presented.