Red States = Red Flags?*

An analysis of birth rate trends from 2001 to 2019 and an exploration of political affiliation of different states and Birth rates in the United States,

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Melissa S. Kearney, Phillip B. Levine, and Luke Pardue in their paper, 'The Puzzle of Falling US Birth Rates since the Great Recession', analyze the decreasing birth rates within the US. In this paper, we repicate use their data and replicate their results of their study. While they focused on examining birth rates by demographics, we focus on minimum wages, education, abortion poilicy, and child support enforcement. The importance of our research is that it highlights the underlying cause of why parents may not to have many children, which leads to a decline in birthrates.

1 Introduction

A country's birth rate is a key determinant of its population growth, which has a profound impact on policy pertaining to education, health, and the economy in general. With changing societal expectations and family dynamics, birth rates across developed countries have seemingly been declining in recent decades. The replacement birth rate is 2.1 births per female, and significant deviations from this figure have consequences that affect countries in several important ways. A high birth rate means that society has to adapt to support a growing population, which places a stress on resources like food and housing. However, a low birth rate means that a society cannot sustain their population and elders may be viewed as "burdens". The contributing factors that drive birth rates vary depending by country. This paper will focus on exploring findings related to declining birth rates in the United States.

Melissa S. Kearney, Phillip B. Levine, and Luke Pardue, analyze potential reasons for a decline in birth rate in their paper, "The Puzzle of Falling US Birth Rates since the Great Recession." In their analysis, examine birth rates by demographic groups defined by age, education, race

*Code and data are available at: https://github.com/RayanAlim/Birth_Rate_Analysis

and ethnicity, marital status, and birth parity in order to find clues that serve as an explanation for the decline. They found factors pointing to the time and location do not serve as enough explanation to the decline in birthrates, although less quantifiable, women shifting their priorities to their aspirations for life instead of having more children is an important contributor. Their analysis does not explore solid evidence of US-specific policies or economic factors that can explain the depth of that decline. We address this gap by replicating their paper and focusing on wages, abortion policies, education and childcare support enforcement data to draw conclusions about whether these factors affect the decline or birth rates.

In this paper, we created a linear regression model to determine the impact of abortion policy on number of birthrates. We analyzed the affects of education on the number of birthrates by tracking the the birthrate for each education level separately. Additionally, to gage the impact of childcare support enforcement on the number of birthrates, we looked at how the maximum welfare benefits, including Medicaid, affect low-income individuals. Analyzing the wages, abortion policies, education, and childcare support important because they give deeper insights regarding why parents may not prefer to have many children and therefore may cause a decline in birthrates. The paper is structured to include the data, results, and the discussion that include our analysis. Although the code used in the original paper is Strata, we use R to replicate some of its graphs, as well as to conduct analysis of our own.

2 Data

2.1 Data Source and Methodology

As part of our study, we looked closely at the variables influencing the decline in US birth rates. Our goal was to expand on and close the gaps left by Melissa S. Kearney, Phillip B. Levine, and Luke Pardue in their paper, "The Puzzle of Falling US Birth Rates since the Great Recession." The interaction between birth rates and childcare costs, healthcare availability, education, political affiliation, and incomes was the main focus of our research. We replicated many of the visuals and analyses from the original paper using R for data visualization and analysis, building on its conclusions through the use of a variety of datasets and approaches. The primary datasets for our study came from a variety of sources, such as the UK Center for Poverty Research National Welfare Database, the annual policy analysis data, and comprehensive birth records from 2001 to 2019. The Center for Poverty Research National Welfare Database [@ukcprWelfareData] at the University of Kentucky supplied more data on state-level laws, minimum wage levels, and political affiliations to supplement these original statistics. The UKCPR National Welfare Data which is a comprehensive dataset that has been compiled and annually updated by the University of Kentucky Center for Poverty Research (UKCPR). This database includes many variables such as population, wage levels, political landscape, dynamics of poverty, employment, and welfare in the United States at the state level. Covering a wide time span from 1980 to 2021, this dataset provides a longitudinal view of significant socio-economic indicators across the country. Building on earlier work by Kearney

and Levine [@Kearney2022Puzzle], state-specific abortion delay law data was updated using the Guttmacher Institute's "Counseling and Waiting Periods for Abortion" database. The Kaiser Family Foundation's "Status of State Medicaid Expansion Decisions: Interactive Map" (KFF 2021) and a collection of birth statistics were the sources of information on Medicaid expansions. The methods used to gather the data made it possible to analyze state-level policies that potentially affect US birth rates in detail between 2001 and 2019. Through the integration of publicly accessible datasets and meticulously curated policy variables, our study offered a comprehensive understanding of the diverse factors influencing the fluctuations in US birth rates.

2.2 Variables and Summary Statisitcs

With an emphasis on the years 2001 to 2019, we created and improved a collection of variables which are needed for studying the decrease in birth rates throughout the United States. Our results are stronger because we were able to record the short-term impacts of various different socioeconomic determinants on birth rates during this time. The development of important variables, their importance, storage formats, and the interactions between them are described in detail below. Graphs, summary statistics, and comments are used to provide context.

The first main variable of interest is the delay variable which looks at the Abortion Policy Delay. This binary variable indicated whether or not a stated has implemented a delay in abortion policy. Our Difference-in-Differences (DiD) analysis relied on this variable to evaluate the policy's effect on birth rates. Secondly relative_births was created to determine the relative birth rates of each state by population in order to provide a common metric for comparing birth rates among states with different population sizes. This variable was created by combining birth statistics with population estimates. State Minimum Wage (min_wage) indicates the minimum wage for each state in a certain year. The purpose of including this economic variable in the study of the correlation between birth rates and salary levels was to test the hypothesis that family planning choices could be influenced by greater salaries. Healthcare Access (healthcare_access): An integer-based composite index based on the availability of healthcare facilities and the expansion of Medicaid. This variable sought to measure the ease of access to healthcare services, as this could have an effect on birth rates by affecting the availability of prenatal and postnatal care. Next, the variable childcare_exp quantified whether or not parents received any support for their childcare expenses. Considering the substantial expenses linked to childrearing, this variable was essential to comprehending the financial influences on decisions about family size.

High-level cleaning included resolving missing numbers, guaranteeing consistency across datasets, and filtering data to the years 2001-2019. Harmonizing variables such as state_name made proper merging possible. To aid in analysis, numerical variables were inspected for anomalies and, if required, normalized.

Visual insights into the effects of abortion policy delays and economic factors on birth rates were provided via graphs showing the trend in relative birth rates over time, by state, and by policy status. A summary of the distribution and dispersion of the data was given via summary statistics. For example, the distribution of min_wage brought attention to economic inequities, while the average relative birth rate and its standard deviation showed variances between states and years.

The associations between the important variables were shown using scatter plots and correlation analysis. For example, the relationship between min salary and relative births was investigated in order to comprehend the impact of the economy on family planning choices.

2.3 Measurements

These datasets have several limitations even if they are quite useful for our research. Firstly, reporting variations in birth rates can occur between states and over time. These disparities could be the result of delayed data entry, modifications to reporting requirements, or variations in data collection techniques. These discrepancies could distort the birth rate estimates, causing an overestimation or underestimating in particular states.

Secondly, although the policy data is extensive, it might not fully account for all state-level programs that have the potential to affect birth rates. In addition, they do not give insight into variations within the policy. Birth trends may also be significantly influenced by policies that are not covered by the dataset, such as regional healthcare access initiatives or educational initiatives, but these factors are not taken into consideration in our research. To address these limitations, we used several strategies. To confirm the trends found and guarantee consistency across sources, we cross-referenced our primary data sources with supplementary datasets and research. Next, in order to determine the potential impact of data mistakes, we performed sensitivity analysis. We evaluated the robustness of our findings to differences in data quality by correcting for any under- or over reporting in birth data.

3 Results:

3.1 Model

As part of the investigation, the researchers investigated the impact of the abortion policy delay on relative number of births per 1000 people using a Difference-in-Differences approach. This was done to compare the change in outcomes over time for the policy between a treatment group and a control group. In this paper, we looked at the effect of the abortion delay policy implementation in North Carolina in 2011. The control group of choice was Tennesse as this state did not implement an abortion delay policy during the years 2001 - 2019. Tennesse was also selected as the control group due to its geographical proximity to North Carolina and

demographic similarities. This was done to satisfy the parallel trends assumption. The model employed is as follows:

[Relative Birthsit = $\beta_0 + \beta_1(\text{Treatment}_i) + \beta_2(\text{PostPolicy}_t) + \beta_3(\text{Treatment} \times \text{PostPolicy}t) + \varepsilon it$]

3.1.1 Model set-up

Where:

- Relative $\text{Births}_{\text{it}}$ is the number of births per 1000 people in state i at time t
- $Treatment_i$ is an indicator for weather state i is NC
- $PostPolicy_t$ is an indicator for years after the policy change
- $Treatment_i$ x $PostPolicy_t$ is the interaction term

3.2 Birth Rate Results

3.2.1 State-Specific Birth Averages (2001-2019):

Figure 1 presents a summary of the average number of scaled births by state over the years 2001 to 2109. Generally, it can be seen that certain states exhibit higher average number of births, while others, usually smaller states, exhibit lower number of births. The three states with the highest averages of births are California (CA), Texas (TX) and New York (NY).

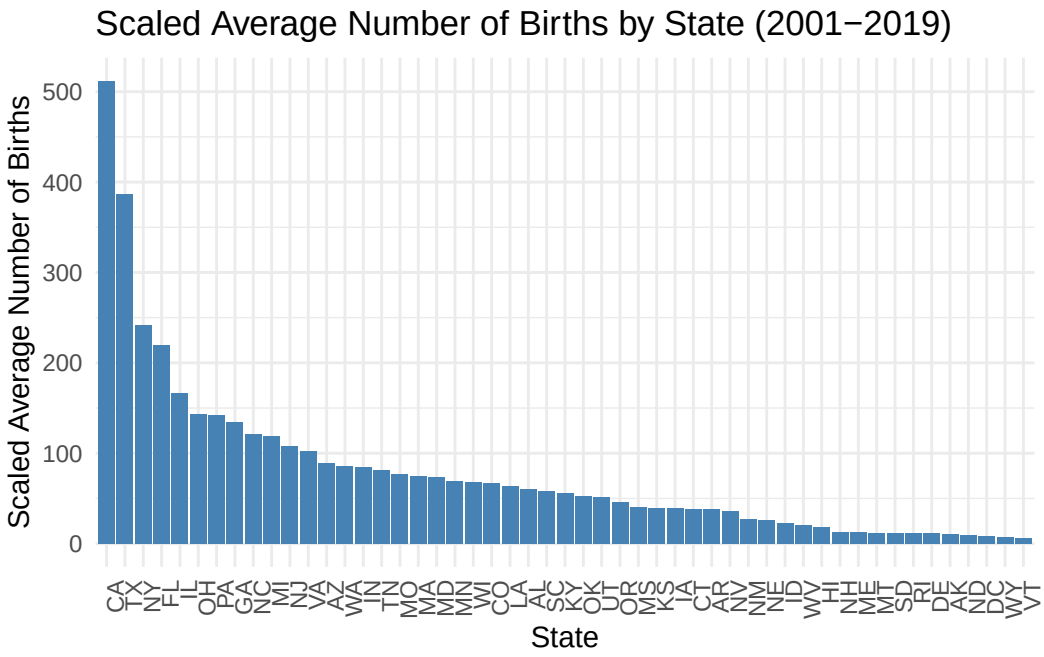

Figure 1

3.3 State Minimum Wage Changes (2001-2019):

Figure 2 shows the trend of the average minimum wage across states depicted by the blue line and the average number of births represented by the red line, between the years 2001 to 2009. The trend for average minimum wage shows a noticeable increase over time. In contrast, the average number of births shows a fluctuating trend. Starting from 2001, the number of births gradually increase, with a peak occurring around 2007. After this peak, there is a discernible decline in the average number of births.

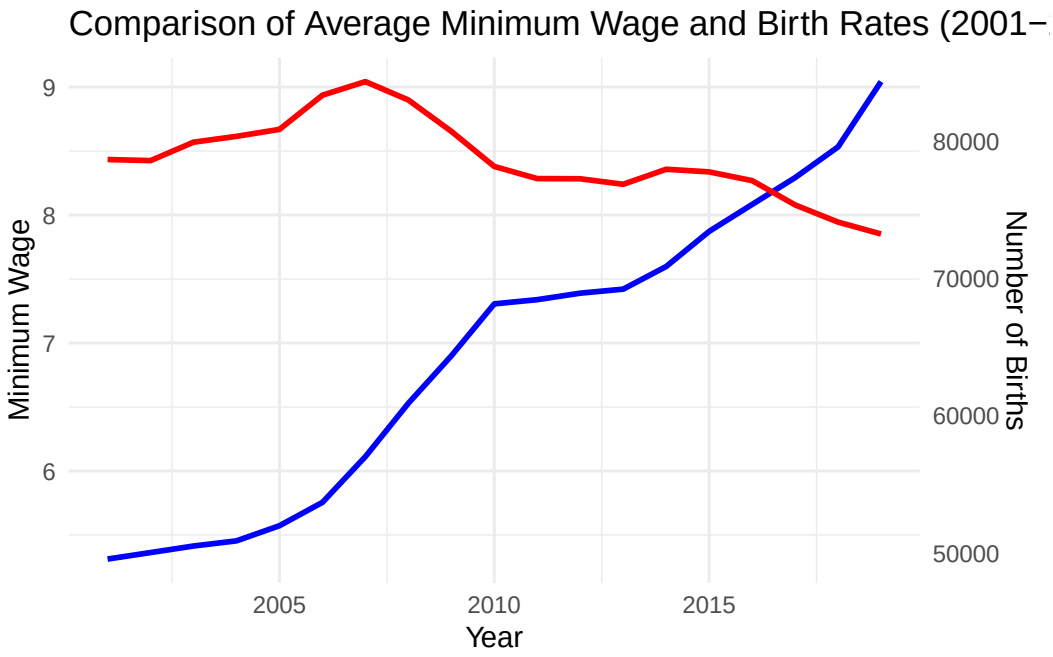

Figure 2

3.4 Impact of Abortion Delay Policy

Abortion delay policies refer to state-level regulations which stipulate a required waiting period between a woman's initial consultation for an abortion and the procedure itself. This paper looks at states which have consistently implemented an abortion delay policy, those without this policy and those which have shifted from having no delay to have a delay policy between the years 2001 to 2019.

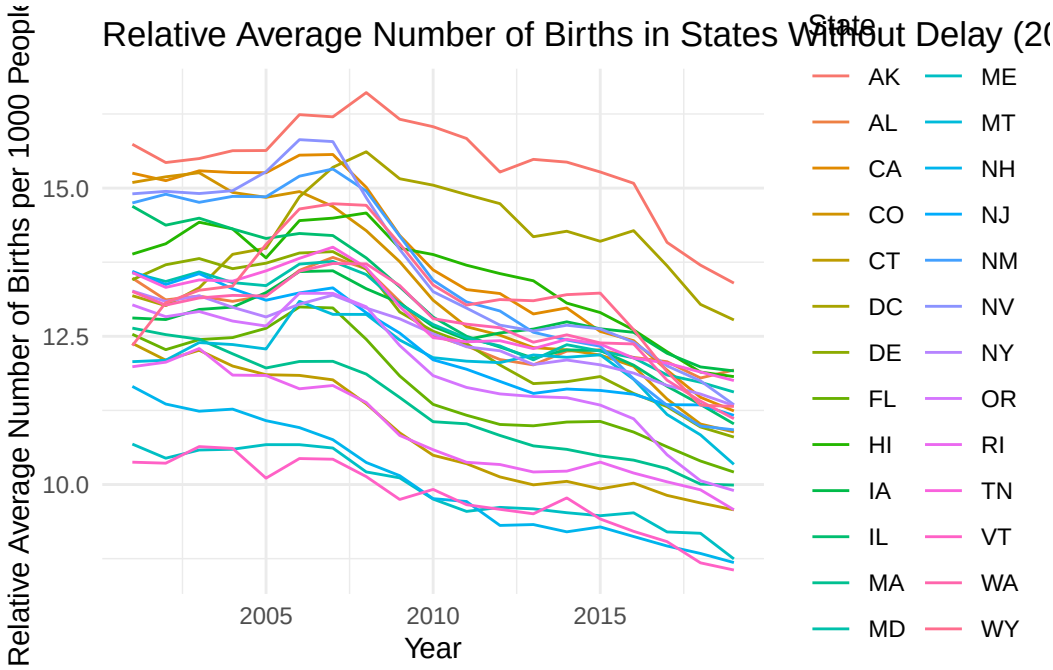

Figure 3

Across the 19-year span, the data for states which have not implemented an abortion policy showcases a wide range of trends. Several states demonstrate a peak in birth rates at various points during the study period. While there is variation between the states, the overall trajectory indicated that the early to late 2000s were a period of higher birth rates, with a shift toward lower birth rates post 2010. It is important to note that this data in Figure 3 showcases the relative average number of births per 1000 people and fluctuates from 10 to approximately 16.

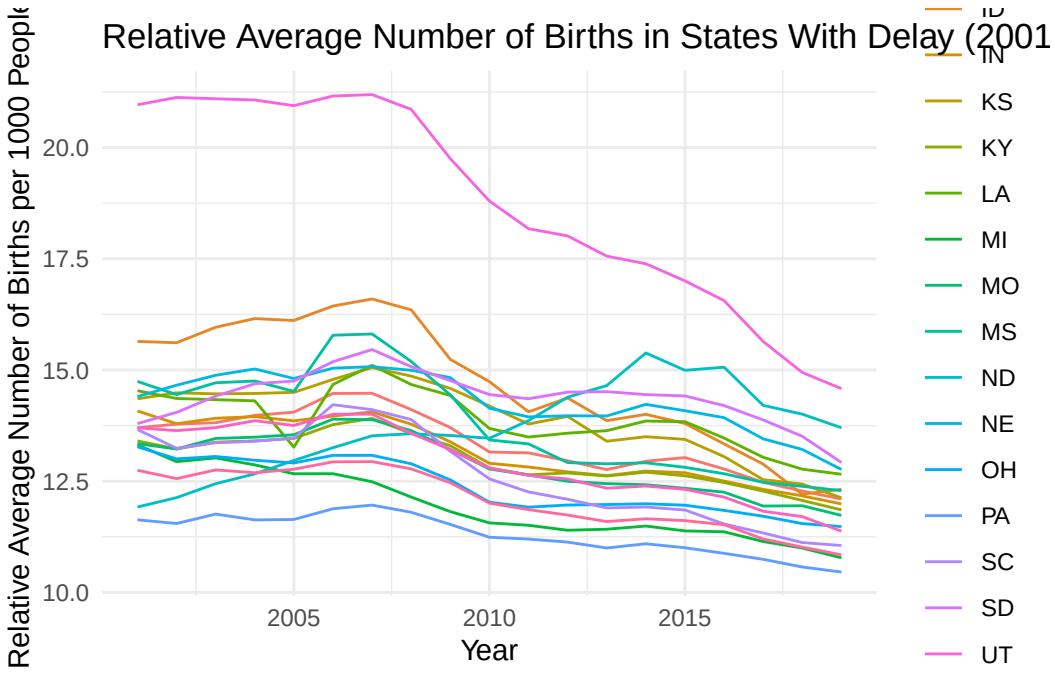

Figure 4

In contrast, figure 4 looks at the trend of relative average number of births which have consistently implemented a delay policy. Similar to states which have not implemented a delay policy, birth rates for these states have generally decreased over the 19 year period. Over this period, the relative average number of births per 1000 people fluctuated significantly, ranging from around 10 to over 20.

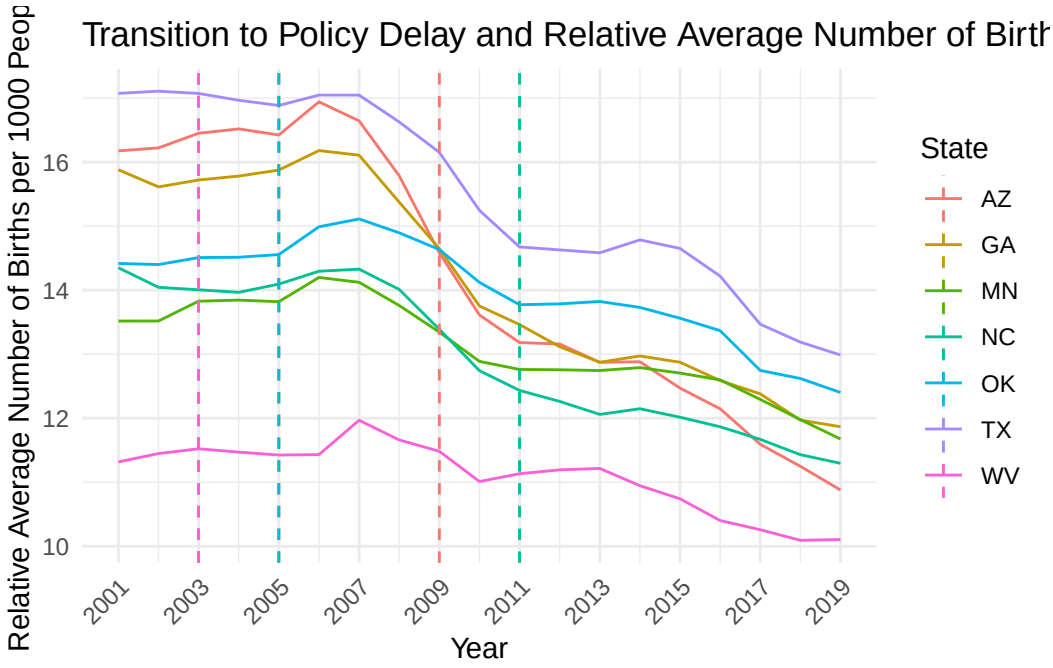

Figure 5

Lastly, figure 5 looks at states which transitioned from having no abortion delay to policy to implementing this policy at various years (indicated by the broken lines). A common trend among these states was an initial period of relatively higher birth rates in the early 2000s, with subsequent declines over the years. This trend also closely follows what observed for states which implemented an abortion delay policy and those which have not implemented such a policy.

3.4.1 Difference-in-Difference

	Estimate	Std..Error
(Intercept)	13.4344573	0.1372185
treatment	0.4887454	0.2090798
post_policy	-1.2372245	0.1608483
treatment_x_post	-0.7770001	0.2583045

These abortion delay policies created natural experiments which can be used to apply a Difference-in-Differences approach. The results from comparing North Carolina (treatment) with Tennessee (control) are as follow: - The intercept (B_0) estimate is 13.4345, suggesting

that the baseline relative number of births per 1000 people is 13.4345 in the absence of treatment and before the policy change. - The treatment effect (B_1) is estimated at 0.4887, which is statistically significant (p = 0.01078). This indicates that, prior to the policy change, NC had 0.4887 more births per 1000 people than TN. - The post_policy effect (B_2) is -1.2372, also statistically significant (p = 1.26e-07), suggesting a general decrease in relative births per 1000 people after 2011 in both states. - The interaction term (B_3), which represents the estimated effect of the policy change, is -0.7770, with a p-value of 0.00569, indicating that the policy delay in NC is associated with a reduction of 0.7770 births per 1000 people relative to TN after the policy implementation. - The model explains a significant portion of the variance in relative births per 1000 people ($R2 = 0.8267$), indicating a good fit.

3.5 Education

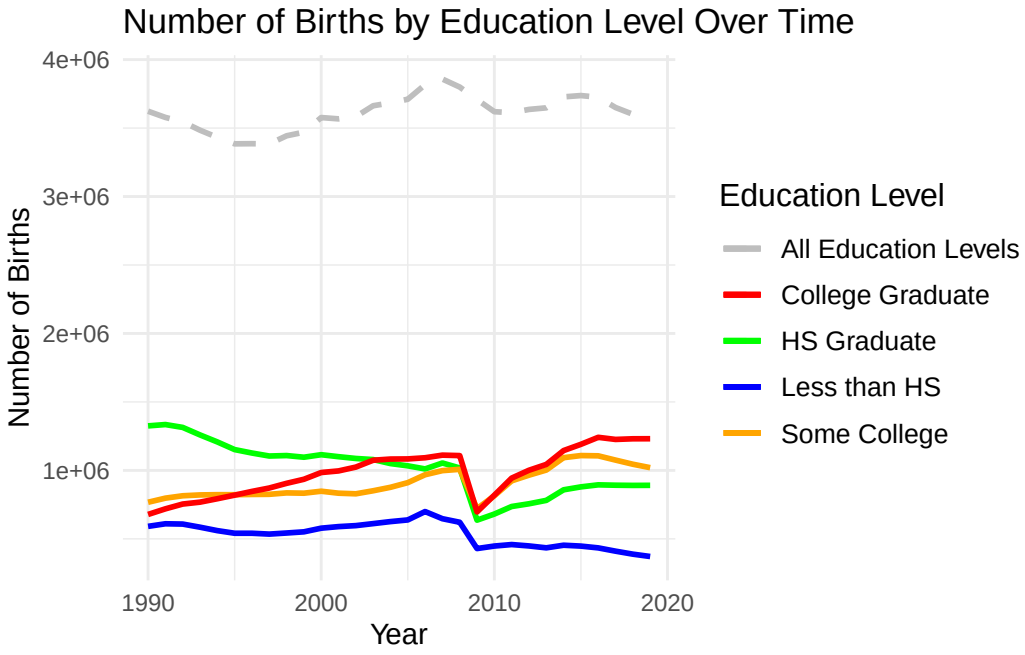

Figure 6

TODO: Results description for Education

3.5.1 State Political Affiliation and Birth Rates

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Warning: One or more parsing issues, call `problems()` on your data frame for details,
e.g.:
```

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  dat <- vroom(...)
  problems(dat)
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Warning: Removed 1 rows containing missing values (`geom_text()`).
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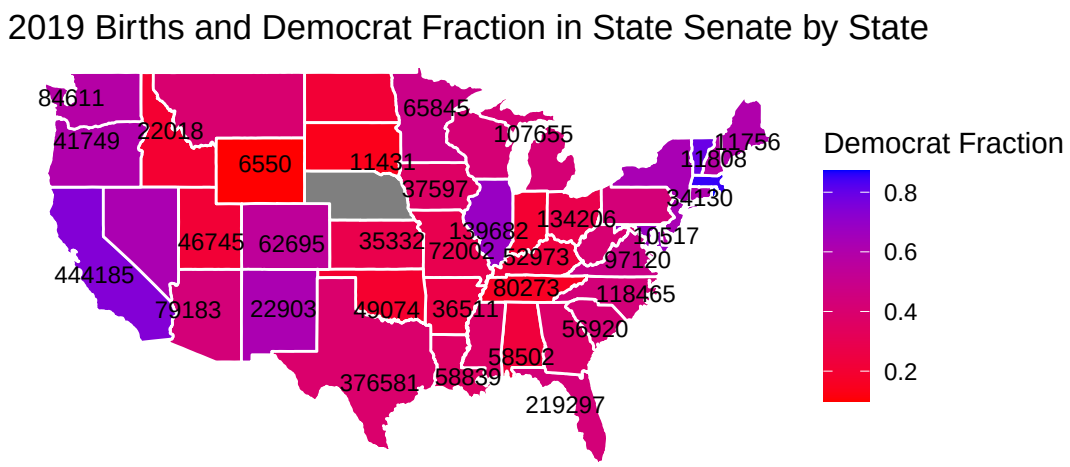


Figure 7

TODO: Results description for Political Affiliation

3.6 Child Support Enforcement

The number of people with ACA Medicaid increased dramatically from 2000 to about 2014. As figure 8 depicts, since 2014, the number of people with Medicaid has slowly increased non-decreasingly till 2020. The ACA Medicaid expansion has been adopted and implemented by states at different times, which explains some of the dramatic increases within the data.

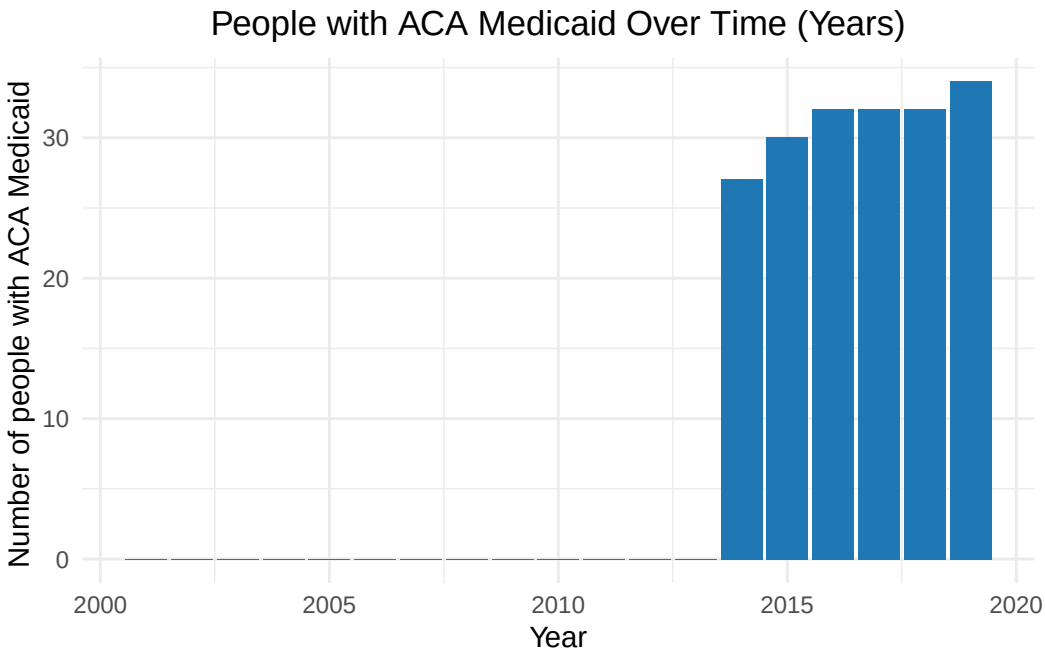


Figure 8: Expansion of Medicaid from 2000 to 2020

In Figure 9, there has been a linear decrease of the maximum welfare benefits from 2000 to 2015. From 2015 to 2020 there has been a small rise in the maximum welfare benefits. Overall, there has been a loss in the maximum welfare benefits, despite the small rise.

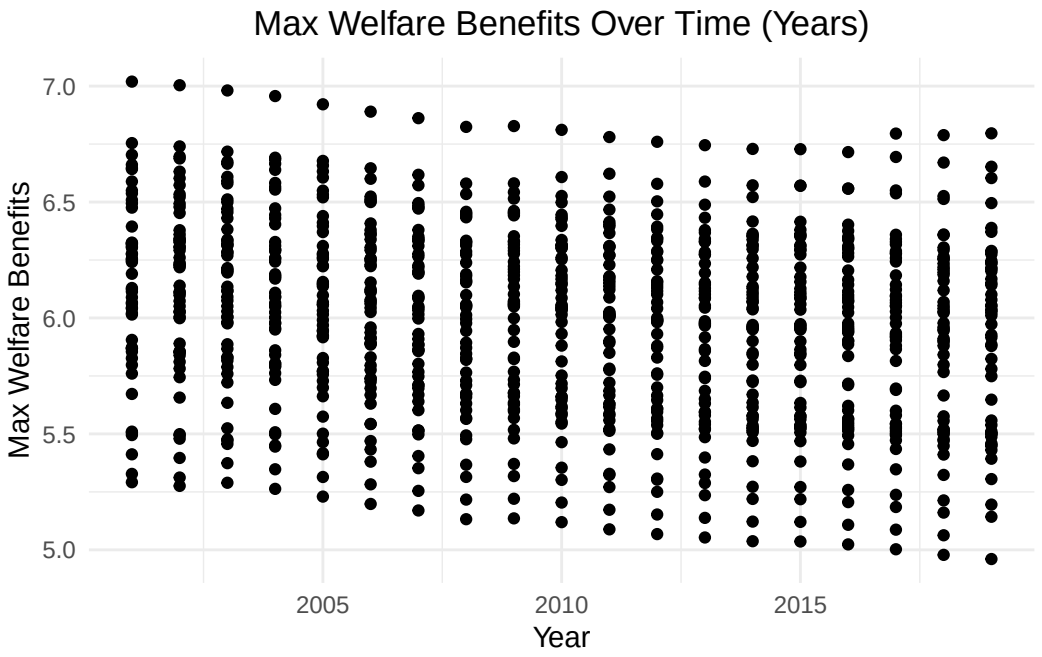
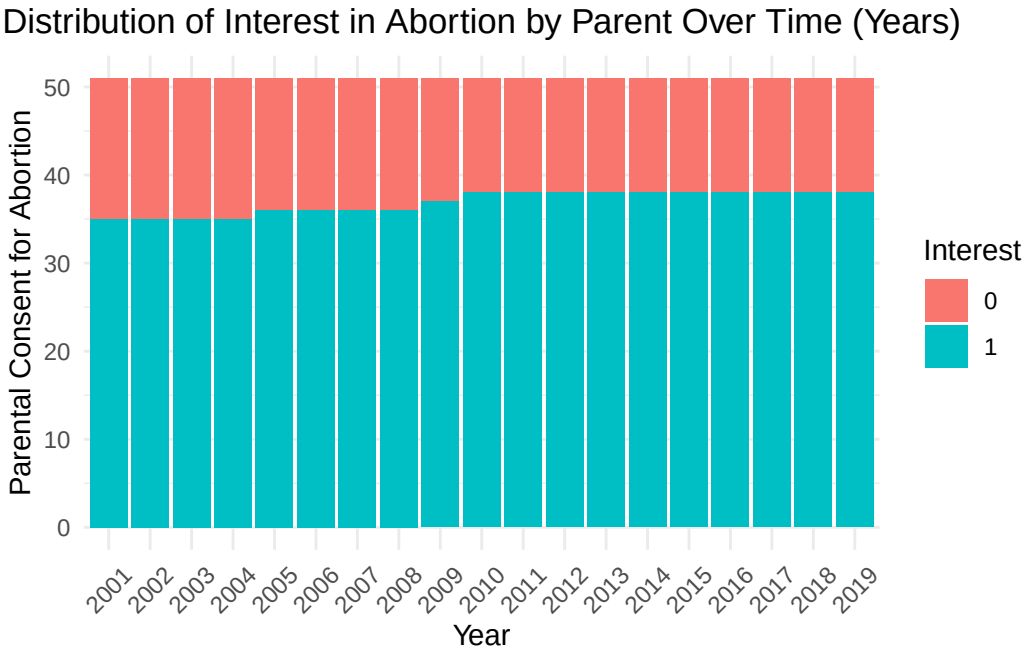


Figure 9

In Figure 10, the blue portion of each column represents the number of parents who have consent for an abortion. The red portion represents the number of parents who don't have consent for an abortion. There is a slight increase in consent for abortion from 2001 to 2019.



4 Discussion:

4.1 Abortion Policy

Through the difference-in-difference analysis, the results indicate a decrease of approximately 0.777 births per 1000 people in North Carolina post policy implementation relative to TN, which did not implement the abortion delay policy. This decrease is statistically significant, suggesting that implementing an abortion delay policy may have a real effect on birth rates.

The observed decrease in birth rates in North Carolina post 2011 could be partially explained by increased barriers to access as highlighted by de Londras et al. whose review supports the results derived in this paper. This review summarizes the effects of mandated waiting periods (MWPs) on outcomes connected to abortion. Their analysis suggests that MWPs may cause delays in obtaining abortion services, which may lower the number of births particularly in young, unmarried women. Noting the disproportionate impact on marginalized populations, such as teenagers, persons of color, and those with lower socioeconomic standing, they also draw attention to the broader human rights concerns of MWPs.

The results of the DiD found in this paper are supported by strong standard errors. However, we need to consider the limitations of the DiD approach as there are several other factors which may impact birth rates such as economic fluctuations and access to healthcare. Future

iterations of this paper could expand on this research by conducting multi-state analysis for a variety of confounding factors.

4.2 Second discussion: Political affiliation and birth rates

From our analysis of political affiliations over the years, there are some relation between the two, especially in years following aggresive rhetorics or policies about reproductive rights. This indicates that periods following aggressive political rhetoric or significant policy changes regarding reproductive rights often coincide with noticeable changes in birth rates. This trend is observable across various states and is particularly pronounced in areas where political affiliation (# of democrats in state senate) change very differently from one side to the other. The rhetoric employed by political leaders and the nature of the policies they implement can have a substantial impact on individuals' choices regarding family planning. For instance, policies that limit access to reproductive healthcare, including contraception and abortion services, can lead to an increase in birth rates, especially in regions where alternative options are scarce.[@Nargund2009DecliningBirthRate]

Conversely, political movements that advocate for and expand access to reproductive healthcare are often associated with a stabilization or decrease in birth rates. This can be attributed to increased autonomy over reproductive choices, allowing individuals to make informed decisions about if and when to have children.

4.3 Education

4.4 Child Support Enforcement

(ACA)'s Medicaid is "intended to address systemic health inequalities for millions of Americans who lack health insurance" Medicaid is "expected to provide coverage to low-income individuals," and also covers low-income pregnant women. Excluding the states where abortion is banned, Medicaid covers abortions, making it more accessible. According to Figure C1, More people continue to have medicaid as seen based on the trend from 2000 to 2020, making an affordable abortion more accessible. In Figure C3, we can see that there is an increase in parental consent for abortion. In other words, more parents are increasingly interested in getting an abortion every year. A potential motivator for parents to want an abortion is that as a low-income family, it is harder to take care of a larger family. Welfare is "federal government-sponsored assistance programs for individuals and families in need." In Figure C2, it is evident that there is a decrease in maximum welfare benefits, making it less affordable for lower-income families to have a larger family size.The increasing demand for an abortion and the insurance covering it may contribute to a decline in birthrates.

4.5 4.2 Weakness and Next Steps

A weakness of this paper is a lack of economical context. For example, we analyze our data independent of events like the Recession that happened in 2008. Without providing context to current events in the time period, our paper gives a weaker justification for the decline in birthrates. Next steps for improving our analysis include not only providing context for the events happening in the US, but focusing on the birth rates on a more micro level. Since each state within the US has its own laws, it will provide more insight to focus on the birth rates within each state. Additionally, to improve our analysis furthermore, we can compare the US to other countries that are similar from an economical standpoint and compare their birth rate to the US.

5 References