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How Does the Modification of Maternity Leave Policies in Universities Impact the Birth Rate of the County?

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Abstract: *A survey published by United Nations' International Labor Organization in May 2014 showed that, among the 185 countries surveyed, America and Papua New Guinea were the only two countries that did not offer paid maternity leave. By July 2014, the states that offer paid maternity leave include California, Hawaii, New Jersey, New York, and Rhode Island. Whether paid or not, maternal leave policies are directly related to women's decisions regarding when and how often to have children, as well as their employment choices. Given this importance, in 1993, the United States's government passed the Family and Medical Leave Act to mandate maternity and parental leave. This study focuses on the correlation between maternity leave policies in universities and the birth rates of counties in which they are located. Data was collected from seventeen universities and counties before and after the maternity leave policy was implemented. Through running mathematical regression models, the results show that additional modification to maternity leave policies actually has a negative correlation with the birth rates. A more generous maternity leave policy does not necessarily change the birth rate's status quo.With this result being discovered, the study can promote suggestions regarding the policies and further investigations based on the subject.*

Keywords: *Maternity leaves, FMLA, Birth rate, University policies.*

1. Introduction

In May 2014, the United Nations' International Labor Organization published a survey, showing that among the 185 surveyed countries only two of them do not offer paid maternity leave: America and Papua New Guinea. Inside America, there were only five states offering paid maternity leave in July 2014: California, Hawaii, New Jersey, New York, and Rhode Island.

Parental leave policy is a significant factor that parents consider when deciding whether and when to have a baby. Hence,this study focus on the primary federal policy setting restrictions for maternity leave policies and how it affects birth rate of a county in America. Among other effects, formal leave programs have been shown to have an impact on the mental health of mothers after giving birth, as well as their choice to re-enter the labor force, and in what capacity. Previous research, using a sample of 570 women (Hyde, 1995) [1], analyzed their mental health and finds that maternity leave programs have a greater impact on the mental health of full-time working mothers than on part-time mothers and housewives. Moreover, in a similar research that compares the mental depressive scale of women working with a more generous maternity policy and a less generous policy (Avendano, Berkman, Brugiavini, Pasini, 2015) [2], they find-that a more generous maternity leave policy reduces the mental depressive scale by 0.38 unit. Additionally, in a study based on children born before and after a change in maternity leave (Dustmann, Christian, and Uta Schönberg, 2012) [3], concludes that mothers' return to work behavior after childbirth increases.

Despite these benefits to families and to the overall labor market, the United States still ranks at the bottom among countries around the world in family maternity leave policies. Given the relative wealth and income of the United States, the cost of maternity leave policies seem unlikely to be the reason for their absence. For example, in a study that focuses on a series of government-funded policy reforms in Norway, (Dahl, Løken, Mogstad, and Salvanes, 2016) [4] finds that the cost for government-funded maternity leave amounts to only 0.25% of GDP – an amount that Dahl, et al. argued is a substantial burden on taxpayers. Other than the purely financial effects, the maternity leave policy, should at the most basic level, impact birth rates. (Averett and Whittington, 2001) [5] for example, using data from the National Longitudinal Survey of Youth, they argue that an increase in birth rates raises participation

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in the labor market, as well as domestic consumption.

Hence,this study focus on the primary federal policy setting restrictions for maternity leave policies. The Family and Medical Leave Act (FMLA) of 1993 protects the jobs of workers who need to take a leave of absence and provides them with up to 12 weeks of unpaid leave. The policy is implemented to all institutions over 50 employees, but the institutions have their freedom to adjust the policy. To get a better idea of how such policies impact family choices, this work studies a panel of Universities across the United States and investigate the effect of additional modification to the FMLA. Among the seventeen universities included in this work, 10 of them implement the FMLA, while the remaining seven universities add to the policy. The study focuses on whether an additional adjustment to FMLA, typically ones that include paid maternity leave, have an impact on birthrates.

Universities were focused as a special case for several reasons. First, University towns were used as an identification strategy to answer the question of how maternity leave policies impacted birthrates. Clearly many factors simultaneously impact the overall birthrate in the United States over time. By using universities that modified the FMLA, and universities that did not, in addition to differences between birth rates in the county where the university is based, before and after the implementation of the policy, this study estimates the impact on birthrates of the policy cleanly. Second, universities generally post their policies on their web pages, thus simplifying data collection. Third, given that the smallest administrative region that publishes official birthrate data is at the county-level, counties were chose where the university population was a non-trivial portion of the overall county population. Combined, these sampling choices give some hope to the study that it can measure the effects of maternity leave policies on birthrates. Maternity leave and birth rates are siginificant contributions to a woman's birth plan. A correlation between the policies and the birth rate can serve as a foundation for relevant reactions or behaviors regarding the topic.

In the work, the study summarizes the theoretical framework that provides the basis for the empirical study, as well as the hypotheses in the next section to show the overall methodology. Next, data was described, in section III. Univariate regression model were presented in section IV, and results were analyzed and concluded in section V, which is very different from previous literature and the hypothesis.

2. Theoretical Framework and Hypothesis

Based on previous literature, it is reasonable that additional paid maternity leave policies in universities will have a positive impact on the birth rate of the corresponding county. This hypothesis is based on the observation: maternity leave lowers the cost of birth whether it is paid or unpaid, and the decrease in the cost of childbirth should increase the fertility rate (e.g., Hoem & Walker 1991) [6]. The decrease in the cost of birth will increase parents' willingness to have children, thus increasing the birth rate in the county. This study was not able to focus on firms due to privacy policies. However, this study focuses on universities and that sets the study apart from previous literature.

Previous research by Averett and Whittington (2001) [5] , used this model for the probability of birth:

$$M_i = M(D_i, Z, P_i;\ u_i)$$

Where (M_i) represents the function of the probability of birth; D_i represents the desired fertility; Z represents the economic and social conditions in the area; P represents the vector of personal characteristics.

However, instead of the probability of birth, the study focuses on the impact of university policy on the birthrate of the entire county. Therefore, to ensure the level of influence of the university to the entire county, the population ratio of universities' enrollment to the counties' population in 2017 were calculated. After including the faculty's population by doubling the enrollment value, the ratio of universities' population to the counties' population will exceed around 35%, showing the significance of the universities. Some of the universities in this range are called university towns, which is a community composed of a university or several universities and the surrounding service industries. Assumption were made that the paid maternity leave will also increase mothers' local spending, thus stimulating the local economy which may impact the county's birthrate. However, the increase in spending does not limit to local businesses, so its effect is hard to measure.

The model includes one independent variable and several control variables:

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$$Y_{it} = \alpha_i * Policy + \beta_1 * University + \beta_2 * Time + \beta_3 * Unemployment\ rate + \beta_4 * Population + \varepsilon_t$$

Where Policy represents the dummy variable of whether the university has modified additional policy; Time represents the time elapse to exclude other possible changes regarding the birth rate during the chosen time period; Unemployment rate excludes the possible effect to the birth rate by the change in unemployment; Population represents the different population of counties included in the sample to exclude the possible effect by counties' different sizes.

3. Data and Estimation Strategies

The independent variable is whether the university has an additional modification to FMLA (the required twelve weeks of unpaid leave), defined as:

$$P = \begin{cases} 1, & \text{If the university has additional modification to FMLA} \\ 0, & \text{If the university has no additional modification to FMLA} \end{cases}$$

The independent variable "additional policy" is a dummy variable, and since universities have different modifications to FMLA, the independent variable cannot be counted as a continuous variable. However, a transformation on the data were not implemented since this study includes a binary variable that has two outcomes only, so adding a log transformation may change the result.

Table 1 University population and ratio to the county population [7-9]

NO.	**Institution**	**Zip codes**	**Number of students**	**County**	**County population in 2017**	**Ratio of Population**
1	Washington State University	99164	30,614	Whitman County, WA	49,365	62.0156%
2	Ohio State University	43210	59,837	Franklin County, MO	103330	57.9086%
3	Ohio University	45701	29,369	Athens County, OH	65,563	44.7951%

From the data of the 97 largest universities in the US based on their enrollment number and their corresponding county, the population ratio of the university to the county in 2017 fall were calculated. After ranking the population ratio from high to low, the first 30 universities and their counties were selected. Table 3 shows the three universities with the largest population ratio. The population ratios of the top 30 universities lie between 62.0% (Washington State University) to 16.7% (University of Kansas). However, actual populations are larger than enrollment numbers, indicating the larger significance and wider influence of universities in their corresponding counties.

Table 2 Counties' Birth and Population from 1995 to 2018 (Center for Disease Control, 2018) (Census.gov, 2014)

	7		
University	University of South Carolina at Columbia		
County	Richland County, OH		
	birth	population	birth rate
2003	1604	127826	12.54831
2004	1565	127459	12.27846
2005	1578	126946	12.43048
2006	1630	126398	12.89577
2007	1623	126039	12.87697
2008	1540	125081	12.31202
2009	1544	124490	12.4026
2010	1369	124175	11.02476
2011	1380	123070	11.21313
2012	1442	122588	11.76298
2013	1432	122292	11.70968
2014	1350	121942	11.07084
2015	1434	121707	11.7824
2016	1328	121107	10.96551
2017	1317	120589	10.92139
2018	1353	121099	11.17268

Because the FMLA was passed in 1993, this study aims to analyze the change in the birth rate after

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the implementation. Data for birth and population from 1995 to 2018 was gathered and the birth rates were calculated using the formula: birth/population*1000 in table 2. Four of the counties do not contain any relevant data about birth and population, so they were excluded. For the rest of the sample, five counties only have birth and population recorded since 2003, so the main focus were shifted to 2003 to 2018 to ensure that all of the data lies in the same period. Table 2 presents an example of the county's annual birth rate where the university locates.

4. Regression

Several regressions with different combinations of variables were ran to check the sensitivity of the results to alternative specifications.

4.1 Independent variable and dependent variable only

Table 3 Regression result with the independent variable

Summary output								
Regression Statistics								
Multiple R	0.349223862							
R Square	0.121957305							
Adjusted R Square	0.118705296							
Standard Error	2.463323942							
Observations	272							
ANOVA								
	df	***SS***	***MS***	***F***	***Significance F***			
Regression	1	227.5616148	227.5616148	37.50213138	3.21025E-09			
Residual	270	1638.350508	6.067964845					
Total	271	1865.912123						
	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	12.47401281	0.162426771	76.79776404	1.8243E-185	12.15422877	12.79379685	12.15422877	12.79379685
Whether there is an additional policy	-2.53131033	0.4133495	-6.12389838	3.21025E-09	-3.345108293	-1.71751238	-3.34510829	-1.71751238

From the result of the regression, the R square value is 0.12, and the adjusted R square value is 0.12. R square shows the percentage of data that represent the trend. The higher the R square value is, the more significant the independent variable is to the dependent variable. At the bottom of the table, the p-value is 3.21E-9, smaller than 0.05, and by definition, rejecting the null hypothesis.

Null hypothesis: Additional modification to FMLA has no impact on the birth rate of the county.

Alternative hypothesis: Additional modification to FMLA has an impact on the birth rate of the county.

The y-intercept is 12.47, which means the original birth rate without the impact of the independent variable. The coefficient of the first X variable (whether there is an additional policy) is -2.53, showing a negative effect of X on the birth rate. This means that universities with additional (more favorable) family leave policies, leads to a decrease in the dependent variable (the birth rate) by 2.53.

This is a very surprising result since it shows a negative correlation between the policies and the birth rates, opposite of the original hypothesis. Moreover, it is different from most of the literature, where they defend that paid maternity leave reduces the cost to give birth and therefore increases the

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birth rate. Thus, the result is very important for this research. While most previous researches choose to analyze the effects of policies on the birth rate regarding females in America as a whole, this study focuses on policies specifically in universities. Using variables like psychological effects on females or maternity leave policies in a specific profession as independent variables can generalize the results into a bigger context. Researches like ours that focus on a specific type of institutions –universities- result in a rather exclusive conclusion. However, it is still a comprehensive result regarding the field of policies in universities.

4.2 The independent variable along with the control variables

Table 4 Regression result with the independent variable and four control variables

Summary output								
Regression Statistics								
Multiple R	0.532111							
R Square	0.283142							
Adjusted R Square	0.269667							
Standard Error	2.242441							
Observations	272							
ANOVA								
	df	***SS***	***MS***	***F***	***Significance F***			
Regression	5	528.3177	105.6635	21.01276	1.07E-17			
Residual	266	1337.592	5.028541					
Total	271	1865.91						
	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	15.27058	0.686234	22.25273	1.13E-62	13.91944	16.62173	13.91944	16.62173
year	-0.14015	0.031458	-4.45508	1.24E-05	-0.20209	-0.07821	-0.20209	-0.07821
university	-0.08485	0.021688	-3.91221	0.000116	-0.12755	-0.04215	-0.12755	-0.04215
whether there is an additional policy	-2.59982	0.407121	-6.38585	7.56E-10	-3.40141	-1.79823	-3.40141	-1.79823
unemployment rate	-0.27385	0.068477	-3.9992	8.24E-05	-0.40868	-0.13903	-0.40868	-0.13903
Population	8.19E-06	3.6E-06	2.27624	0.023627	1.11E-06	1.53E-05	1.11E-06	1.53E-05

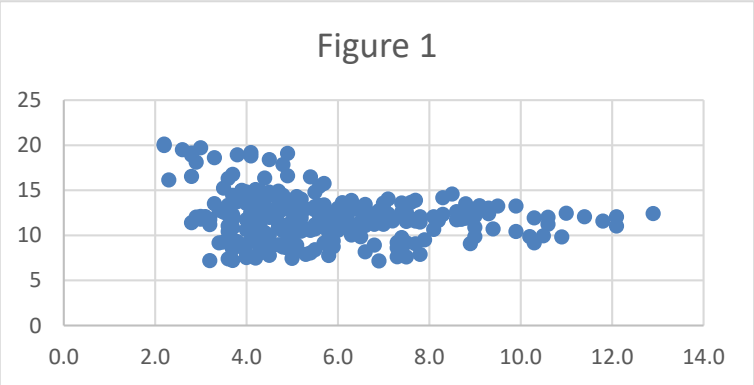

Figure 1 (The correlation between the unemployment rate (the control variable) and the birth rate)

In this case, the R square value increases to 0.28, and the adjusted R square value increased to 0.27, meaning that more data in the result follow this model than the previous regression. The P-values of all the variables are still smaller than 0.05, rejecting the null hypothesis. The coefficient of the independent variable regarding the policy is a -2.6 and the coefficient of the control variable unemployment rate is -0.27. When the independent variable regarding the policy increases by one unit, the dependent variable decreases by 2.6 units, meaning that when a university adjusts the maternity leave policy, the birth rate decreases by 2.6; when the control variable of the unemployment rate increases by one unit, the dependent variable decreases by 0.27, meaning that one unit of increase in the unemployment rate decreases the birth rate by 0.27units, showing a negative correlation as well. The unemployment rate

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was included as a control variable due to a possible theoretical framework that relates the unemployment rate to the birth rate. According to a paper by Janet Currie and Hannes Schwandt [10], where they analyze the fertility rate of groups of US-born women defined by their states and birth years, the result is that when there is one unit increase in the unemployment rate of the groups, the fertility rate decreases by six conceptions per 1,000 women and 14.2 conceptions per 1,000 women in the 20 years old group and the 40 years old group respectively. In figure 1, both short-term and long-term effects on groups of women imply that an increase in the unemployment rate leads to a decrease in the birth rate. It is believed by the researchers that a high unemployment rate affects women's economic conditions that change their decisions in giving births. In other words, an increase in the unemployment rate limits women's financial condition to give birth and raise a child. Therefore, this study believes that the unemployment rate is a necessary control variable to be included in.

Looking at the model again,

$$Y_{it}= \alpha_i *\text{Policy}+ \beta_1*\text{University} + \beta_2*\text{Time} + \beta_3*\text{Unemployment rate}+ \beta_4*\text{Population}+\varepsilon_t.$$

The regression implies that despite birth rates is falling continuously throughout the years(estimated $\beta_2<0$), university counties also have lower birth rates after the element of time trend was controlled, and surprisingly, additional policies still lead to lower birth rates (estimated $\beta_1<0$). However, once the overall declining trend in birthrates were controlled, the impact of the additional university policies has a very small effect (i.e., the effect declines from -2.6 to -0.08)

For both regressions, the coefficient of the independent variable regarding policy remains negative, meaning that it has a negative correlation to the dependent variable. This result does not support the hypothesis--additional modification to FMLA by universities will increase the birth rate of the county--and suggesting that additional modification to FMLA by universities will decrease the birth rate of the county. Nevertheless, considering the detailed independent variable, a negative correlation is also a possible conclusion, which specifically targets universities, unlike previous research that targets bigger groups. Cases like a decrease in income level as a result of paid maternity leave are also potential influences of a negative correlation between generous policies and a decrease in birth rates.

5. Conclusions

It is often suggested that paid maternity leave policies enhance people's willingness to work and lower the cost of giving birth and raising children. A more generous policy on maternity leave may boost the desire for a family to welcome a new family member through both financial and psychological paths. However, in this paper which focuses on this phenomenon in universities and counties, the expected results are reversed.

This study explores the correlation between additional modification of maternity leave policy in universities and the birth rate of their counties. Little pieces of evidence were found from the economic model that the birth rate has an increase after certain universities have implemented their own policies. From the model, along with the corresponding analysis, it turns out that making modifications to the original Family and Medical Leave Act in universities decreases the birth rate of their corresponding counties. This result is not only different but opposite of the original hypothesis.

However, there are limitations to the experiment. In the mathematical model, there are four control variables. Since the addition of the control variable other independent variables to the model increases R square by approximately sixteen percent, control variables are definitely important variables to include in a model. The result may be more statistically significant with including more control variables in the model, such as the ratio of male to female and income level of the counties, but due to data limitation, only four control variables were included. The model, in the beginning, includes 90 universities in the US and was continuously cut down to 17 of them in response to lack of data and university significance. After analyzing the 17 universities, this study attempts to use the results to represent the status of the entire America. However, the population ratio between the university and the county shows the influence of the policies, so the result can only apply to the samples the study has included, and it will be more significant and representative of larger samples involved.

Maternity leave and birth rates are the two factors that contribute to a woman's birth plan, which is also a life decision, making it a significant matter for females and their families. Birth can change a family's members' organization and how they allocate their time daily. In the United States, there are only five states who offer paid maternity leave policies. Therefore, a correlation between the policies and the birth rate can serve as a suggestion for other policymakers in other states who have not

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implemented paid policies yet. If a state or a county is experiencing a high death rate and needs a high birth rate to balance the population of the area, they can find papers like ours to see whether implementing a more generous maternity leave policy can help their situation. And regarding the research topic, if a university who made up a high portion of a really-low-birth-rate county, feels their obligation to make their county a better place, they can also look at the paper to decide whether to implement a paid policy or not.

Until now, many relevant pieces of literature have analyzed the relationship between maternity leave policies and birth rates. However, it is still a question of whether the change in birth rates has a significant impact on the economy of the county, the state, or the university town. These unsolved enigmas suggest a need for further investigation in maternity leave policies and the birth rates.

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