Family Leave and Child Care Policy Across States: Implications for Labor Force Participation Over Time

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Abstract

This paper investigates the impact of child care subsidies, maternity and paternity leave policy, and Earned Income Tax Credits on labor force participation rates at the state level, utilizing data sets from the Bureau of Labor Statistics and Current Population Survey. Results suggest labor force participation increased with federal maternity and paternity leave, increased child care subsidy expenditures, and Earned Income Tax Credits. Head Start expenditures, state maternity leave, and Temporary Disability Insurance have negative impacts. These findings have wider policy implications; altering combinations of family leave and child care policy could help improve employment outcomes of parents.

***JEL Classifications**:* J13, J18, J22

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I. Introduction

In 1993, the United States passed the Family and Medical Leave Act (FMLA), standardizing coverage across the country, providing millions of workers with unpaid time off following childbirth. Despite this and state-level improvement in legislation, it continues to be difficult for parents, particularly women, to re-enter the workforce after giving birth. As stated by Sheryl Sandberg in her well-renowned book, *Lean In: Women, Work, and the Will to Lead*: 43 percent of highly qualified women leave their careers, or "off-ramp" for a period of time, in order to have children (Sandberg, 2013). Of the women who gave birth in 2007, only 62 percent returned to the labor force within 12 months (United States Department of Labor). For many, the ability to return to work depends on the availability and affordability of daycare, as well as the family responsive policies of their state. This paper addresses the resulting economic question: do family leave and child care policy improve labor force participation rates?

For parents—historically women—once maternity and paternity leave has ended, they can stay home, pay for child care, or apply for highly sought-after government-funded child care. It is this choice—giving up/delaying one's career or paying for child care—that leads me to question if there is a correlation and causal relationship between labor force participation rates for both men and women and child care subsidy and leave policies at the state and federal level.

It is hypothesized that parents' labor-force participation rates decrease in states with fewer maternity and paternity leave weeks, as well as less subsidized child support. This result will be highlighted over time and across states as child care subsidies and tax breaks have become more readily available. By looking at this relationship, new perspective on the obstacles parents face following childbirth may come to light. Although researchers have previously studied child care decisions and family-responsive policies, these aspects of family planning do not appear to have

been thoroughly analyzed at the state level (especially in certain states) over this period of time and for labor force participation rates of both men and women. It is hoped that this study will build upon existing research in the field of labor and family economics, as well as develop new ideas not yet discussed or analyzed by current researchers.

In the following sections, a background overview of family leave and child care policy is provided, and existing literature is summarized. A theoretical framework, developed by previous researchers, is discussed and expanded upon at the state level. The impact of child care subsidies, state leave policies, and tax credits on labor force participation rates is measured utilizing data from the Current Population Survey. It is clear from this that federal maternity and paternity leave and Earned Income Tax Credits have positive effects on labor force participation. When controlling for state fixed effects, child care subsidies are also beneficial. However, Head Start expenditures, state maternity leave, and Temporary Disability Insurance have negative impacts.

II. Background

Parental leave, defined as a mother or father's leave from work at the time of their child's birth, has existed at the state level since the early 1970's. Prior to the FMLA, parents relied upon individual state policies to guarantee them the time needed to balance work and home in the first few months postpartum. Protected maternity and paternity leave have been shown to be beneficial to overall maternal health, improving mothers' mental health, reducing cesarean deliveries, and encouraging breastfeeding (Zagorsky, 2017). Policies like the FMLA now provide many new parents with the time they need to bond with their child and restore their vitality. However, in order to qualify for the 12 weeks of leave provided by the FMLA, a mother or father must be employed by a company with greater than 50 employees, have been employed for more than a year, and have worked more than 1250 hours in the last twelve months. Because

of these qualifications, less than 50 percent of workers are eligible for leave under this act (Ruhm, 1997). Thus, although there are benefits of family leave for both the mother's and child's health, it often leads to negative consequences regarding job security, promotion, and pay.

On a global scale, the United States remains significantly below the international standard in maternity and paternity leave coverage in comparison to other OECD countries. Almost all OECD countries provide employment-protected leave with some sort of income replacement or income support payments. Of the countries studied in Cascio, Haider, and Nielson (2015), including Canada, France, Germany, Spain, and the U.K., the average time of paid maternity leave was 17.0 weeks, with a 77.7% income replacement rate. The U.S. averaged zero for both. The United States remains one of only two countries surveyed by the National Labor Organization without cash benefits to cover lost income during pregnancy (International Labor Organization 2014). Although the United States Government does not provide income replacement immediately following birth, a number of tax credits and programs, as well as state-specific policies that expand upon existing federal laws, exist to make child care more accessible to parents.

Despite deficiencies at the national level, thirteen states and the District of Columbia have policies more generous than the FMLA,[1] with five states and D.C. providing some level of paid leave following childbirth (Han et al., 2009).[2] These states have each built upon existing social insurance programs with the hope of improving the mother's quality of life in the time after birth. This is primarily done through State Disability Insurance (SDI) and Temporary Disability Insurance (TDI), which provide partial income replacement to qualifying individuals

[1] California, Connecticut, District of Columbia, Hawaii, Maine, Massachusetts, Minnesota, New Jersey, New York, Oregon, Rhode Island, Vermont, Washington, Wisconsin
[2] Washington, New York, District of Columbia, California, New Jersey, and Rhode Island

for up to six weeks (Guendelman et al., 2014). However, it is estimated that only 24 million Americans, or 22% of the private sector workforce, are covered (Pettersson-Lidbom & Thoursie, 2013). In the case that an individual is not covered under these policies, employer-offered maternity leave (EOML), both paid and unpaid, plays a significant role in determining the duration of postpartum leave.

An important change in work incentives for individuals with children came with the Earned Income Tax Credit (EITC). The EITC is a refundable tax credit for low to middle class individuals and varies based on number of children, level of income, and marriage status. Between 1984 and 1996, the EITC increased from $1.6 billion to $25.1 billion (Meyer & Rosenbaum, 2001). This amount further increased to an estimated $69 billion in benefits to 28 million recipients in 2015 (Edwards & de Rugy, 2015). The goal of this policy is to incentivize individuals to enter the labor force with a tax credit, increasing labor supply, and thus labor force participation rates. This federal support program can be expanded or adapted at the state level. As of March 2019, twenty-nine states and the District of Columbia increased the size of their credits to varying degrees to promote further labor force participation. Although it is important to note that the predicted impact of this policy varies based on the income level and marriage status of the individual—due to the substitution effect—there is evidence for an overall gain in labor force participation rate at the state level.

While maternity and paternity leave policy has been shown to impact the labor force retention of parents, child care costs and subsidized care have the next largest role in decision-making processes following the conclusion of covered leave. Early-care and education has been described as a two-generation strategy: it is necessary for early childhood development and allows parents to return to work in a timely manner (Morrissey, 2017). These child support

expenditures include federal and state level spending on Head Start, Pre-K, and child care subsidies, like the Child Care Development and Block Grant (CCDBG). These policies are particularly important for low-income individuals who have no option other than return to work quickly. While some programs, like child care subsidies, require parents to be employed in order to receive benefits, Head Start determines eligibility from each state's poverty line guidelines.

The implementation of these various family leave and child care policies at the federal and state level has propelled a number of longitudinal and cross-sectional studies regarding the impact of leave policy, child care subsidies, and tax credits on the labor force participation rate of parents. Defined as the number of people available, able, or looking to work as a percentage of the total population, LFPR has traditionally been used to estimate discouraged workers. It does not include those with disabilities, students, and, most important to this analysis, homemakers. Given the changes in United States child care policy since the 1990's, it is important to review literature that has examined these policies. The studies included in the section below are not exhaustive but represent the major studies in the area of child care and family leave policy.

III. Literature Review

Maternity and Paternity Leave Policy

In order to understand the impact of parental leave policy on labor force participation rates, we must first look more closely at the widespread impacts of maternity and paternity leave policy on employment patterns. Laughlin (2011) provides a broad overview of trends of female workers in the labor force between 1961 and 2008. As noted in the paper, one in five women quit her job before or after childbirth between 2006-2008 (Laughlin, 2011). Additionally, only 51% of women received paid leave benefits during the same time period. Further, 80% of women who returned to work within 12 months of maternity leave returned to the same employer, with only

69% reporting no change in pay, skill-level, or hours (Laughlin, 2011). Overall, these statistics indicate that women are returning to work more quickly after having children, and in general attempt to balance both child rearing and working more than women of the 1960's. The trends for "prime age men" in the labor force, however, have been declining. Since 1965, the male labor force participation rate has declined by .16 percentage points each year. Further, the participation rate of males with children has dropped by 4.9% (Black et al., 2016). Although these are illuminating statistics, it is necessary to take a closer look at some speculated causes of these changes in behavior.

The FMLA is known to have disparate impacts on the employment patterns among mothers and fathers. As discussed by Klerman and Leibowitz (1997), protected leave is expected to increase leave-taking, but appears to have ambiguous effects on work. This may be due to parents choosing short job-protected leave over longer absences that require finding a new job. Looking more directly at the impact of the FMLA and different effects among genders, Han and Waldfogel (2003) found increased leave taking and longer leaves among women but no impact on men. Their results were sensitive to the inclusion of state fixed effects, indicating that the estimated effect of maternity-leave entitlements is partially due to other differences among the states (an important consideration in this thesis). The effects were particularly pronounced in the first three months following birth, suggesting that women have been utilizing employer provided paid leave, which these researchers were unable to measure (Han & Waldfogel, 2003). Zagorsky (2017) utilized monthly interviews from the Current Population Survey (CPS) to examine maternity and paternity leave rates between 1994 and 2015. Although the U.S. economy expanded rapidly over this time period, there was no significant change in women taking maternity leave. On average, 273,000 women took maternity leave in a typical month. This result

suggests, but does not prove, that the benefits of the large economic expansion between 1994 and 2015, along with the implementation of improved leave policies, did not proportionately benefit women (Zagorsky, 2017). Although maternity-leave entitlements are not the focus of this research, the use of federal parental leave, the length of leave, and the impact of state fixed effects, play an important role in labor force participation rates.

In 2004, Berger and Waldfogel expanded upon their previous research, looking more closely at the rate of return to the labor force among women with leave coverage. In general, "women in pre-birth jobs with leave coverage return to work more quickly than women without leave coverage" (Berger & Waldfogel, 2004, p. 346). This is consistent with the theory that women with access to maternity leave will return more often and more quickly than women without coverage. However, given the policies of the FMLA, a woman with maternity leave would have to return within 12 weeks if she hoped to keep her job. With these conclusions in mind, it is not surprising that mothers in the U.S. return to work much more quickly than comparable industrialized countries like Germany, where women take between 15 and 36 months of maternity leave (Cascio, Haider, & Nielsen, 2015).

While many researchers, including Han and Waldfogel, were unable to measure employee-provided leave, Guendelman et al. (2014) utilized a subset of California's Prenatal Screening Program (CPSP) from 2002-2003 to study the impact of employee offered maternity leave (EOML) in a state with historically generous leave policy. These policies disproportionately benefit higher income and more educated mothers due to the fewer resources and lack of support from smaller companies. Nonetheless, EOML is associated with later returns to work following childbirth. Mothers with less than six weeks of EOML, along with those offered 6–12 weeks, had five times higher odds of returning to work within 12 weeks. Further,

those with no leave returned to work earlier, with six times higher odds. The authors conclude that the job security and employee retention found in EOML should encourage the government to expand the coverage of the FMLA (Guendelman et al., 2014). While insightful, this analysis is limited to the study of a single state over the span of just two years, leaving a gap in the literature regarding other state policies and other time periods.

It is clear that both state and federal leave policies impact employment patterns in some way, whether it be encouraging quicker returns or improving the odds of returning. This impact appears to be greater in states with longer and/or paid coverage. However, it does not appear that the impact of these policies on labor force participation has been studied in all states over time, or in conjunction with the decision-making process of fathers. Prior to further analysis, it is necessary to discuss child care costs and subsidized care, and their combined impact on labor force participation.

Child Care Costs and Subsidized Care

Cascio, Haider, and Nielson (2015) estimate child care costs to consume almost a fifth of earnings for families with two children. This number varies tremendously, rising as high as 31.2% in Canada. In theory, lower child care costs, through subsidized care or low-cost care, would decrease the relative cost of employment, increasing the use of child care and the likelihood that parents would return to work (Morrissey, 2015). Averett et al. (1997) implement a static model to incorporate the constraints of households with children who require continuous care. Because a toddler requires full-time care, a mother's own decisions of time allocation are jointly determined with decisions of child care. It is clear, through this work, that government subsidies to child care will increase the labor supply substantially. Additionally, the use of a child care tax credit would have a larger effect on the supply of labor than would an increase in

the annual expenditure limits of the subsidy. However, this work remains outdated, and mostly theoretical, with numerous child care policies implemented in the last 20 years since its publication (Averett et al., 1997).

As summarized in Morrissey (2015), the majority of child care policy analysis in the United States does find a negative relationship between child care costs and parental labor force participation. More specifically, Blau and Robins (1988) estimate that both employment and child care decisions are sensitive to child-care costs, with the price elasticity with respect to employment estimated to be -0.38 and the price elasticity with respect to market care estimated at -0.34. Han and Waldfogel (2001) suggest that a 25% reduction in child care costs would increase the employment of married mothers and unmarried mothers by 3 and 5 percent, respectively. Further, a $1 subsidy increase per hour would result in increases of 11–13 and 19–20 percentage points of married and unmarried mothers, respectively.

Although the positive impact of child care subsidies on employment appears settled, it is important to note alternative forms of government expenditures that may also promote labor force participation. Tekin (2007) estimates through cost-effectiveness that a dollar of government expenditure towards child care subsidies is more effective in generating additional hours than a wage subsidy. In 2010, Herbst compared the benefits of a $100 increase in subsidy spending to a $1000 increase in the Earned Income Tax Credit (EITC). While employment rates in both scenarios increased, subsidies increased employment rates by .7 percentage points more than the EITC, with a tenth of the spending (Herbst, 2010).

Most important to this analysis, is the study of child care policy across states. Blau and Tekin (2007) utilized cross-sectional data from 1999 to understand the impact of subsidies on the employment of single mothers at the county level. They estimate receiving a subsidy increased

labor force participation rates immensely, a 33% change in employment and 20% change in unemployment. Further, in California, the state with the most progressive family leave and child care policy, if a low-income single woman's probability of receiving a subsidy changes from zero to 50%, her probability of being in the labor force would increase by 52%, from 21% to nearly 73% (Meyers et al., 2002).

Although the results of these studies are clear, Lefebvre and Merrigan had the unique opportunity to conduct an event study to look at the economic effects of a specific change in child-care policy in Canada between 1993 and 2002. As described in the paper, the provincial government of Quebec initiated a new policy in 1997 that began offering day-care spaces at a reduced daily fee. Three years later, this policy applied to all children under kindergarten age. The authors concluded that the low-fee day-care policy had substantial labor supply effects on the mothers of preschool children (Lefebvre & Merrigan, 2008, p. 543). This research provided the unique opportunity to examine maternity employment before and after a child-care policy change through the use of a rotating panel survey between 1993 and 2002. More specifically they found that the policy increased annual hours worked by 22% and annual weeks worked by 16.2%. The effect is also stronger "as more subsidized spaces are offered to mothers of young children" (Lefebvre & Merrigan, 2008, p. 537). The findings of this paper leave room for a number of future possible studies, particularly in regard to policy changes in the U.S. Further analysis of state level policy and child support expenditure will build upon existing literature and expand into the impacts of child care subsidies.

It is clear from the summary of available literature above that the impact of child care policy has been studied extensively, particularly in other countries and in states with distinct differences in expenditures. However, it does not appear that these subsidies have been studied in

all states over time, particularly in regard to total labor force participation, or in conjunction with paternal leave policy.

Combined Impacts of Policy on Labor Force Participation

Although discussions regarding maternity and paternity leave policy and child care policy are important, it is necessary to understand how these policies work together to impact labor force participation rate (LFPRs). As discussed above, there are numerous articles that study maternity and paternity leave policy and child care subsidies individually. Many of these articles focus on the impact of policy changes on women. However, only a small subsect of researchers have looked at the combined impact of these policies, or their impact on total labor force participation.

The combined effects of public policies on women's employment was explored in 2011 by Washbrook, Ruhm, Waldfogel, and Han. Examining parental leave laws, exemptions from welfare work requirements, and child care subsidies for low-income families, these researchers estimated the timing of work participation after birth and a range of child well-being outcomes in subsequent years. Most notably, the authors concluded strong influences by the incentives provided by these policies in the patterns of mothers returning to the labor force. In a treatment group, an extra $1000 spent on child care subsidies in low-income families increased post-birth employment by 3 to 4%, slightly lower than the impact estimated by Blau and Tekin (2007). They did not, however, find strong evidence for consequences on child well-being. Although this paper highlights the interaction of three policies that impact mothers in the months following birth, the analysis is limited to the first nine months of infancy and focuses more closely on the impact on children of these decision-makers. Further, the study is limited to women, and does not incorporate labor force participation of men, or total labor for participation.

Most closely related to this topic is a paper entitled "Public Policies and Women's Employment After Childbearing", from Han, Ruhm, Waldfogel, and Washbrook (2009). In this article, researchers examine the effects of four different policies, including state-level laws, and their respective impacts on maternal employment. In their analysis, they estimate that the current combination of policies enacted in the United States increase the employment of less advantaged mothers by 30 to 50 percent nine months after birth. Child care subsidies are observed to impact employment strongly, particularly among those with lower income. While the focus of this study is similar to the goal of this thesis, Han, Ruhm, Waldfogel, and Washbrook centered their analysis solely on the individual employment decisions of women nine months after birth, and did not directly analyze labor force participation rates over time or across states. It is hoped that this thesis will further support the existing literature of leave policy and child care subsidies through an analysis of total labor force participation rates at the state level.

IV. Theoretical Framework

Beginning with a static labor supply framework, one can generally theorize the decision-making process of a new mother. In the absence of government intervention, a mother can exchange an hour of time with her infant, a form of leisure, by reducing her current level of consumption of goods and services. This exchange can be calculated through the opportunity cost of an hour at home, calculated by subtracting the price per hour of child care purchased from the mother's hourly wage rate. *Ceteris paribus*, those who have higher wage rates would be more likely to return to work, and those with higher child care costs would be less likely to return. Preferences for work and leisure also have an impact.

Expanding upon this basic analysis, the addition of governmental policy will further affect the labor supply and budget constraint of the mother. As found by Brückner and Pappa

(2012), labor force participation rates significantly increase in OECD countries following increases in a variety of government expenditure. These policies, whether through subsidy or tax break, increase a mother's relative wage, net of the cost of child care. This further increases the opportunity cost of remaining at home. Therefore, it is likely that maternal employment rates will be positively impacted by such policies. This increase can be broken down, however, based on the number of hours a mother would have worked without the policy implementation (Brückner & Pappa, 2012). As explained by Cascio, Haider, and Nielson (2015), for women who would have worked fewer or no hours without a subsidy, income and substitution effects work in opposite directions. For those who would have been working more hours, there is a pure income effect and number of hours worked would fall. Therefore, participation rates would theoretically increase. However, number of hours worked may appear ambiguous. This labor supply framework can be applied to leave policy reform. Although higher income replacement and longer leave will decrease labor force participation in the short run, these policies make it easier for new mothers to return to the labor force in the long-run (Cascio, Haider, & Nielson, 2015).

This theory can be further detailed at the state level. As briefly explained by Lester (2005), individual states may choose to reinforce or improve particular concepts of "family values". For example, a state may choose to support traditional single-earner, husband-wife families by skewing benefits towards married couples. More applicable to this research, the state may aim to encourage workforce participation through public daycare policies and subsidies (Lester, 2005). In short, as Lester concludes, government policy can influence the family form by determining the economic rewards associated with decisions and paths of behavior. Further, any state intervention that makes "a choice previously unavailable to some portion of the population financially more attractive, the effect will be to encourage individuals on the margin toward the

new option" (Lester, 2005, p.6). In short, the combination of both maternity and paternity leave policy, as well as child care policy, aims to improve and reward labor force participation at the state level. Theoretically, the aggregate impact of leave and child support policy should improve labor force participation of parents.

This theoretical framework has been detailed more thoroughly by Erdal Tekin (2007) through a multinomial logit model. Although this model is described for a single mother, and will not be fully implemented empirically, the theoretical framework and methodology behind a parent's decision-making in response to subsidies is worth discussing prior to this paper's analysis of policy at the state level. This discussion will aid in understanding of why policy changes impact labor force participation. State-level analysis can then be thought of as a summation of individual decision-makers.

As Tekin (2007) describes, single mothers are assumed to base their decisions on the following discrete choices: "(1) whether to work, and conditional on working, whether to work part-time or full-time; (2) whether to pay for child care; and (3) whether to receive a child care subsidy (conditional on paying for child care)" (Tekin, 2007, p. 457). With these variables in mind, the mother's utility function can be expressed as: $U = U\ L, Q, C,\ H\square NP\square, I; X,\ v\square 1\square\square$ [3]. The example given in the paper describes a mother who may derive disutility from receiving child care or being employed due to the stigma surrounding both. The discrete choice indicator (I) is utilized to represent fixed utility costs that directly or indirectly influence other variables in the utility function (as seen in Blau and Hagy, 1998). Further, it is assumed that a mother only utilizes paid child care if she is employed.

[3] Where L is the amount of time spent at home, Q is the quality of her children, C is consumption of market goods, H_{np} is the number of unpaid child care hours, and I is the categorical variable, defined by a cross-classification of the discrete alternatives available to each mother. Additionally, X and $v_1$are the observed and unobserved determinants of preferences.

The quality of child care received is based on Tekin's second equation, a production function with inputs of unpaid child care time (H_{NP}), paid child care time (H_P), mother's time at home (L), and the quality of purchased care (A), resulting in the equation: $Q = Q(H_{NP}, H_P, L, A; X, v_2)$ where, similar to above, v_2 represents the unobserved determinants of child quality.

During a mother's working hours, she receives support from both paid and unpaid sources through formal and informal child care. When she is at home, she divides her time between leisure activity and maternal care. As described by Ribar (1992), one can assume hours of maternal care to be a fixed proportion of leisure time. Therefore, the variable (L) representing a mother's time at home includes both leisure and maternal care. With this information in mind, the time constraints facing mothers can be represented by the following equation: $L + H = L + H_{NP} + H_P = 1$.[4] As explained in the paper, because a woman is faced with the employment choices of no work, full-time work, and part-time work, this approach "simplifies the labor supply decision to a multinomial choice problem and avoids the difficulties of dealing with a nonlinear budget constraint" (Tekin, 2007, p. 459). The list of alternatives can be seen in the table below, Table 1, listed on page 458 of the article:

[4] Where H is a mother's number of working hours, with H_{NP} and H_P representing the unpaid and paid child care hours, respectively.

Table 1: List of Single Decision-Maker Alternatives and Budget Constraints

Alternative	Employment Status	Childcare Payment Status	Childcare Subsidy Status	Budget Constraint
1	No-work	—	—	$C=N$
2	Part-time	Yes	Yes	$C+(P_s-S_s)H_P=W_{PT}H_P+N$
3	Part-time	No	No	$C=W_{PT}\ H_{NP}+N$
4	Part-time	Yes	No	$C+P_sH_P=W_{PT}H_P+N$
5	Full-time	Yes	Yes	$C+(P_s-S_s)H_P=W_{FT}H_P+N$
6	Full-time	No	No	$C=W_{FT}H+N_{NP}$
7	Full-time	Yes	No	$C+P_sH_P=W_{FT}H_P+N$

Source: Childcare Subsidies, Wages, and Employment of Single Mothers
By Erdal Tekin (2007)

As shown in this table, the budget constraint a mother faces depends on her employment status, her labor income from that status ($W\square PT\square,\ W\square FT\square$), her choice of paid or non-paid child care is the hourly price paid for child care), and her subsidy status (where $S\square s\square$is the subsidy rater per hour in the market s).

A mother will maximize her utility subject to the quality of child care received, her budget, and her time constraints. In this scenario, Tekin states that the outcome of interest is I, the discrete choice indicator. For a given value of I, the utility function can be maximized in respect to L, C, $H\square NP\square$, $H\square P\square$, and A, and the demand functions can be substituted into the utility and quality production function (Tekin, 2007, p. 459). By substituting the quality function into the utility function, we can obtain the indirect utility of a given value of I as a function of all explanatory variables utilized thus far. This yields the following equation:

$V\square i\square = X\,\beta\square i\square + \alpha\square Pi\square\ P\square s\square * \square + \alpha\square pTi\square\ W\square PT\square + \alpha\square FTi\square\ W\square FT\square + \varepsilon\square i\square,\ i = 1, \dots, J$ [5]. One mu

employment alternatives (non-employed, part-time, and full-time) in order to utilize the

[5] Where W_{PT} and W_{FT} are the full-time and part-time wage rates. ε_i is the alternative specific disturbance, and X is a vector of observed determinants encompassing all variables invariant to the alternative chosen (i.e. age, nonwage income, etc.). The β's and α's are the parameters that will be estimated through modeling, where the α's differ by employment type and child care payment status. The child care payment status, as detailed in the paper, is determined by a comparison between the household income and the state income threshold for subsidy eligibility

multinomial choice model and determine eligibility. The total number of alternatives depends on the scenario of eligibility of the mother, and thus can be up to seven. The hourly rate of the subsidy is subtracted from the hourly price of child care for the alternatives for which the mother uses a subsidy. Again, referring to Table 1, this can be seen in as ($P□s□ - S□s□$) and equal to $P□s□$ otherwise.

It can be predicted from this model that a higher price of child care will reduce the utility in the alternatives in which a mother uses paid child care, but will not affect the utility in other alternatives ($\alpha□P2□, \alpha□P4□, \alpha□P5□, \alpha□P7□ < 0; \ \alpha□P1□ = \alpha□P3□ = \alpha□P6□ = 0$). Additionally, higher wages will increase the utility in alternatives in which a mother works part-time, but does not affect the utility in alternatives ($\alpha□PT2□, \alpha□PT3□, \alpha□PT4□ > 0; \ \alpha□PT1□ = \alpha□PT5□ = \alpha□PT6□ = \alpha□PT7□ = 0$). The same is true for a mother who works full-time ($\alpha□FT5□, \alpha□FT6□, \alpha□FT7□ > 0; \ \alpha□F1□ = \alpha□F2□ = \alpha□F3□ = \alpha□F4□ = 0$). Lastly, a higher child care subsidy will increase the utility in alternatives in which a child care subsidy is received, but not in other alternatives ($\alpha□P2□, \alpha□P4□ < 0; \ \alpha□P1□, 3, \alpha□P5□, \alpha□P6□, \alpha□P7□ = 0$).

With each of these implied effects in mind, the paper states that it is optimal for a single mother to choose alternative i if:

$V□i□ > V□j□, \forall j \neq i \ or$

$\varepsilon□i□ - \varepsilon□j□ >$

$X \ B□j□ - B□i□□ + P□s□ * \ \alpha□Pj□ - \alpha□Pi□□ + W□PT□ \ \alpha□PTj□ - \alpha□PTi□□ + W□FT□ \ \alpha□FTj□ - i.$

In other words, it is optimal for a mother to choose alternative i if the linear approximation to the indirect utility function is greater than that of the linear approximation to the indirect utility function of a second option j.

As described in Tekin's paper, it is possible for correlations to cause bias in the estimated coefficients due to cross-classifying discrete outcomes available to single mothers. One of the examples describes a mother who has strong preferences to work, or may face higher better wage prospects. This individual may be more likely to seek a child care subsidy.

I chose to focus on Erdal Tekin's framework due to his incorporation of informal and formal child care, mother's wages, state-specific markets, price of child care, impact of child care subsidies, full-time work, and part-time work. His model was the most complete model found in existing literature. He expands his model by discussing issues with discrete alternatives and accounts for possible correlations among terms. Tekin's research focuses on policy implementation while simultaneously developing a model that allows one to analyze the part-time and full-time employment decisions, as well as child care decisions, of mothers. His results indicate that lower child care price and higher full-time wage rate lead to an overall increase in employment among mothers.

Although Tekin's model will not be fully utilized in this analysis due to data limitations, it is important to comprehend his theoretical analysis and methodology in order to understand the decision-making process of the individuals behind the aggregate state LFPR statistics. I aim to utilize this understanding to expand on Tekin's existing research through the use of a longitudinal data set at the state level with both men and women.

V. Data

In this paper, the primary investigation is of parental labor force participation and the impact of paternity and maternity leave policy, as well as government child support expenditures, at the state level spanning the 33-year period 1977 to 2009. The data utilized is derived from the Current Population Survey (CPS), a nationally representative annual survey of

noninstitutionalized households, with detailed information on income, poverty, and labor force participation. The CPS is administered by the United States Census Bureau using a probability selected sample of 60,000 households from 824 sample areas. This data set is freely available and is the most comprehensive data set among surveys measuring labor force participation and family leave policy in the U.S., particularly in comparison to the NLSY. The sample includes all 50 states and the District of Columbia. The survey makes use of a computerized documentation system administered by Bureau representatives in person and over the phone. The sample includes individuals over the age of 16 and excludes those in the armed forces, prisons, nursing homes, and long-term care hospitals. The survey consists of over 200 questions, but contains complex skip patterns to allow participants to answer questions solely related to their experiences. Over 8 months of interviews in a single year, participants spend an average of six minutes per person on labor-related questions. Further, the questionnaire often includes supplemental questions of interest to analysts, including a Fertility Supplement.

As explained by the U.S. Bureau of Labor Statistics, sample sizes are determined by reliability requirements in terms of the coefficient variation. The coefficient of variation is described as a relative measure of the sampling error and is calculated as sampling error divided by the expected value of the given characteristic. In this data set, "sufficient sample is allocated to maintain, at most, a 1.9-percent coefficient of variation on national monthly estimates of unemployment level, assuming a 6-percent unemployment rate" (U.S. Bureau of Labor Statistics). In other words, a change of 0.2 percentage points in the unemployment rate is significant at a 90-percent confidence level. In the CPS, each of the 50 States and the District of Columbia maintain a coefficient of variation of at most eight percent on the annual average estimate of unemployment level, assuming a 6-percent unemployment rate.

The data set utilized in this paper is based on a project titled "Work-Family Policies and Other Data" by Professors Han, Ruhm, and Waldfogel and contains data from the CPS on child-care and related policies at the state level across 33 years. Due to the use of state-level data, and the correlation between age, race, sex, state of residence, and labor force participation, it is important to discuss the use of weighting in the CPS. The data is weighted to estimate the number of actual persons that the sample person represents. Since 1985, however, most individuals within the same state have had the same probability of selection. Further, a state coverage adjustment is made to control for independent state population estimates. Additional adjustments are made in the Los Angeles-Long Beach metropolitan area, the balance of California, New York City, the balance of New York State, each of the other 48 States, and the District of Columbia.

I expanded the "Work-Family" set to include Local Area Unemployment Statistics from the Bureau of Labor Statistics. These annual average series include the civilian non-institutional population, the total civilian labor force (employed and unemployed), and their respective percentages/rates for all fifty states and the District of Columbia between 1976 and 2018. This set of data was matched to the original data set using Census Codes, FIPS Codes, and Year. Additional data is available on the labor force participation rates of mothers and fathers with children under the age of 6 for the years 1994-2017. However, this set is not available at the state level and does not include the years prior to the implementation of the FMLA. Therefore, it will not be utilized in this analysis.

While these data range from 1977 to 2009, the data utilized in this study will focus on years in which all variables of focus are available: 1990-2006. Prior to 1990, data is unavailable for all child care subsidy variables (*subexp)* and Head Start Expenditures (*hsexp).* Data collected

after 2006 do not include state populations, the percent of state populations that are Hispanic, black, female, or over 65, or information on parental leave policies at the national and state level (*lvwk, plvwk, stlvwk, pstlvwk)*. A summary of variable names and labels can be found in Appendix 1. Preliminary summary statistics are shown in Appendix 2.

Shown below, in Figure 1, is the labor force participation rate at the state level (*TotLFPercent*) between 1976 and 2018. Most noticeable is the significant gap between Mississippi and the general trend of all other states. Additionally, a preliminary scatterplot of *subexp* (state and federal child care subsidy funding) across states is shown in Figure 2. As is apparent, California continually diverges from the mean for all years. However, it is necessary to account for population effects. Although it is likely that certain states prioritize child care subsidies to some degree, it is also likely that this amount is impacted by the population of residents under the age of 5, shown in Figure 3. With this adjustment, the District of Columbia, Connecticut, Massachusetts, New York, Vermont, and Washington remain the top five states throughout years with available data. This is consistent with the list of states in which leave policies are more generous than that of the FMLA. The relationship between these two variables, child care subsidy funding and labor force participation, are the primary focus of this research. Variables measuring federal and state maternity leave weeks, as well as federal Head Start expenditures are also included.

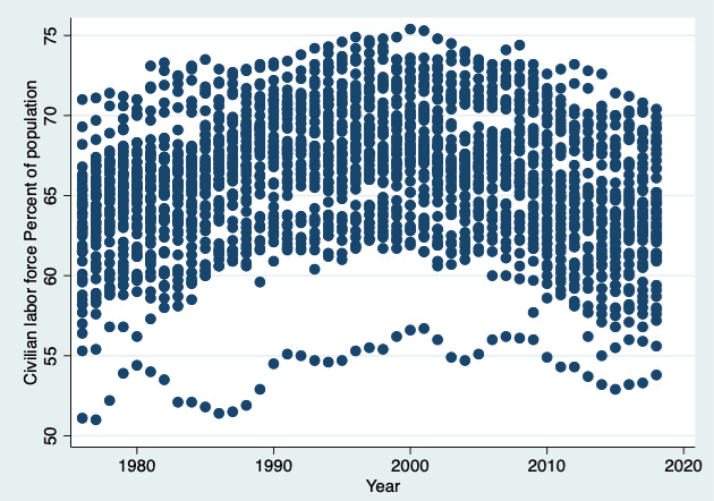

Figure 1: State Civilian Labor Force Participation (1976-2018)

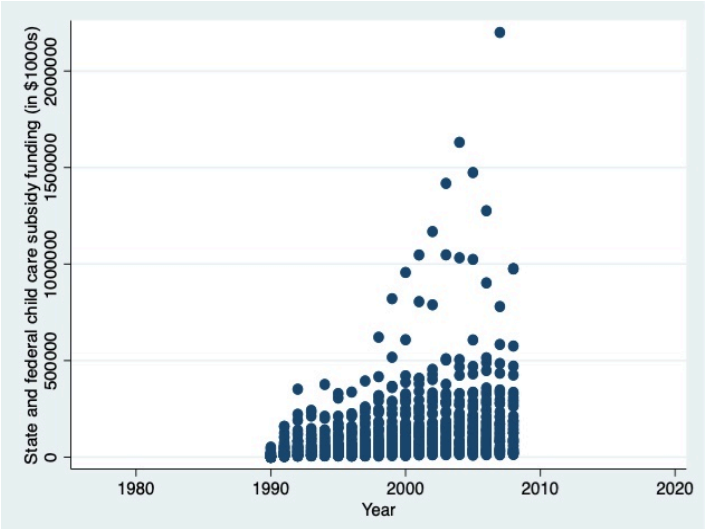

Figure 2: State and Federal Child Care Subsidy Funding (1990-2008)

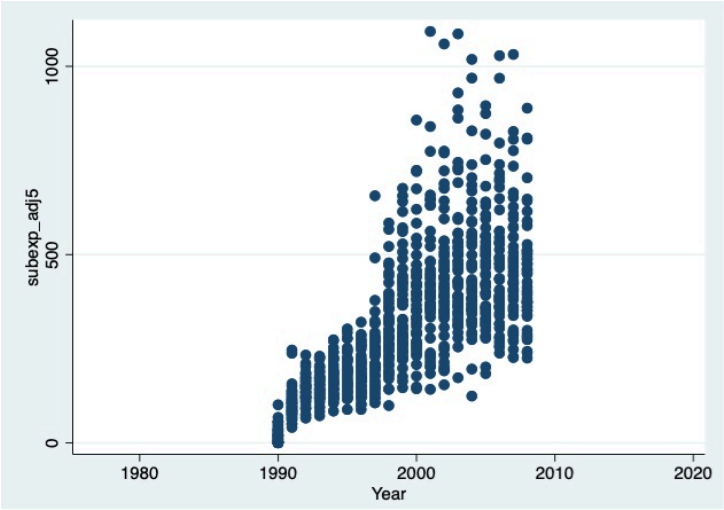

Figure 3: State and Federal Child Care Subsidy Funding Adjusted for Population Under 5 (1990-2008)

VI. Empirical Specifications

Ordinary Least Squares

The goal of this analysis is to estimate the effect of state level child care subsidy expenditures and maternity and paternity leave policies on total state labor force participation rates. More specifically, because these policies are not implemented randomly, often changing with varying historical and geographical factors, measuring the relationship over time is important, particularly across the 1993 implementation of the FMLA. This analysis will focus on the data points of available years, between 1990 and 2006.

As mentioned in the 'Data' section, each set of variables was summarized prior to analysis. From these summaries, it is clear that both child care subsidy expenditures (*hsexp* and *subexp*) and state leave policies (*pstlvwk* and *stlvwk*) vary tremendously across states and over time. For example, state leave policies for both mothers and fathers range from 0 weeks to 52 weeks. Further, it is shown that child support expenditure has a standard deviation of $347,947,000. Once an understanding of the trends in data has been established, we can proceed with more detailed econometric regressions.

Through preliminary analysis of the data and theoretical framework, it is predicted that both child support expenditures and extended leave policies improve labor force participation rates. To test this hypothesis, we will use an Ordinary Least Squares (OLS) regression. The OLS estimates are determined by minimizing the sum of squared differences between the dependent variable and the linear combination of independent variables. The regression equation for this analysis therefore looks as follows:

$$1 \quad LFPR_{ij} = \beta_0 hsexp_{ij} + \beta_1 subexp_{ij} + \beta_2 tdiwk +$$

$\beta_3 eitcmax_{ij} + \beta_4 lvwk_{ij} + \beta_5 plvwk_{ij} +$

$\beta_6 pstlvwk_{ij} + \beta_7 stlvwk_{ij} + \varepsilon$

Where $LFPR_{ij}$ represents labor force participation rate for each state i and year j. $Hsexp$ is the Head Start expenditures (in $1000s), $subexp$ is the state and federal child care subsidy funding (in $1000s), $tdiwk$ is the number of Total Disability Insurance weeks provided, $eitcmax$ is the natural log of Earned Income Tax Credit, $lvwk$ is the number of weeks provided for mothers at the federal level, $plvwk$ measures the number of weeks provided for fathers at the federal level, $pstlvwk$ is the number of state provided paternity leave weeks, and $stlvwk$ is the number of state level provided maternity leave weeks. Regressions were run across all data points but were confined to the years 1990-2006 as previously stated.

State and Year Fixed Effects

As mentioned in the 'Data' section, it is important to understand the impact of these policies within the context of each state. Therefore, the regression was run with a frequency weight for state population, as well as fixed effects for state and year. Frequency weights are utilized to specify that each observation, in this case by state, are repeated multiple times. Further, to control for inflation over time, expenditure values were adjusted to the year 2000 using the *inflator* variable from the CPS. In this type of panel data, where longitudinal observations exist for the same state, fixed effects can be applied to represent the state and/or year-specific means, F_i and T_j respectively. In other words, fixed effects assume that there are state or year-specific effects that are correlated with independent variables. As explained in Washbrook et al. (2011), these fixed effects remove the need to control for state or year-specific differences, such as unemployment rates or average wages. The estimated equation can now be represented as:

$$2) \quad LFPR_{ij} = \beta_0 hsexp\_deflated_{ij} + \beta_1 subexp\_deflated_{ij} + \beta_2 tdiwk_{ij} + \beta_3 eitcmax_{ij} + \beta_4 lvwk_{ij} + \beta_5 plvwk_{ij} + \beta_6 pstlvwk_{ij} + \beta_7 stlvwk_{ij} + F_i + T_t + \varepsilon$$

Where equation (1) is expanded to include state fixed effects F_i and year fixed effects T_t.

Following analysis of collinearity, discussed more extensively below, this equation was further expanded to account for interactions among terms. Interaction terms are utilized when the effect of one causal variable depends on the value of another causal variable. The addition of interaction terms in regression analyses helps to determine if correlated causal variables offset or reinforce each other's effect. The estimated equation can now be represented as:

$$3) \quad LFPR_{ij} = \beta_0 hsexp\_deflated_{ij} + \beta_1 subexp\_deflated_{ij} + \beta_2 subexp\_deflated_{ij} * hsexp\_def$$
$$\beta_7 plvwk_{ij} + \beta_8 eitcmax_{ij} * plvwk_{ij} + \beta_9 lvwk_{ij} * plvwk_{ij} + \beta_{10} stlvwk_{ij} + F_i + T_t + \varepsilon$$

A side-by-side comparison of these regressions will provide insight into how child care expenditures and parental leave policies impact labor force participation rates across states and over time.

VII. Results and Discussion

Results

To begin my analysis, I utilized simple regressions, run with single independent variables, shown in Appendix 3. This bivariate analysis is helpful in observing simple hypotheses of association between labor force participation and measures of family leave, child care subsidies, and tax credits. As observed across the bivariate regressions, all independent

variables are significant at the p <.01 level, with positive coefficients indicating that an increase in one variable leads to an increase in labor force participation rates. Further, each R-squared value is greater than .1, with EITC, federal paternity leave, and federal maternity leave above .7. It is, at this point, clear that family leave, child care subsidy expenditures, and tax credits are significant at some level, and are predicted to have some impact on labor force participation. However, further analysis is needed to determine what this relationship looks like across all 50 states and the District of Columbia, across time, and whether there are combined effects between variables.

Prior to running more extensive regressions, I utilized a correlation matrix to quantify the degree to which variables in the data set are potentially dependent upon each other. As shown in Table 2, below, there are several variables highly correlated with each other, particularly Head Start Expenditures and child care subsidy funding, EITC, federal maternity and paternity leave weeks, and state maternity and paternity leave weeks. It is important to keep these relationships in mind when further analyzing multivariate regressions.

Table 2: Variable Correlation Matrix

Measure	hsexp*	subexp*	tdiwk	eitcmax	plvwk	lvwk	pstlvwk	stlvwk
hsexp*	-							
subexp*	**0.938**	-						
tdiwk	0.418	0.450	-					
eitcmax	0.256	0.285	0.030	-				
plvwk	0.223	0.231	0.024	**0.883**	-			
lvwk	0.226	0.229	0.089	**0.849**	**0.937**	-		
pstlvwk	0.141	0.123	-0.102	0.010	0.008	-.006	-	
stlvwk	0.142	0.130	-0.106	0.009	0.007	-.007	**.996**	-

*indicated deflated variable (to 2000)

Following preliminary understanding of the data and relationships among variables, I

began with multivariate analysis with an OLS regression using the simplest form of the model, shown in equation (2). The results of labor force participation rate (*TotLFPercent*), child care subsidies, tax credits, and leave policies are shown in Table 3, below. As previously mentioned, the regression includes variables measuring Head Start expenditures, state and federal child care subsidy funding, refundable Earned Income Tax Credit, Temporary Disability Insurance weeks, state provided paternity leave weeks, and state provided maternity leave weeks. The regression was first run without state or fixed effects, shown in column (1), followed by state fixed effects in column (2), year fixed effects in column (3), and combined state and year fixed effects in column (4).

Table 3: OLS Regression Output with State and Year Fixed Effects

	(1)	(2)	(3)	(4)
VARIABLES	TotLFPercent	TotLFPercent	TotLFPercent	TotLFPercent
hsexp_deflated	3.66e-06***	-3.92e-06***	2.36e-06***	-3.14e-06***
	(5.77e-08)	(2.93e-08)	(5.67e-08)	(3.14e-08)
subexp_deflated	-4.53e-06***	1.46e-06***	-1.08e-06***	2.10e-06***
	(4.08e-08)	(1.27e-08)	(3.92e-08)	(1.31e-08)
tdiwk	-0.0876***	-0.0744***	-0.364***	-0.102***
	(0.00247)	(0.00112)	(0.00191)	(0.00114)
eitcmax	9.050***	0.184***	8.346***	0.109***
	(0.00186)	(0.00895)	(0.0679)	(0.0313)
plvwk	-0.487***	0.0192***	0.159***	0.00225**
	(0.00260)	(0.000826)	(0.00207)	(0.000939)
lvwk	-0.0968***	0.00936***	0.0264***	0.0427***
	(0.00276)	(0.000748)	(0.00232)	(0.000992)
pstlvwk	-0.120***	-10.93***	-0.104***	-10.83***
	(0.00202)	(0.0110)	(0.00163)	(0.0436)
stlvwk	0.0824***	10.92***	0.0654***	10.82***
	(0.00208)	(0.0110)	(0.00169)	(0.0436)
State Fixed Effect	No	Yes	No	Yes
Year Fixed Effect	No	No	Yes	Yes
Observations	464,328	464,328	464,328	464,328
F-test	999,999	999,999	999,999	999,999
R-squared	0.997	1.000	0.998	1.000

RMSE	3.396	0.819	2.936	.735

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As shown in the table above, all variables are statistically significant at the $p < .01$ level, indicating that the relationships are unlikely to occur due to chance. For Earned Income Tax Credits, the relationship is consistently positive across all regressions, indicating that the policy may in fact incentivize individuals to enter the labor force. Further, Temporary Disability Insurance has a negative impact across all fixed effects, indicating that partial income replacement for qualifying individuals may decrease total labor force participation across states over time.

Although it is important to include the R-squared value and F-test in this analysis, it is necessary to note that fixed effects add a number of independent variables to the regression, one for each state and year, and may decrease the sum of squared residuals tremendously in comparison to a simple regression. For this reason, the Root Mean Squared Error (RMSE) has also been included. Further, the RMSE remains low, particularly for the regressions with state-fixed effects, indicating that the absolute fit of the model is close to the observed data points.

While all other included variables appear significant, the regression must be re-run to include interaction terms for variables with high correlations prior to further analysis. Interaction terms are utilized when the effect of one causal variable depends on the state of another causal variable. The addition of interaction terms in regression analyses helps to determine if correlated causal variables offset or reinforce each other's effects. As shown in Appendix 4, the initial regression was re-run to account for interactions among select continuous and discrete variables, including: Head Start expenditures, child care subsidy expenditures, Earned Income Tax Credit, federal maternity and paternity leave weeks, and state maternity and paternity leave weeks.

Again, these variables were chosen based on the correlation matrix in Table 2. As in the regressions run without these interactions, almost all variables are significant at the $p < .01$ level.

We can first observe the differing effects of state level maternity and paternity leave weeks on LFPR. As shown in the table, paternity leave weeks at the state level appear to have a consistently negative impact on participation rates, while maternity leave weeks are consistently positive. These values range from -.00037 to $\pm$10.81 across all regressions run. While significant with state and year fixed effects, it is important to note that the number of states offering additional weeks of parental leave is small (only 11 of 52 states) and unchanging over time. Although one can conclude that the impact is significant, the coefficients for state-fixed effects appear too extreme. Further, the coefficients of maternity and paternity leave are almost exact opposite values. This may be due to high collinearity between the two variables, as seen in Table 1. One solution may be to remove either paternity state leave weeks or maternity state leave weeks in order to determine the impact of state leave weeks as a whole on labor force participation. Although doing so limits the conclusions of this analysis, leaving both variables in the regression would be misleading. With this limitation in mind, the new regression is shown below, in Table 4.

Table 4: OLS Regression Output with Interaction Terms, State and Year Fixed Effects

VARIABLES	(1) TotLFPercent	(2) TotLFPercent	(3) TotLFPercent	(4) TotLFPercent
hsexp_deflated	-1.18e-06***	-4.11e-06***	1.86e-06***	-2.27e-06***
	(4.15e-08)	(3.14e-08)	(5.00e-08)	(3.54e-08)
subexp_deflated	-6.67e-06***	7.07e-07***	-8.99e-06***	2.88e-06***
	(4.38e-08)	(1.80e-08)	(5.40e-08)	(2.09e-08)
c.hsexp_deflated#c.subexp_deflated	0***	0***	0***	-0***
	(0)	(0)	(0)	(0)
tdiwk	-0.230***	-0.127***	-0.360***	-0.0568***
	(0.00163)	(0.00166)	(0.00195)	(0.00130)
eitcmax	9.088***	0.252***	16.59***	-0.770***
	(0.00181)	(0.0251)	(0.146)	(0.0663)
plvwk	-10.90***	2.036***	2.269***	1.657***
	(0.428)	(0.109)	(0.396)	(0.138)
c.eitcmax#c.plvwk	1.525***	-0.276***	-0.282***	-0.233***
	(0.0571)	(0.0146)	(0.0530)	(0.0184)
lvwk	8.884***	1.806***	4.503***	2.314***
	(0.0966)	(0.0356)	(0.123)	(0.0477)
c.eitcmax#c.lvwk	-1.208***	-0.247***	-0.606***	-0.311***
	(0.0132)	(0.00484)	(0.0168)	(0.00647)
c.plvwk#c.lvwk	0.536***	-0.318***	-0.241***	-0.339***
	(0.0345)	(0.00889)	(0.0296)	(0.0101)
c.eitcmax#c.plvwk#c.lvwk	-0.0765***	0.0436***	0.0328***	0.0469***
	(0.00459)	(0.00119)	(0.00396)	(0.00134)
stlvwk	-0.0306***	-0.00728***	-0.0209***	-0.0165***
	(0.000377)	(0.000498)	(0.000344)	(0.000487)
State Fixed Effect	No	Yes	No	Yes
Year Fixed Effect	No	No	Yes	Yes
Observations	464,328	464,328	464,328	464,328
F-test	-	-	-	-
R-squared	0.998	1.000	0.998	1.000
RMSE	2.953	0.812	2.824	0.727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Beginning with an analysis of child care expenditures, the regression shows varying impacts in regard to Head Start expenditures and child care subsidies, measured in thousands of dollars. At first glance, there appears to be a significant negative impact from Head Start expenditures across all fixed effect combinations. Although significant, this effect is small, with coefficients in the millionths. In other words, in order to decrease the LFPR by 1%, a state would need to invest over 500 million dollars, a threshold surpassed solely by California, Texas, and New York. Although positively significant when controlling for state fixed effects, and negative without, we conclude similar results for child care subsidies. In this case, the difference in signage across regressions may be explained by state-specific differences. In other words, when accounting for state factors not included in this model, the impact of child care subsidies on labor force participation is small, but positive. When controlling for both state and year fixed effects, a state would need to spend over 350 million to increase LFPR by 1%. This threshold is reached consistently by California, New York, Texas, and Florida.

Earned Income Tax Credits result in similar conclusions. Because the EITC is a federal program, values are consistent across states for each year but differ over time. Looking at Table 4, the effect of EITC on LFPR is positive and statistically significant for the first three regressions. However, when incorporating both state and year fixed effects, EITC appears to have a negative effect on LFPR. This may be due, in part, to the negative interaction between *eitcmax*, *lvwk*, and *plvwk* counteracting the positive impact of EITC on labor force participation. The number of Temporary Disability Insurance weeks, however, is predicted to decrease LFPR in all regressions. This relationship ranges from -0.05% with state and year fixed effects to -0.36% with year fixed effects.

Federal parental leave appears a bit more consistent, with both paternal and maternal

leave positively significant in each regression with state and year fixed effects. Looking more closely, when controlling for both state and year, labor force participation appears to be more positively impacted by maternity leave at the federal level than by paternity leave (2.314 and 1.657, respectively). In other words, when controlling for state-specific and year-specific differences not included in the model, both federal maternity and federal paternity leave positively impact labor force participation. In more specific terms, for every additional 2.3 weeks of maternity leave or 1.7 weeks of paternity leave, total LFPR should increase by 1%. A larger gap in this difference is seen with the year fixed effect, with coefficients of 4.503 and 2.269 for maternity and paternity leave, respectively. Interestingly, these two variables counterbalance each other, with negative interaction terms across all three regressions with fixed effects. In other words, the combined effect of federal maternity and paternity leave is less than the individual effects.

Lastly, one can analyze the impact of state leave weeks. As previously mentioned, this analysis is limited to the study of maternity leave at the state level due to collinearity between variables. Across all regressions, state leave coverage significantly decreases total labor force participation at the $p < .01$ level. Although this effect is small, with every additional week of leave decreasing participation rates between .007% and .03%, it is clear that longer maternity leave policies decrease the total labor force participation rate. This impact appears to be smaller when including state fixed effects, and around .017% when accounting for both state and year fixed effects. It can be extrapolated from this result that paternity leave would have a similar effect on participation rates due to the correlation between terms. However, because we are unable to study the combined effects in this analysis, no direct conclusions can be made.

As mentioned previously, the overall fit of the model can be analyzed using Root Mean

Squared Errors (RMSE). Due to the use of frequency weights and fixed effects, the R-squared and F-test values are misleading, and thus appear unnaturally high or are excluded by Stata altogether. As shown in Table 4, RMSEs range from 2.953 without state and year fixed effects to 0.727 with both fixed effects. Considering the data range for Labor Force Participation, these RMSEs are relatively small and represent a good absolute fit of the model to the actual data when controlling for state and year fixed effects.

Discussion and Limitations

Family-responsive policy changed drastically at the national and state level between 1990 and 2006. The goal of this study was to examine these child care subsidies, tax credits, and parental leave policies at the national and state level, as well as their combined impact on total labor force participation rates. Consistent with previous studies (e.g. Averett et al. 2007; Morrissey 2015; Han and Waldfogel 2001), this research found that child care subsidies increase total LFPR with state fixed effects. This impact is greater in states with more generous subsidies and a greater number of weeks provided (California, Texas, and New York). Child care subsidies are intended to incentivize individuals to return to work by lowering the cost of care and by increasing the opportunity cost of remaining at home. This positive effect can be seen in Tekin's single decision-maker framework (2007) in which relatively lower child care prices increased employment among mothers. These results differ from the literature, however, regarding the impact of EITC. Herbst (2007) had previously predicted subsidy spending to benefit labor force participation more than EITC, with a tenth of the spending. When controlling for state and year fixed effects separately, however, this analysis demonstrates more consistent benefits of tax credits than child care subsidies across states and time.

In regard to maternity and paternity leave, this study found strong positive impacts on labor force participation rates when including fixed effects. As explained by Cascio, Haider, & Nielson (2015), it is expected that the number of leave weeks provided decreases LFPR in the short run. However, by providing coverage for individuals to spend time with their newborns, fewer men and women exit the labor force in the long run. As supported by these results, as well as previous literature, a minimum of 12 weeks of leave encourages individuals to return to the labor force more quickly than those without coverage (e.g. Berger & Waldfogel, 2004).

Total LFPR decreased, however, as a result of Head Start expenditures, Temporary Disability Insurance, and state level maternity leave weeks. In regard to state level maternity leave weeks, it is possible that there is an equilibrium point for the ideal number of leave weeks. It could be that states are providing too much protected leave, allowing their residents to remain out of the labor force for too long, resulting in a negative impact on total labor force participation. TDI may have similar results: state residents who receive paid weeks off do not rush to return to the workforce as quickly. As stated previously, Head Start does not require parental employment and focuses solely on benefiting those below the poverty line. For this reason, it lowers the cost of child care but does not increase the opportunity cost of remaining at home, a possible explanation for its small negative impact on LFPR. While these conclusions assist in explaining the results of this particular model, further research is needed to test these hypotheses.

Although some of these results are not consistent with past research, it is important to note that this study focuses on state level analysis, which may differ from the single decision-maker frameworks mentioned in previous literature. Although this analysis utilizes the theoretical aggregation of individuals, it is possible that this model captures cultural differences

based on the environment individuals to which are responding to, that is, by incorporating parental leave policy, child care subsidies, and tax breaks at the state level, this research isolated the varying benefits of post-birth policies across states with differing goals and priorities (as described in Lester, 2005). Different states are governed by different public cultures, which tend to have varying views on the proper size of governments and the propriety of public programs.

Due to the lack of availability of data and the time constraints of this thesis, individual level data for both men and women was unable to be studied. These restraints further limited the number of years available for analysis to 1990-2006. Further, a breakdown of male and female labor force participation was only available post-1994. Although interesting, use of this data would have further narrowed the years available for study, more specifically by eliminating the use of data prior to the 1993 implementation of the FMLA. Despite these limitations, this analysis is still valuable in the study of family-responsive policies and their impact on labor force participation.

While the implementation of family-responsive policies is important, it is predicted, from the results of this analysis, that there are differences in effectiveness between different policies when aiming to increase labor force participation. When looking towards future research and policy-implementation, it is recommended that state and federal legislators collaborate to balance a combination of child care subsidies, parental leave, and tax credits optimally.

VIII. Conclusion

The goal of this thesis was to analyze the role of child care subsidies and family leave policies on total labor force participation rates across states and over time, also exploring the interaction between these policies and their combined effect on LFPR. Utilizing a derived data set from the Current Population Survey, child care subsidy expenditures, Head Start

expenditures, Temporary Disability Insurance, Earned Income Tax Credits, federal paternity and maternity leave weeks, and state level maternity leave weeks were incorporated into a series of regression models. These models included state and year fixed effects, controls for inflation, interaction terms among variables, and population frequency weights.

Results indicate that, when controlling for state fixed effects not included in the model, both child care subsidies and federal maternity and paternity leave increase total labor force participation. EITC increases participation in most regressions, but the extent is diminished by its interaction with federal leave weeks. Further, total LFPR was decreased by Head Start expenditures, Temporary Disability Insurance, and state level maternity leave weeks. This is explained, in part, by a lack of employment requirements—and lack of incentive—for Head Start, and longer absences from the labor force with TDI and state level parental leave.

Despite this research, and the contributions of previous economists, there remains a large gap in this area of labor and family economics. While there is in-depth research regarding both parental leave and child care subsidies, these policies are intertwined in the decision-making processes of men and women as they return to work. More specifically, it is necessary to explore how these policies have impacted labor force participation over the last ten years, particularly across the recession of 2008. With further research in this area, the benefits and implications of family leave and child care policy may be better understood. With this understanding, along with cooperation between state and federal legislators, policymakers will be more able to maximize the labor force participation rates of parents with young children.

IX. Appendices

Appendix 1: Summary of Variable Names, Labels, and Years Available

Variable Name	Type	Variable Label/ Description	Years Available
state	Categorical	State using Census Codes (which list states from east to west, starting at 11)	1976-2018
year	Categorical	Year	1976-2018
fipscode	Categorical	Federal Information Processing Standards Code (FIPS) Code	1976-2018
stateandarea	Text	Name of State/Area	1976-2018
TotPop	Scale	Civilian non-institutional population	1976-2018
TotLFPercent	Scale	Civilian labor force- Percent of population	1976-2018
inflator	Scale	Inflator to 2000 $	1977-2009
stpop	Scale	State population	1980-2008
eitcmax	Scale	LN of fed and state max refundable Earned Income Tax Credit (EITC)	1977-2007
subexp	Scale	State and federal child care subsidy funding (in $1000s)	1990-2008
hsexp	Scale	Federal head start expenditures (in $1000s)	1990-2008
plvwk	Scale	Federal_State Paternity Leave weeks Policy	1987-2006
infe	Scale	State Infant Exempt	1987-2006
tdiwk	Scale	State Temporary Disability Insurance (TDI) weeks	1987-2006
pstlvwk	Scale	State Paternity leave weeks	1987-2006
lvwk	Scale	Federal_State Maternity leave weeks	1987-2006
stlvwk	Scale	State maternity leave weeks	1987-2006

Appendix 2: Summary of Variable Means, Standard Deviations, Minimums, and Maximums

VARIABLES	N	mean	sd	min	max
fipscode	2,193	27.76	15.78	1	56
state	2,193	54.04	25.54	11	95
year	2,193	1995	8.366	1980	2008
TotPop	2,193	8.603e+06	6.859e+06	335,667	2.761e+07
TotLFPercent	2,193	66.03	3.338	51.40	75.40
inflator	1,683	1.225	0.338	0.800	2.090
stpop	1,479	1.140e+07	9.226e+06	500,000	3.676e+07
eitcmax	1,581	7.714	0.649	6.720	8.644
subexp	958	280,301	347,947	0	2.200e+06
subexp_deflated	958	124,873	205,739	0	2,649,048
hsexp	967	189,186	199,607	2,129	835,094
hsexp_defalted	967	83,556	121,065	1,423.13	1,042,574
plvwk	1,020	8.463	5.444	0	16
tdiwk	1,020	1.541	2.798	0	12
pstlvwk	1,020	5.317	12.65	0	52
lvwk	1,020	9.121	4.956	0	16
stlvwk	1,020	5.471	12.62	0	52

Appendix 3: Bivariate Analysis of Relevant Variables

VARIABLES	(1) TotLFPercent	(2) TotLFPercent	(3) TotLFPercent	(4) TotLFPercent	(5) TotLFPercent	(6) TotLFPercent	(7) TotLFPercent	(8) TotLFPercent
hsexp_deflated	0.000146***							
	(2.49e-07)							
subexp_deflated		7.97e-05***						
		(2.12e-07)						
tdiwk			9.879***					
			(0.0101)					
eitcmax				8.505***				
				(0.000843)				
plvwk					5.576***			
					(0.000527)			
lvwk						5.641***		
						(0.000828)		
pstlvwk							1.850***	
							(0.00257)	
stlvwk								1.896***
								(0.00273)
Observations	525,391	524,896	538,315	732,026	538,315	538,315	538,315	538,315
R-squared	0.432	0.356	0.227	0.993	0.711	0.775	0.145	0.153
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix 4: OLS Regression Output with Interaction Terms, State and Year Fixed Effects (Including Paternity State Leave Weeks)

VARIABLES	(1) TotLFPercent	(2) TotLFPercent	(3) TotLFPercent	(4) TotLFPercent
hsexp_deflated	-2.96e-06***	-4.11e-06***	-2.83e-07***	-2.23e-06***
	(4.22e-08)	(3.14e-08)	(5.19e-08)	(3.54e-08)
subexp_deflated	-4.85e-06***	7.09e-07***	-6.89e-06***	2.89e-06***
	(4.51e-08)	(1.80e-08)	(5.85e-08)	(2.08e-08)
c.hsexp_deflated#c.subexp_deflated	0***	0***	0***	-0***
	(0)	(0)	(0)	(0)
tdiwk	-0.288***	-0.127***	-0.390***	-0.0562***
	(0.00164)	(0.00166)	(0.00195)	(0.00130)
eitcmax	9.123***	0.249***	15.56***	-0.801***
	(0.00171)	(0.0252)	(0.144)	(0.0663)
plvwk	-10.41***	2.034***	0.728*	1.624***
	(0.409)	(0.109)	(0.388)	(0.138)
c.eitcmax#c.plvwk	1.452***	-0.276***	-0.0743	-0.228***
	(0.0545)	(0.0146)	(0.0520)	(0.0184)
lvwk	9.358***	1.804***	5.140***	2.308***
	(0.101)	(0.0356)	(0.124)	(0.0478)
c.eitcmax#c.lvwk	-1.272***	-0.247***	-0.693***	-0.310***
	(0.0138)	(0.00484)	(0.0170)	(0.00649)
c.plvwk#c.lvwk	0.480***	-0.318***	-0.118***	-0.338***
	(0.0329)	(0.00889)	(0.0289)	(0.0101)
c.eitcmax#c.plvwk#c.lvwk	-0.0681***	0.0436***	0.0161***	0.0468***
	(0.00437)	(0.00119)	(0.00387)	(0.00134)
pstlvwk	-0.271***	-10.86***	-0.322***	-11.98***
	(0.00179)	(0.0308)	(0.00146)	(0.0839)
stlvwk	-0.000370	10.86***	0.0848***	12.01***
	(0.00183)	(0.0310)	(0.00160)	(0.0839)
c.pstlvwk#c.stlvwk	0.00548***	-0.000238	0.00489***	-0.00163***
	(1.97e-05)	(0.000182)	(2.00e-05)	(0.000175)
State Fixed Effect	No	Yes	No	Yes
Year Fixed Effect	No	No	Yes	Yes
Observations	464,328	464,328	464,328	464,328
R-squared	0.998	1.000	0.998	1.000
RMSE	2.779	0.812	2.679	0.727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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