Does the EITC Reduce Birth Spacing?
A New Look at the Effects of Wage Subsidies on Fertility

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Abstract

The value of mother's labor market time is thought to play an important role in childbearing. Therefore, wage subsidies like the Earned Income Tax Credit (EITC) may impact fertility among low-income households. Existing literature finds no effect of the EITC on completed fertility, however. In this article, I consider whether the EITC affects a different fertility outcome: birth spacing. If there are economies of scale in childrearing, mothers may reduce space between births to minimize time spent out of the labor market. Close spacing is thought to be detrimental to child health and educational outcomes.

To identify the effects of the EITC, I use a novel regression discontinuity design (RD) in first child's birth month around the end of the year. Children born before the end of the year can be claimed as dependents on that year's tax returns, substantially increasing EITC eligibility for first time parents. My design incorporates recent evidence that first time EITC eligibility functions as an information shock for many recipients. I find that EITC receipt decreases time to second child by 3-4%. Effects are concentrated among single mothers (19% decrease), whereas I find no effects for married mothers or on completed fertility. My findings suggest there may be unintended negative effects of welfare-to-work policies on children in single parent households.

Keywords: fertility; tax and transfer system; birth spacing; Earned Income Tax Credit (EITC); regression discontinuity

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1 Introduction

The Earned Income Tax Credit (EITC) is one of the largest antipoverty programs in the U.S., with a budget of $56 billion in 2013. The credit is a wage subsidy administered through the tax system — the subsidy rate is determined by household income, family size, filing status, and other factors. While a small credit is available for single, childless adults, the majority of the EITC goes to single mothers and married households with children (see Figure 1).

The subsidy rate initially increases (phases in) with household income, then is constant for a certain income range, and then decreases (phases out) for higher incomes. Because the subsidy increases labor income, all eligible households are incentivized to enter the labor market. On the intensive margin (hours), households in the phase-in region face an ambiguous incentive due to opposing substitution and income effects, while households in the constant and phase-out regions face incentives to reduce hours.

Single parent households (most of which are female-headed) are mostly located on the phase-in region, while marrIed households are located on the constant and phase-out regions — therefore, these two groups face differing labor market incentives. Single mothers are incentivized to enter the labor market, while married mothers are incentivized to leave to *leave* in order to reduce total household hours.[1][2] Correspondingly, studies have shown that the EITC increases labor force participation among single mothers and causes small reductions in labor force participation among married mothers (Eissa and Hoynes, 2004; Eissa and Liebman, 1996; Eissa and Hoynes, 1998, 2004; Meyer and Rosenbaum, 2001).

If the EITC affects the opportunity cost of mother's time out of the labor market, it may have important implications for fertility. However, previous work finds no effects completed fertility (see Hoynes *et al.* (2011) for a discussion). In this article, I consider the effect of the EITC on a new, and plausibly more sensitive, birth outcome: birth spacing. Suppose there are economies of scale in childrearing, so two children spaced closely take less maternal time than two children spaced far apart. The EITC may therefore decrease spacing among single mothers to the extent that it increases the labor market value (opportunity cost) of

[1]See Eissa and Hoynes (2004) for a thorough explanation of the labor supply incentives along the different sections of the EITC.

[2]Eissa and Hoynes (2004) write "the EITC is effectively subsidizing married mothers to stay home."

maternal time.

Research suggests that short birth intervals (less than 18-24 months) cause adverse birth outcomes for the younger sibling through maternal nutritional depletion (Smits and Essed, 2001; Conde-Agudelo *et al.*, 2006; Rosenzweig and Wolpin, 1988).[3] Birth spacing may also impact other child outcomes by affecting the distribution of household resources. Recent work finds that close spacing reduces economic investments children, resulting in lower educational attainment (Powell and Steelman, 1993; Black *et al.*, 2005; Buckles and Munnich, 2012).

In order to estimate the effect of the EITC on birth spacing, I use a novel regression discontinuity design in first child's birth month around the end of the year. Children born before the end of the year can be claimed as dependents on that year's tax returns, substantially increasing EITC eligibility for first time parents. Conversely, households with children born in January effectively become eligible for the EITC a year later. Recent evidence suggests that first time eligibility serves as an information shock about the credit, making the adjustment to future expected income (and associated labor market incentives) larger (Lalumia *et al.*, 2012).

Using two different datasets containing children's birth dates and fertility outcomes, I find that the EITC consistently decreases spacing between first and second children in low-

[3]Conde-Agudelo *et al.* (2006) explain in greater detail: "A plausible explanation [for the association between a short interval between pregnancies and adverse perinatal outcomes] is the maternal nutritional depletion hypothesis, which states that a close succession of pregnancies and periods of lactation worsen the mother's nutritional status because there is not adequate time for the mother to recover from the physiological stresses of the preceding pregnancy before she is subjected to the stresses of the next. This results in depletion of maternal nutrient stores, with the subsequent increased risk of adverse perinatal outcomes. The folate depletion hypothesis claims that maternal serum and erythrocyte concentrations of folate decrease from the fifth month of pregnancy onward and remain low for a fairly long time after delivery. Women who become pregnant before folate restoration is complete have an increased risk of folate insufficiency at the time of conception and during pregnancy. As a consequence, their offspring have higher risks of neural tube defects, intrauterine growth restriction, preterm birth, and LBW. Some investigators have attributed the higher risk of poor pregnancy outcomes to several factors associated with having short intervals, such as socioeconomic status, unstable lifestyles, failure to use health care services or inadequate use of such services, unplanned pregnancies, and other behavioral or psychological determinants. However, the fact that the birth spacing effects are not strongly attenuated when socioeconomic and maternal characteristics are controlled for suggests that the effects are not caused by these confounding factors." Recent studies in economics have linked nutrition *in utero* to adult health and economic outcomes (Almond *et al.*, 2011; Almond and Currie, 2011), suggesting that the impacts of close spacing on the younger child may be long-lasting. Physicians generally advise spacing of at least 18-24 months. See: `http://www.mayoclinic.com/health/family-planning/MY01691`

income households by 3-4%. Effects are concentrated among single mothers (19% decrease), whereas I find no effects for married mothers. Additionally, I find no effects on completed fertility, in line with previous research (Hoynes *et al.*, 2011). I motivate my results using a simple theoretical model in which mothers trade-off the costs of time spent out of the labor market with the health costs of close spacing.

My paper adds to recent work looking at the effects of the EITC on non-labor margins, including infant and maternal health and child test scores (Hoynes *et al.*, 2011; Evans and Garthwaite, 2010; Dahl and Lochner, 2012). Evans and Garthwaite (2010), for example, find evidence that the expansion of the EITC lowered the counts of the risky biomarkers in mothers, suggesting a reduction in maternal stress. While these papers find *positive* impacts of the EITC on maternal and child well-being, my research suggests incentivizing single mothers to enter the labor force may have *negative* impacts on their children's well-being.

This paper is organized as follows: Section 2 presents a simple framework to fix ideas; Section 3 describes the Data; Section 4 describes the Empirical Methods; Section 5 describes the Results; Section 7 considers Sorting; Section 8 concludes.

2 Framework

Below I present a simple framework in which households make spacing decisions by trading off mother's opportunity cost of time spent out of the labor market against the perceived health costs of close spacing. Mothers make wage w_t for each period t that they are in the labor market. Children require τ periods of mother's time and there are economies of scale in childrearing, so that two children spaced one year apart only require $\tau + 1$ years out of the labor force, rather than 2τ years.[4]

Because I am primarily interested in spacing, rather than completed fertility, I assume that total fertility is fixed at two births and focus on the number of months between these births. A mother has her first child in period 0 and decides whether to have her second child in period m or n. Births less than or equal to H periods apart incur health cost c and $m < H < n$. There is a time discount factor of δ. For simplicity, I assume utility is linear in

[4] More generally, two children spaced p periods apart, $p \leq \tau$, require $\tau + p$ years out of the labor force, whereas two children spaced r periods apart, $r > \tau$ require 2τ years out of the labor force.

income and the mother lives infinite time periods.

If the mother has her second child in period m, she receives the following:

$$\sum_{\tau+m}^{\infty} \delta^t w_t - c$$

If the mother has her second child in period n, she receives the following:

$$\sum_{\tau+n}^{\infty} \delta^t w_t$$

Comparing the two equations, a mother will decide to space adequately (i.e., births one and two are $> H$ periods apart) if the health costs outweigh the present discounted wage gains of additional time spent in the market , or:

$$c > \sum_{\tau+m}^{\infty} \delta^t w_t - \sum_{\tau+n}^{\infty} \delta^t w_t = \sum_{\tau+m}^{\tau+n} \delta^t w_t$$

Because the EITC increases the cost of time spent out of the labor market for single mothers (w_t), I hypothesize that it will cause a decrease in spacing between births one and two. Conversely, spacing should increase for married mothers, who face incentives to leave the labor market. Given the empirical evidence that the EITC has little or no effect on labor market participation for married mothers (compared to large increases among single mothers), however, it may be that spacing is unchanged for married mothers.

3 Data Description

To assess my hypotheses, I use three sources of data: Vital Statistics Birth Certificates from the State of Texas, the Nielsen Homescan Consumer Panel, and the American Community Survey. I choose these datasets because they include variables necessary for my identification strategy: demographics of parents and the birthdates of their children.

3.1 Texas Birth Certificates, 1990-2004

I use the universe of birth certificates issued in Texas from 1990-2004 to measure spacing between births one and two for a given mother (my outcome of interest). For each birth, the data record "month and year of [the mother's] last live birth." Therefore, I keep in the sample births of second parity *only*, as the date of the "last live birth" enables observation of months since birth one (spacing).

The variables on "month and year of last live birth" are of good quality, as they are missing only 3.0% of the time. I do not observe any stacking at certain months (such as December, the RD cut-off), years or month-year combinations. Last birth frequencies by month for 2nd parity roughly follow the seasonal pattern observed in 1st parity births (Appendix Table 2). These variables were originally collected to study child spacing and have not been widely used.

The running variable I use is the calendar month of birth of the *first* child, re-defined so that July = month 1 and June = month 12. The re-defined month is therefore centered around January (month 6), which is the cutoff for dependent eligibility. Households to the left of the cutoff (first birth December and before) may be eligible for the EITC immediately after their first birth while households to the right are not eligible until the following year. I assume that households learn about the EITC (update their understanding of maternal labor market value) when they become eligible for EITC.[5]

Finally, I keep only first and second births that are at most three years apart *and* in which the first birth is from July 1990 to June 2001. These adjustments enable me to observe the *all* possible first-second birth matches within three years of each other. I choose three years because it incorporates the spacing guidelines – marginal changes under 3 years may be more important than at higher levels.[6] In addition, I drop any birth with missing values for parity, gestation, date of last live birth, or county of residence, as these variables are used in my

[5] I also re-center the *year* of birth around January, so that, for example, children born July-December 2000 are given the same birth year as children born January-June 2001 (for both, I assign 2000 as the birth year). I then keep only observations in which the first birth is between July 1990 to June 2004, so that my sample begins at the start of the newly defined year (July) and ends at the end of the newly defined year (June).

[6] Results are similar when I use 4 or 5 years (corresponding to keeping first births from July 1990-June 2000 and July 1990-June June 1999, respectively).

analysis.[7]

Note that the birth certificates also record important variables such as mother's county of residence, maternal education, race, marital status and other demographics. An important limitation, however, of these variables is that they are recorded *at the time of the second birth* (recall that the sample contains second births only). Because marriage is likely endogenous to birth timing, I do not use this dataset to compare spacing decisions for single vs. married mothers, who face differing EITC incentives regarding labor market entry after the first birth. I do, however, use information on high school attainment, which is fixed for most mothers at time of birth.

3.2 Nielsen Homescan Consumer Panel, 2004-2009

The Nielsen Homescan Consumer Panel is a nationally representative dataset that tracks household purchases. Participants enter their purchasing information into the database using an in-home scanner. The data from 2004-2009 contain 125,000 households. For the purposes of this article, I use only the demographic data on household members, which includes birthdate, age, education, marital status, and approximate income, and drop purchasing information. Nielsen is one of the few datasets that includes year and month of birth of each household member, as well as marital status of the head of household recorded at the time of first birth.

Demographic data is recorded each year of the panel. This is important because when demographic information is recorded is not related to the timing of the second birth, as is the case in the births data. The Nielsen data also provides an important check that any results in the births data are not driven by quality problems with the "last birth" month distribution.

A drawback to having information on members of the *household* versus information on all biological children is that older children may or may not be living in the household. To focus my attention on households with younger children, I keep any household with at least two resident children under the age of 20.[8]

[7] In addition, I exclude mothers who live outside Texas (for whom I do not observe county of residence, one of my controls).

[8] More restrictive conditions, such as requiring that all resident children are under 20 cut down the already

To measure spacing between siblings within this sample, I again calculate the months between the birth date of the oldest child under 20 living in the household and the second oldest child living in the household. As with the births sample, I take the log of this measure. For maternal characteristics, I use the demographic indicators as recorded in 2004, the earliest panel year.

In order to avoid mechanical effects on spacing by older child's birth month, I proceed similarly to the TX Vital Statistics sample construction. I limit the number of months between child 1 and child 2 to 36 (three years) and drop households in which the older child is born after July 2005. This way, the last "year," re-centered around January, of oldest child's birth is July 2004-June 2005, and all younger siblings born within 3 years are observed within the span of the Nielsen panel years.[9]

3.3 American Community Survey, 2005-2011

Finally, I use the 1-in-100 American Community Survey (ACS) public use micro-sample for the years 2005-2011 to approximate completed fertility. The advantages of the ACS are, in addition to its large size, its information on demographics for members of the household roster, including birthdate, marital status and education and the fact that it has household income. The drawback is that timing of children's birth is only recorded at the quarter level.[10] For that reason, I restrict my analysis of the ACS to completed fertility, rather than birth spacing.

I approximate completed fertility by counting children living in the household. I focus on household heads ages 40-55, to get at those who have completed fertility but still have children living at home, and count children under 18. Because of the large sample size, I create a more restrictive condition than with the Nielsen data and require that all biological children on the roster are under age 18, to further avoid miscounting fertility in the case where some adult children live at home and others don't. Finally, I re-center the children's dates of birth around the end of the tax year, re-defining year of birth as starting in July

small sample size.

[9]Although data on purchases runs from 2004 to 2009, the demographic variables are recorded for the *previous* year, so the "household demographics" dataset essentially runs from 2003-2008.

[10]Given evidence on the seasonality of birth outcomes and parental characteristics (Buckles and Hungerman, 2008), it is more difficult to draw inferences based on birth timing.

(Q3) of a given year and ending in June (Q2) of the next year.[11]

3.3.1 Simulating Tax Liability in the ACS

An important benefit of the ACS is that it contains individual level household income and I can add another dimension to the analysis by simulating tax liability. Note that households with qualifying dependents file for several different tax benefits besides the EITC. These include the dependent exemption, the Earned Income Tax Credit (EITC), and the Child Tax Credit (CTC). Table 1 gives eligibility rules, award amounts and a brief history of these benefits. Most low-income households will only benefit from the EITC and CTC since they have no tax liability. In any case, the CTC and dependent exemption do not affect the predictions of my spacing model because they function as a lump-sum transfer, rather than a wage subsidy. These lump sum transfers may have income effects on completely fertility, however, which I will test below.[12]

I calculate tax liability and/or credits associated with an additional dependent child well as marginal tax rate of ACS households in my sample using NBER's TAXSIM program (Feenberg and Coutts, 1993). To calculate changes in tax liability, I first duplicate each household observation, adding a child (dependent) to the second observation. I then calculate income tax liability for each observation using marital status, number of children and household income.[13] I subtract tax liability for the first observation from the second observation; this gives me the tax "gain" associated with claiming an additional dependent. If there are income effects on fertility of tax credits, the fertility effects should increase with the amount of the tax gain. The average per-year tax gain of an additional dependent for female head of households with a high school diploma or less (low-income, single mother households, who receive the largest EITC credits) in my sample is \$2,140.39.

[11] Because there may be mechanical effects on the "number of children" observed by first child's birth month, given the observation period has the same deadline for everyone, it is important the I incorporate another source of variation – EITC return amount – in this analysis. An alternative method would be to create a standardized interval over which completed fertility is recorded for each household, based on the birth month of the first child (and controlling for the age of the parents). Such a process is computationally involved and the resulting standardized completed fertility counts may still be subject to mechanical effects.

[12] Although a one year delay in credit receipt – which is low compared to the lifetime cost of a child — may not affect overall fertility, if we assume that receipt of these credits function as an information shock, then it is plausible that overall fertility may be affected

[13] I assume married women file jointly; unmarried, childless women file as singles; and unmarried women with children file as head of household.

3.4 Summary Statistics

In Table 1, I present summary statistics for the three different datasets. Recall that the running variable in my analysis is month of birth of the first child, re-centered so that July= month 1 and January of the following year = month 6. Table 1 shows that half (51-52%) of first children are born before January, as expected.

My outcome variable is number of months between the first and second births — Table 1 shows the average is 23.78 and 24.62 months in the births and Nielsen data, respectively.[14] Note that the standard errors imply a spacing of 15 months at the 90th percentile for both samples, well under the recommended spacing of 18-24 mos. on the lower end of the distribution.[15][16]

The samples differ in demographics of the parent or head of household. The Texas births sample is of relatively lower socioeconomic status, with 67.1% of mothers having a high school education or less, vs. 17.8% and 17.0% in the Nielsen and ACS, respectively. These differences are likely due to 1) differences between Texas and a nationwide sample; 2) the fact that Nielsen samples relatively higher SES households; and 3) the restrictions I put on the ACS households (parents aged 40-55, all co-resident children under age 20). Therefore, comparisons should be treated with some caution.

4 Empirical Design

I estimate a regression discontinuity in birth month of the first child. The cut-off is January, as children born before January warrant an EITC refund one year earlier. If we assume that month of childbirth within a few months is difficult to control, then the start date for EITC (this year or next year) can be thought of as randomly assigned among households with first children born around the December threshold.

In addition, I am assuming that households learn about the EITC when they first become

[14] Months between births is not observed in ACS.

[15] Both standard errors are about 7, implying 24-7*1.28=15.

[16] One factor mitigating conception postpartum (i.e., close spacing) is that women may experience temporary infertility if they exclusively breastfeed. Effects may last up to 6 months, but only around 10% of women are exclusively breastfeeding at 6 months in the U.S. from 2003-2005. Sources: `www.plannedparenthood.org/health-topics/birth-control/breastfeeding-4219.htm` and `www.cdc.gov/breastfeeding/data/nis_data/`.

eligible. A concrete example in the case of single mothers: suppose that single mothers whose first child is born in December and January plan to space their second child adequately (at least 18-24 months apart). The December mother learns about the EITC first and reduces the interval below 18, to "inadequate" spacing, in order to limit time out of the labor market. The second child is then conceived before the "January" mother learns about the EITC and updates their information about the cost of time out of the labor market.

The regression specification I use with the Texas births and Nielsen data is the following:

$$\ln Months_1 to2_h = \alpha + \beta birth1beforeJan_h + \gamma f(m) + \Theta' Controls_h + \nu_y + \rho_g + \epsilon_h \qquad (1)$$

where $\ln Months_1 to2$ is the log of months between births 1 and 2, h indexes the household, m denotes month of the first birth in linear form and re-centered around January and y denotes the year of first birth (also re-centered around January, so that July-June consists of one year); g denotes location of mother's residence (state for Nielsen and ACS and TX county for births). ν_y are year fixed effects, ρ_g are location fixed effects and $Controls_h$ is a vector of household controls including indicators for head of household's age, race and Hispanic ethnicity as well as the panel year (Nielsen only). Standard errors are clustered on the relevant geographic level (state or county).

This regression discontinuity design (RD) identifies a causal effect by comparing households on either side of the cut-off (January), assuming there is no systematic sorting around the cut-off. There is some evidence that the timing of previous births may be manipulated through c-section and induction of labor, although recent estimates show that any effects are tiny (Lalumia *et al.*, 2012). I discuss this issue in more detail in the last section.

Second, I estimate Equation 2 to test whether there are effects on completed fertility, using the ACS sample:

$$\begin{aligned}\ln Fert_h = \alpha + \beta birth1beforeJan_h * gain_h + \phi birth1beforeJan_h + \psi gain_h + \gamma f(q) \\ + \Theta' Controls_h + \nu_y + \delta_s + \rho_g + \epsilon_h\end{aligned} \qquad (2)$$

where $Fert_h$ is the total children in the household as defined in my sample; $gain_h$ is the estimated tax savings of claiming an additional dependent; q and y denote quarter and year of the oldest child's birth (re-centered around January), respectively, and g stands for state of residence of the household. Standard errors are clustered on state of residence.[17]

I first test my identifying assumption that households are not sorting around the RD cut-off. Figure 2 plots average maternal characteristics by month of birth of first child, using the births sample.[18] Clearly, maternal characteristics vary greatly by birth month, and there are strong seasonal trends, which is known from previous research (Currie and Schwandt, 2013). However, discontinuities between December to January are not seen in these characteristics, lending support for my identification design.

5 Results

Similarly, Figure 3 plots average log months from first to second child against first child's birth month using the births sample. The averages have been demeaned so that average for December = 0.[19] As predicted, space between first and second child is lowrr among households which receive the EITC immediately after the first birth (first child is born December and before), by about 1%.[20]

Next, I estimate the RD specification (Eq. 1). I include in my regressions flexible specifications of $f(month)$, the control function in first child's birth month. In particular, given the strong seasonal effects seen in Figure 2, I include fixed effects for season of first birth.[21] Based on Figure 3, which shows differently sloped trends on either side of January, I also include a linear trend interacted with an indicator for "after January."

Tables 2-5 present results from estimating Eqs. 1-2. In Table 2, I show the results of estimating Equation 1 on the Texas birth certificate sample. Overall, mothers whose first

[17] Regarding $\ln Fert_h$: note that because my running variable is birth month of first child, households in the sample must have at least one child in the ACS sample, so total fertility in my sample is never 0, and the log is defined everywhere

[18] Averages of categorical variables are demeaned so that the graphs center around 0.

[19] This method makes it easier to measure the percentage increase from December to January.

[20] Note that spacing trends downward a bit for first births after January. The later a mother has her first birth after January, the sooner she will start receiving the EITC (and associated disincentive to spend time out of the labor force) relative to the birth of her first child, so I would expect this decrease in time to second child to decrease with months from January.

[21] Codes for season of first birth are as follows: 1 = December, January, February, 2 = March, April, May, 3=June, July, August, 4= September, October, November.

child is born before January tend to have their second birth more quickly. The results show a 2.7% reduction in months to the second birth for these mothers[22], which is robust to the inclusion of county fixed effects.[23] The result appears to be completely driven by low-education mothers, i.e. those eligible for the EITC, as we would expect (3.4% reduction in spacing).

Recall that some maternal demographic indicators in the Texas births data are potentially endogenous to spacing because they are measured at the time of the second birth — in particular, marital status is problematic. Therefore, I use the Nielsen sample to compare results on spacing between married and single mothers. I hypothesize that mothers who are single at the time of their first birth (and therefore incentivized by the EITC to enter the labor market) will reduce spacing in response to the EITC. For married mothers, the effect on spacing should be the opposite (an increase), although given empirical evidence that the labor supply response among married mothers is small or zero, it may be that their fertility behavior is also unchanged.

Table 3 presents analogous results to Table 2 using Nielsen data. Table 3 shows effects of a similar magnitude to those from the births sample (1.2% for the whole sample, 3.4% for mothers with a high school education or less), but none are significant. Note that the coefficient on the interaction between first birth month (linear) and the RD cut-off is not significant, suggesting no change in slope on either side of the RD.

Table 4 replicates Table 3, dropping from the control function the interaction between the linear trend and the RD cutoff (season fixed effects are retained). Now the coefficients are of a similar magnitude and precision as those in Table 2. Overall, having the first birth before January is associated with a 1.7% reduction in months to the next birth (3.9% among low-education mothers). Strikingly, these effects are driven by the sample of households in which the head of household is single at the birth of the first child, where we see a 19.3% reduction in birth spacing. This decrease would reduce the average spacing in the Nielsen sample from 24.6 months (adequate spacing) to 19.68 months (inadequate by some guidelines)[24]

[22] Recall the outcome measure is in logs.

[23] In general, the regression results in Table 2 are quite robust to different formulas for $f(month)$ and county-specific linear time trends (results not shown).

[24] Recall that medical guidelines advise spacing of at least 18 to 24 months).

The result for married, low-education households is not significant.

Given the large decreases in spacing for single mothers, I would expect negative impacts on the health outcomes of their second child, following medical studies discussed above which show that small birth intervals cause insufficient folate levels among mothers during the second pregnancy. Appendix Table 3 tests this hypothesis using the Texas births sample. Note that the breakdown by married and single is problematic because of possible bias in this variable discussed above, so the results should be treated with caution. Although the results are not significant in the full sample, it appears that EITC receipt increases health at birth among married mothers, which follows recent research (Hoynes *et al.*, 2011), while the coefficient for single mothers is positive (but not significant). This evidence suggests that the protective effects of income on infant health may not extend to cases in which income support incentivizes mothers to increase labor market attachment.

Finally, I test whether being able to claim the an extra dependent immediately after the birth of a household's first child (rather than one year later) affects fertility overall, rather than just spacing. Table 4 presents results of estimating Eq. 2 on the sample of household heads aged 40-55.[25] There appears to be no effect on completed fertility. The coefficients on β are inconsistently signed and very imprecise. These results are in line with previous research showing no effects of the EITC on completed fertility (e.g. Hoynes *et al.* (2011)).

6 Shifting Births Across the Tax Year

I consider whether my results may be affected by households shifting births across the end of the tax year. It is possible that potential tax savings motivate households to shift births back from the first week in January to the last week in December through elective procedures such as c-section or labor induction (Dickert-Conlin and Chandra (1999); Lalumia *et al.* (2012)). This sort of behavior could produce stacking of births in December or shifts in the type of mothers giving birth from January to December–in other words, there would sorting around the RD cut-off I use.

The most recent evidence on shifting shows very small or no effects. Lalumia *et al.* (2012) use the universe of tax returns from 2001 and 2010 and find that an additional $1,000 of

[25] Results are consistently imprecise across all 5, 10, 15, 20 and 25 year subsets of ages 35-65.

tax savings is associated with a 1% increase in births in the last week of December. The authors conclude: "Our results cast doubt on the hypothesis that, over the last decade, large numbers of parents have strategically shifted the timing of childbirth in response to tax incentives."[26]

Further, if birth shifting were affecting my analysis, I would expect to see a difference in my outcomes in December and January only from the other months (January should have fewer births, December should have more; mothers should be relatively uniform in other months). Instead, Figure 1 shows that spacing remains higher to the right of January and that spacing is lower for all months to the left of December. I also test for stacking in births in December versus January. Appendix Figure 2 graphs first parity births increase of December over January birth sums, overall and for mothers with less than a high school education (Lalumia *et al.* (2012) also note this).

7 Conclusion

The economics literature suggests that the EITC greatly increased the participation of low-income single mothers in the labor force and also confers health and educational benefits on their children. However, to the extent that the EITC encourages single mothers to enter the labor force, it is possible that it reduces time spent with their children. In my article, I hypothesize that, if there are economies of scale in childrearing, the EITC will encourage single mothers to decrease spacing between their children to limit time out of the labor market. Inadequate spacing between children may reduce health and educational outcomes.

I evaluate this hypothesis using a novel RD which compares low-income households which give birth to their *first* child before the new year (qualifying immediately for the EITC) to those who give birth in January (qualifying on the next year's tax returns for the EITC). To the extent that qualifying for the EITC for the first time functions as an information shock,

[26]The tax benefits may not offset of the cost of the elective procedures needed to shift births. Lalumia *et al.* (2012) write: "Data from the Healthcare Cost and Utilization Project carried out by the Agency for Healthcare Research and Quality indicate that, in 2010, the mean charge for vaginal delivery was $10,166 while the mean charge for a cesarean delivery was $17,052. Data are available at http://hcupnet.ahrq.gov. Naturally, insurance can shield a patient from paying this cost difference out-of-pocket." In addition, shifting of births has not been observed for other, comparably large financial margins for which there is a birthdate cut-off, such as kindergarten entrance, which generates childcare savings (Dickert-Conlin and Elder, 2010).

as recent work on the EITC shows, the December households will update their expected value of labor market time one year earlier. For single mothers, I expect that the time to their second child will decrease in response to the EITC incentives.

Across two different datasets with information on birth timing and maternal demographics, I find that earlier receipt of the EITC following birth one is associated with a 3-4% decrease in months to birth two. Effects are concentrated among single mothers, as expected, who reduce time by 19%, well under recommended spacing. There are no effects for higher SES mothers or low SES married mothers.

My paper sheds light on some of the trade-offs regarding welfare to work policies on family formation. In particular, by incentivizing single mothers to enter the workforce and married mothers to stay at home, the EITC may cause inequality in parental time investment between these households.

References

Almond, D. and Currie, J. (2011). Human capital development before age five. In O. Ashenfleter and D. Card (eds.), *Handbook of Labor Economics*, vol. 4, Elsevier, pp. 1315–1486.

—, Mazumder, B. and van Ewijk, R. (2011). *Fasting During Pregnancy and Children's Academic Performance*. NBER Working Papers 17713, National Bureau of Economic Research, Inc.

Black, S. E., Devereux, P. J. and Salvanes, K. G. (2005). The more the merrier? the effect of family size and birth order on children's education. *The Quarterly Journal of Economics*, **120** (2), 669–700.

Buckles, K. and Hungerman, D. M. (2008). *Season of Birth and Later Outcomes: Old Questions, New Answers*. NBER Working Papers 14573, National Bureau of Economic Research, Inc.

Buckles, K. S. and Munnich, E. L. (2012). Birth spacing and sibling outcomes. *Journal of Human Resources*, **47** (3), 613–642.

Conde-Agudelo, A., A, A. R.-B. and Kafury-Goeta, A. (2006). Birth spacing and risk of adverse perinatal outcomes: a meta-analysis. *JAMA*, **295** (15), 1809–23.

Currie, J. and Schwandt, H. (2013). Within-mother analysis of seasonal patterns in health at birth. *Proceedings of the National Academy of Sciences*, **110** (30), 12265–12270.

Dahl, G. B. and Lochner, L. (2012). The impact of family income on child achievement: Evidence from the earned income tax credit. *American Economic Review*, **102** (5), 1927–56.

Dickert-Conlin, S. and Chandra, A. (1999). Taxes and the timing of birth. *Journal of Political Economy*, **107** (1), 161–177.

— and Elder, T. (2010). Suburban legend: School cutoff dates and the timing of births. *Economics of Education Review*, **29** (5), 826–841.

Eissa, N. and Hoynes, H. (1998). *The Earned Income Tax Credit and the Labor Supply of Married Couples*. NBER Working Papers 6856, National Bureau of Economic Research, Inc.

— and Hoynes, H. W. (2004). Taxes and the labor market participation of married couples: the earned income tax credit. *Journal of Public Economics*, **88** (9-10), 1931–1958.

— and Liebman, J. B. (1996). Labor supply response to the earned income tax credit. *The Quarterly Journal of Economics*, **111** (2), 605–37.

Evans, W. N. and Garthwaite, C. L. (2010). *Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health*. NBER Working Papers 16296, National Bureau of Economic Research, Inc.

Feenberg, D. and Coutts, E. (1993). An introduction to the taxsim model. *Journal of Policy Analysis and Management*, **12** (1), 189–194.

Hoynes, H., Miller, D. and Simon, D. (2011). Income, the earned income tax credit, and infant health, mimeo, U.C. Davis.

Lalumia, S., Sallee, J. and Turner, N. (2012). New evidence on taxes and the timing of birthÓ.

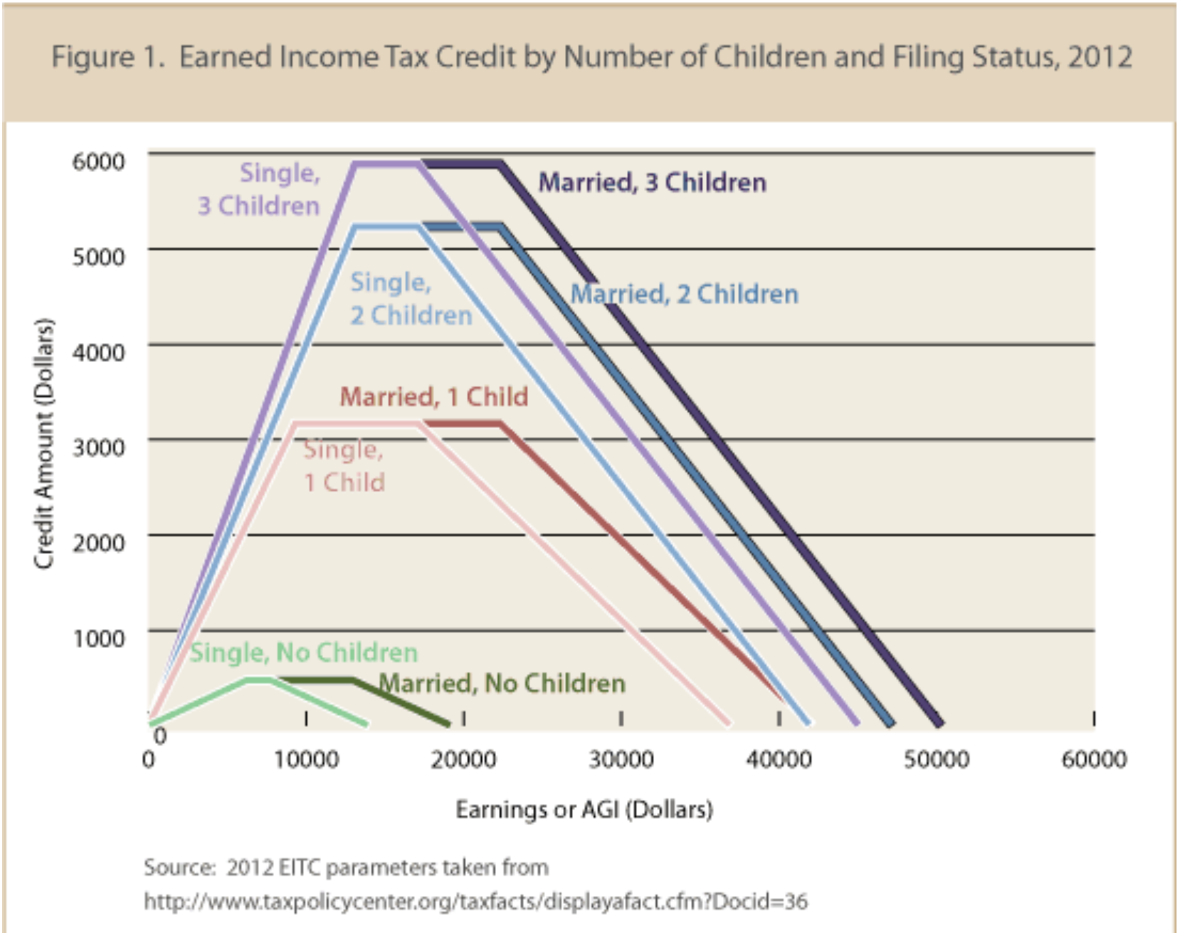
Meyer, B. D. and Rosenbaum, D. T. (2001). Welfare, the earned income tax credit, and the labor supply of single mothers. *The Quarterly Journal of Economics*, **116** (3), 1063–1114.

Powell, B. and Steelman, L. C. (1993). The educational benefits of being spaced out: Sibship density and educational progress. *American Sociological Review*, **58**, 367–381.

Rosenzweig, M. and Wolpin, K. (1988). Heterogeneity, intrafamily distribution, and child health. *Journal of Human Resources*, **23** (4), 437–461.

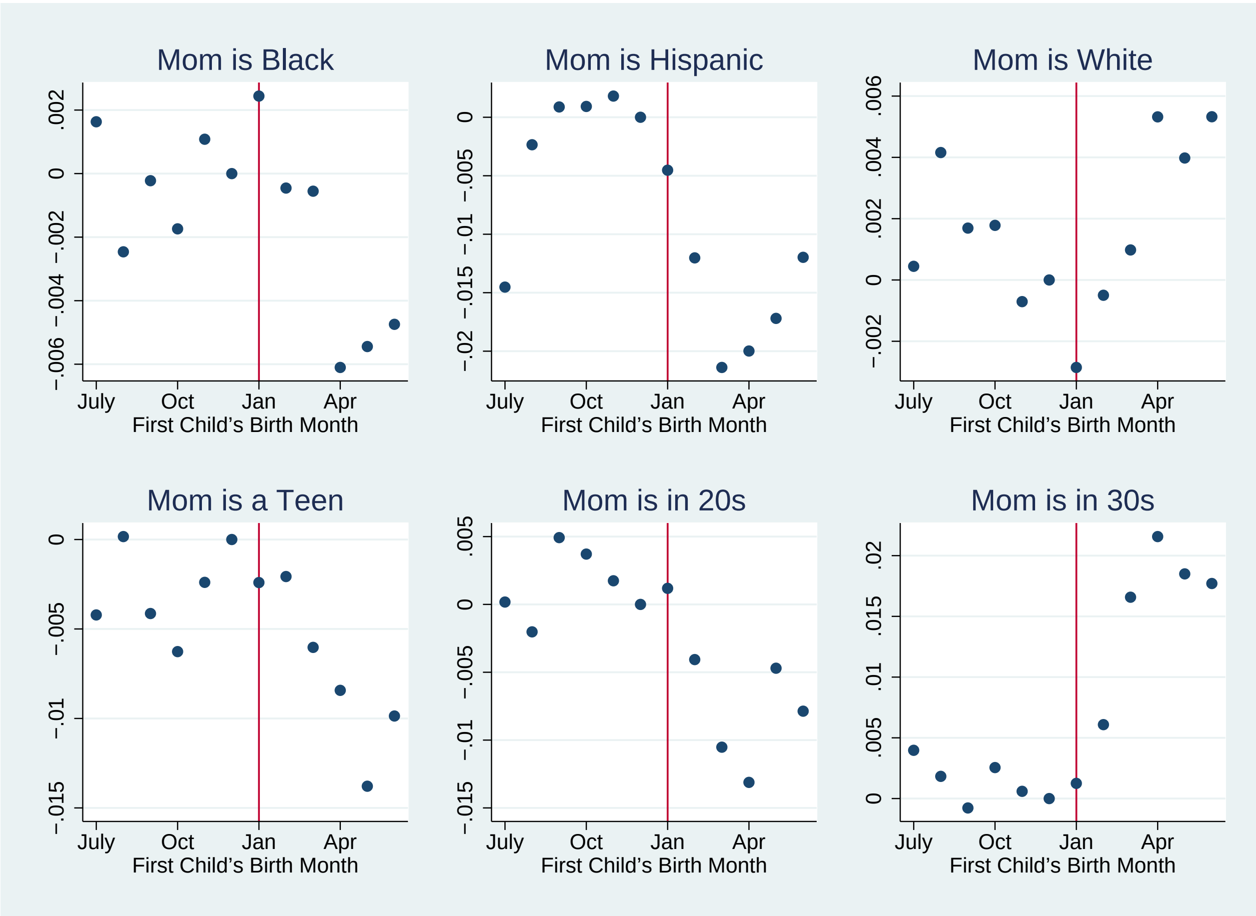
Smits, L. J. and Essed, G. G. (2001). Short interpregnancy intervals and unfavourable pregnancy outcomes: Role of folate depletion. *Lancet*, **358** (9298), 2074 Ð2077.

Figure 1: Federal EITC Schedule, 2012



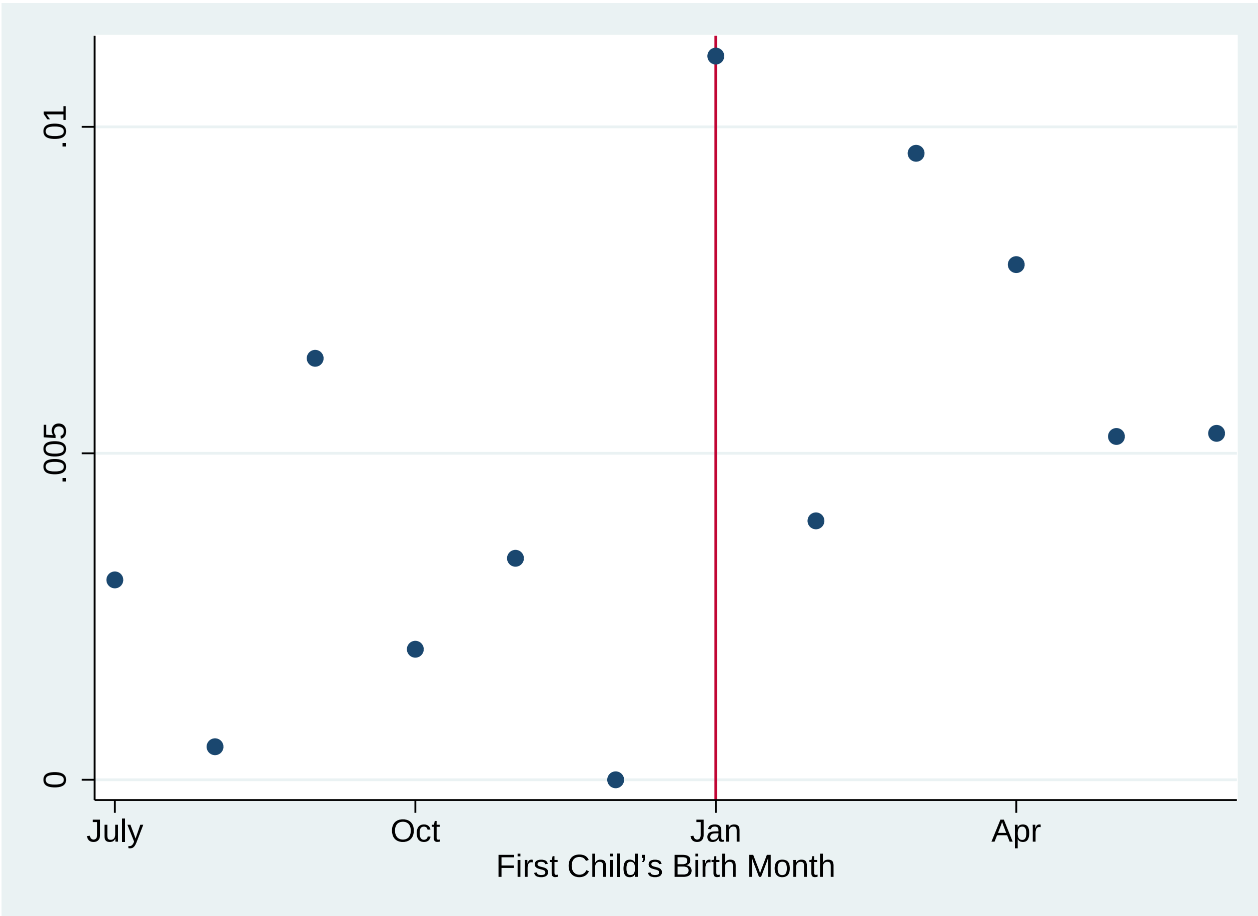
Notes: Source is Center on Budget and Policy Priorities `www.cbpp.org`

Figure 2: 1st Birth Timing and Mother Characteristics: Texas 1990-2004



Notes: The sample contains the universe of 2nd parity births in Texas from 1990-2004 within three years of the first birth. The graph shows the demeaned averages (with respect to December) of maternal characteristics by first child's birth month.

Figure 3: 1st Birth Timing and Birth Spacing: Texas 1990-2004



Notes: The sample contains the universe of 2nd parity births in Texas from 1990-2004 within three years of the first birth. The graph shows the demeaned averages (with respect to December) of log months between births 1 and 2

Table 1: Summary Statistics

	TX Births: 1990-2004	Nielsen Sample, 2004-2009	ACS, 2005-2011
EITC (First Child Born < Jan)	0.5196	0.5226	0.5137
Months b/w Child 1 and 2			
Median	24	25	-
Average	23.7783	24.6160	-
	(7.1405)	(6.7610)	-
Total Children in HH	-	2.6516	1.8009
	-	(0.9157)	(0.8436)
Parent Demographics			
LTHS	0.3116	0.0177	0.0725
HS	0.3598	0.1709	0.0978
Some College	0.1055	0.2905	0.2942
College+	0.2140	0.5209	0.4221
Married	0.7544	0.8891	0.7777
White	0.8589	0.8192	0.7447
Hispanic Origin	0.4139	0.0938	0.1006
Households	549,649	7,455	900,036

Notes: The Texas births sample contains the universe of 2nd parity births to mothers living in Texas from 1990-2004, which occur within three years of the first parity birth. Maternal demographics are measured at the time of second birth. The Nielsen sample contains households 2004-2009 with at least two children (< age 20) three years apart or less. The ACS sample contains households from 2005-2011 where the head of household is 40-55 and all resident children are under age 20. In the ACS and Nielsen sample, "first" child refers to the oldest resident child and demographics are measured with respect to the head of household. Nielsen head of household demographics are measured in the last year the household appears in the sample. "-" indicates that the variable is not measured in the given dataset

Table 2: Effect of the EITC on Spacing, Texas births 1990-2004

	(1)	(2)	(3)	(4)
1st Birth < Jan	-0.0265***	-0.0266***	-0.0340*	-0.0082
	(0.0092)	(0.0092)	(0.0180)	(0.0149)
1st Birth Month	-0.0023***	-0.0023***	-0.0033**	-0.0007
	(0.0007)	(0.0007)	(0.0014)	(0.0012)
1st Birth Month * (< Jan)	0.0025*	0.0025*	0.0033	-0.0005
	(0.0014)	(0.0014)	(0.0026)	(0.0021)
N	549,597	549,597	368,980	180,617
County FE		Yes	Yes	Yes
Sample	All	All	<= High School	> High School

Notes: The outcome is log of the number of months between a mother's first and second birth. The sample contains the universe of 2nd parity births from 1990-2004 to mothers residing in Texas which occur three years of the preceeding (first) birth. Mother's demographics are measured at the time of second birth. Specifications control for these maternal demographic indicators: black, white, Hispanic ethnicity, teenage, 20-29, 30-39, less than high school, high school, some college, college or advanced degree. Specifications also include fixed effects for season of 1st birth, year of 1st birth re-centered around January, and county of mother's residence at time of birth. Standard errors are clustered on county of residence. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Effect of EITC on Spacing, Nielsen Consumer Panel, 2004-2009

	(1)	(2)	(3)	(4)
EITC (1st Birth < Jan)	-0.0122	-0.0109	-0.0341	-0.0094
	(0.0141)	(0.0143)	(0.0442)	(0.0161)
1st Birth Month	0.0070	0.0086	0.0067	0.0091
	(0.0064)	(0.0064)	(0.0164)	(0.0062)
1st Birth Month	-0.0137	-0.0163	-0.0126	-0.0182
* (< Jan)	(0.0112)	(0.0111)	(0.0280)	(0.0114)
N	7,455	7,455	1,405	6,050
State FE		Yes	Yes	Yes
Sample	All	All	<= High School	> High School

Notes: The Nielsen sample contains households 2004-2009 with at least two children (< age 20) three years apart or less. "EITC" refers to the fact that the oldest child under 20 in the household was born in or before December, so that the household starts receiving the EITC a year earlier. All specifications control for the following demographics of the head of household (measured in last year of sample): white, black, Oriental, other, Hispanic Origin, grade school, less than high school, high school, some college, college, advanced degree, below age 25, 25-29, 30-39, above 39. Head of household is assumed to be male unless only a female head of household exists for the household. In addition, all specifications control for season of first birth, year of first birth re-centered around January, and county of residence. Subsamples by education and marital status are defined with respect to the earliest year a head of household appears in the Panel. Standard errors cluster on county of residence. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Effect of EITC on Spacing, alt. spec., Nielsen Consumer Panel, 2004-2009

	(1)	(2)	(3)	(4)	(5)	(6)
EITC (1st Birth < Jan)	-0.0163+	-0.0174**	-0.0394	-0.0137	-0.1937**	-0.0261
	(0.0084)	(0.0085)	(0.0278)	(0.0093)	(0.0736)	(0.0257)
N	7,455	7,455	1,405	6,050	209	1,196
County FE		Yes	Yes	Yes	Yes	Yes
Sample	All	All	<= High School	> High School	<=HS, Single	<=HS, Married

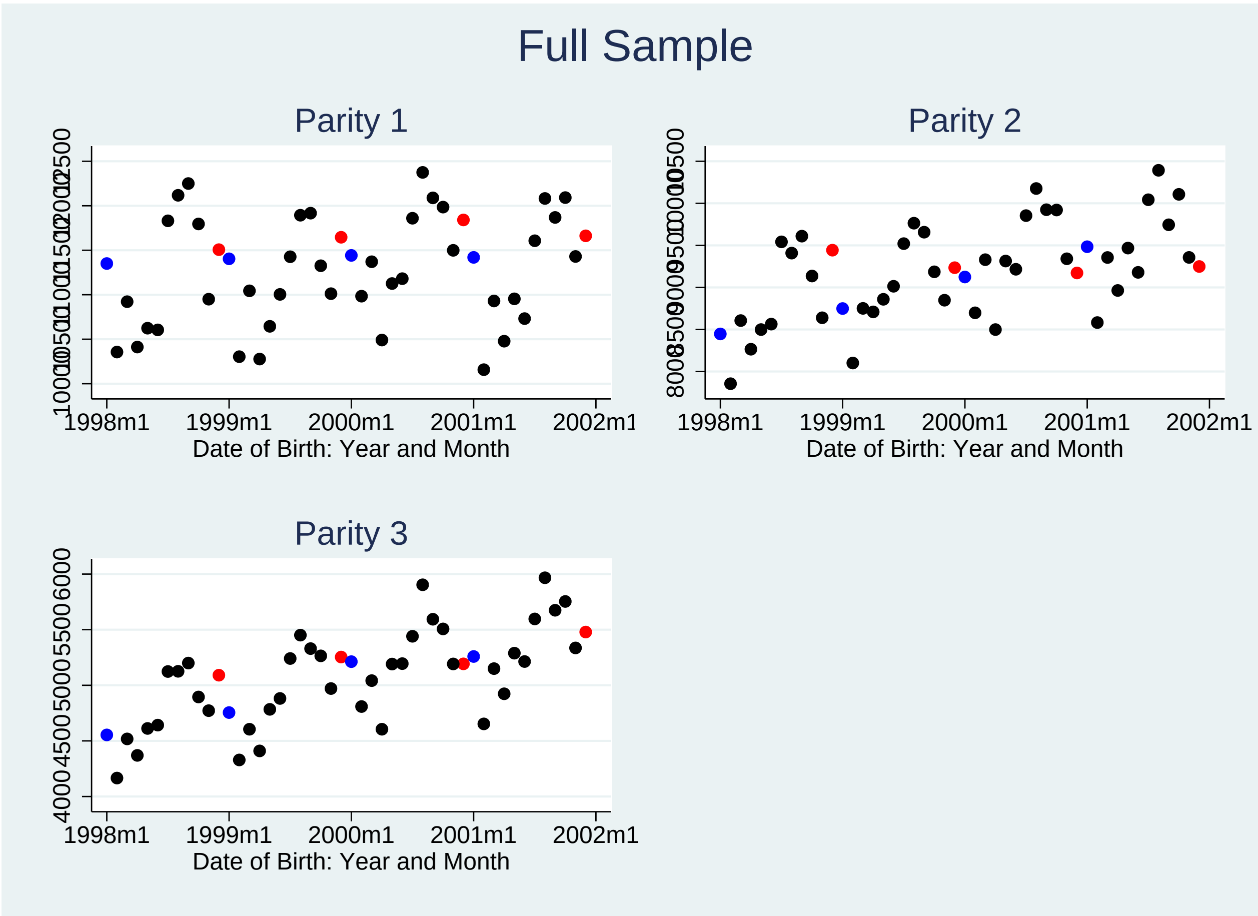
See notes to previous table.

Table 5: The EITC and Completed Fertility, American Community Survey, 2005-2011

Eligible*Gain	-0.0001	0.0008	0.0001	-0.0006
	(0.0009)	(0.0020)	(0.0032)	(0.0011)
Eligible	0.0210+	0.0159	0.0078	0.0240+
	(0.0108)	(0.0216)	(0.0325)	(0.0125)
Gain	-0.0095***	-0.0288***	-0.0264***	0.0008
	(0.0016)	(0.0032)	(0.0030)	(0.0017)
No. Obs	896175	151973	42839	643040
R2	0.1627	0.1454	0.0889	0.1712
f(Month of Prev. Birth)	Linear	Linear	Linear	Linear
Mom's Education	All	<=HS	<=HS, Single	>= Some Coll.

Each column is from a separate regression and contains estimates of from Equation 2. The outcome is the log total number of children living in the household. The sample consists of all households in the ACS, 2005-2011, in which the head is between ages 40-55 and all children in the household are under age 20. The level of observation in the sample is the household unit. All specifications control for state, season, year and quarter fixed effects, as well as state specific linear year trends. In addition, the following are included as controls: indicators for race, marital status, sex, age and Hispanic ethnicity of the head and the survey year. Specifications include a linear control function in quarter of previous birth. Year and quarter of first childÕs birth are re-centered around Q1, as described in the text. Standard errors are clustered on the state level. + significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Figure 1: Birth Counts by Birth Month and Parity



Sample is drawn from the universe of conceptions of parity 2, 3, and 4 linked to a birth certificate issued in Texas from 1990-2004. Any observations with missing information on gestation or date of previous birth are dropped. Red indicates December births, blue indicates January births.

Appendix Table 1: Tax Transfers Available to Households with Qualifying Dependents

Name	Refundable?	Amount	Dep. Age	Eligibility	Brief History
Dependent Exemption	No	$3,800	0-18	Households must file income taxes to be eligible.	Created in 1913, the dependent exemption was originally worth $3,000, or $66,367 in 2011$, compared with only $3,700 in 2011. By some calculations, it was the largest federal tax expenditure on children until the end of the 1960s. It subsequently declined greatly in value, as it was unadjusted for inflation until 1984.
Earned Income Tax Credit (EITC)	Yes	Max credit increases by $2,694 with first child; by $2,067 with second child; by $655 for the third child	0-19	The income limit is $50,270. The credit varies by income, family size, filing status and other factors.	The EITC began in 1975 as a small program and expanded dramatically through three tax acts: the 1986 Tax Reform Act (TRA86) and the Omnibus Reconciliation Acts of 1990 and 1993 (OBRA90, OBRA93). Today, these refunds can be quite large; for example, among families with two or more children,the average credit in 2008 was $2,563.
Child Tax Credit (CTC)	Partially	$1,000	0-17	Full credit is available for houseolds with incomes under $110,000. Partial credit for those with incomes from $110,000 to $130,000	The CTC was created in 1997 and worth $400 per child. Expanded in 2001 and 2009, it is now worth $1,000 per child.

Eligibility rules, descriptions and amounts are given as of tax year 2012. Rules pertaining to yearly income limits, qualifying age ranges and household size measure these outcomes as of December 31st of the previous year (the tax year). This table excludes an additional tax benefit available to households with dependents: the Dependent and Child Care Credit. The age range for dependents is not measured at the end of the year for this benefit, so its effects are no identified in my research design. For more information on precise eligibility rules, exceptions, benefit amounts and their history, please see: `http://www.taxpolicycenter.org/briefing-book/key-elements/family/index.cfm` and `http://www.irs.gov/uac/A-"Qualifying-Child"`

Appendix Table 2: Current and Previous Birth Month Frequencies, 2nd Parity Births

	2nd Child's Birth Month		1st Child's Birth Month		Months b/w 1 and 2
	Freq.	Percent	Freq.	Percent	Avg.
January	44,777	8.15	46,525	8.46	23.91
February	41,524	7.55	41,619	7.57	23.73
March	46,097	8.39	44,749	8.14	23.87
April	44,104	8.02	42,640	7.76	23.82
May	45,968	8.36	44,347	8.07	23.78
June	44,996	8.19	44,192	8.04	23.79
July	48,601	8.84	47,288	8.6	23.74
August	48,963	8.91	48,526	8.83	23.70
September	48,103	8.75	48,316	8.79	23.83
October	46,978	8.55	47,772	8.69	23.74
November	44,118	8.03	45,848	8.34	23.76
December	45,420	8.26	47,827	8.7	23.68
Total	549,649	100	549,649	100	

The Texas Births sample contains the universe of 2nd parity births from 1990-2004 within three years of the first birth. "Parent Demographics" in the TX sample are measured for the mother at the time of the second birth.

Appendix Table 3: Effect of EITC on Low Birth Weight of 2nd Child, TX 1990-2004

	(1)	(2)	(3)	(4)	(5)	(6)
1st Birth < Jan	-0.0077	-0.0078	-0.0087	-0.0034	0.0084	-0.0175*
	(0.0059)	(0.0059)	(0.0078)	(0.0064)	(0.0122)	(0.0093)
1st Birth Month	0.0005	0.0005	0.0007	0.0001	0.0001	0.001
	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0011)	(0.0006)
1st Birth Month	-0.0011	-0.0011	-0.0013	-0.0003	0.0006	-0.0023*
* (< Jan)	(0.0008)	(0.0008)	(0.0011)	(0.0009)	(0.0018)	(0.0013)
N	549,597	549,597	368,980	180,617	125,704	242,919
County FE		Yes	Yes	Yes	Yes	Yes
Sample	All	All	<= High School	> High School	<=HS, Single	<=HS, Married

The sample contains the universe of 2nd parity births from 1990-2004 within three years of the preceeding (first) birth. Mother's demographics are measured at the time of second birth. Specifications control for these maternal demographic indicators: black, white, Hispanic ethnicity, teenage, 20-29, 30-39, less than high school, high school, some college, college or advanced degree. Specifications also include fixed effects for season of 1st birth, year of 1st birth re-centered around January, and county of mother's residence at time of birth. Standard errors are clustered on county of residence. * significant at 10%; ** significant at 5%; *** significant at 1%