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Tots and Teens: How does Child's age Influence Maternal Labor Supply and Child Care Response to the Earned Income Tax Credit?

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Abstract:

Building on earlier work that shows that the Earned Income Tax Credit (EITC) has a substantial positive effect on maternal labor supply, we show that labor supply effects are concentrated among mothers with children under age three, with only moderate effects of the EITC on the labor supply of mothers with teenagers. These increases in labor supply are coupled with large increases in the use and cost of child care among mothers with children under age three. Results highlight the importance of considering heterogeneous treatment effects of policy and have implications for child care policy and other family policy.

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Early childhood (birth through age five) is widely recognized as a critical developmental period when important brain, social, and other foundational capabilities are developed (Shonkoff and Phillips 2000). It is also a time when poverty can have especially detrimental impacts on children through poorer brain development (Hair et al 2015; Noble 2015a, 2015b) and lower school readiness (e.g., Duncan et al. 2012). Interventions and policies that increase income in early childhood are particularly effective and have long lasting positive effects on child wellbeing (e.g. Heckman and Carneiro 2003; Duncan, Morris and Rodrigues 2011; Baker, Gruber and Milligan 2019). However, child poverty rates, and in particular, early childhood poverty rates, remain high in the U.S. Twenty-two percent of infants and toddlers are poor, compared to 16% of teenagers (authors' calculations, 2018 American Community Survey).

These high rates of poverty have prompted calls for efforts to reduce poverty in early childhood. As the U.S. has shifted away from direct cash assistance programs like Temporary Assistance for Needy Families (TANF) toward refundable work-contingent tax credits like the Earned Income Tax Credit (EITC), several proposals have called for expanding these tax credits for families with young children (West, Boteach and Vallas 2015; Garfinkel et al. 2016; Maag and Isaacs 2017; Shaefer et al. 2018). In 2016, Oregon became the first state to implement a more generous EITC for families with children under age three, and in 2019, California created a more generous credit for EITC-eligible families with children under age six.

Despite interest in expanding tax credits for families with young children, little research has considered how existing credits might affect families with young children differently than families with older children. Although many studies show that the expansions to the EITC in the 1990s had a positive impact on the labor supply of single mothers (Eissa and Liebman 1996; Ellwood 2000; Meyer and Rosenbaum 2001; Hoynes and Patel 2018; although for an exception, see Kleven 2019), the literature has largely overlooked how labor supply responses differ for mothers with very young children compared to mothers with older, school-aged children.[2]

This is surprising, given that the EITC is contingent on work (unlike unconditional assistance programs like food stamps, or parental leave, which is often conditioned on staying *out* of the labor force), and maternal employment is patterned by the ages of her children. Mothers with very young children likely face more constraints or different preferences for work, which may make them less responsive to tax incentives. On the other hand, mothers with young children may be more responsive to tax credits because mothers with older children are likely closer to full employment levels than mothers with young children, who historically have had lower labor supply. Thus, it is theoretically ambiguous how expansions to the EITC affect maternal labor supply differentially among mothers with young children compared to mothers with older children. It is especially important to consider heterogeneity in maternal labor supply response by child's age, as maternal employment affects income, time, and child care use – key factors that affect child development (Cunha and Heckman 2007), particularly when children are young (Baum 2002; Duncan, Magnuson and Votruba-Drzal 2017; Waldfogel 2006).[3]

This study extends our understanding of the effectiveness of the EITC by studying labor supply effects of the EITC by child's age and the implications of these labor supply responses for child care arrangements. We investigate this question using a parameterized difference-in-

[2] Some studies examine how labor supply responses differ for mothers with children under age five or six, compared to mothers over age five (Meyer and Rosenbaum, 2001), but to our knowledge, none have fully modeled the differential labor supply effects according to child's age.

[3] Studies generally show that income in early childhood is particularly beneficial for children (e.g., see Duncan et al. 2017 for a review). In contrast, a number of studies show that early maternal employment has negative effects on child outcomes (e.g., Herbst 2017), but this may be less true for lower income families (e.g. Berger et al. 2008). Research also suggests if income is not raised by employment there may be negative effects on kids (Mogstad and Pronzato 2012; Morris, Huston, Duncan Crosby and Bos 2001) and that the negative influence on children depends on the types of child care substitutions that occur (e.g., see Bernal and Keane 2011 for a review of employment effects on cognitive outcomes; see Danzer, Halla, Schneeweis and Zweimüller 2017 for a review of paid leave effects on child outcomes; Løken, Lommerud and Reiso 2018).

differences analysis capturing both federal and state policy changes to the EITC over time, using data from the Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) between 1990 and 2016, when most of the large federal and state EITC expansions took place. We examine whether expansions to the EITC affected maternal labor supply by studying differences between infancy/toddlerhood (ages 0 to 2), preschool (3 to 5), middle childhood (6 to 12), and adolescence (13 to 17). We then analyze the implications of these labor supply responses for child care arrangements, examining how the type of care, amount of time spent in care, and costs of care are affected by the EITC using data from the Survey of Income and Program Participation (SIPP) from 1996 to 2008. We focus on unmarried mothers as they are a group of particular policy interest in efforts to reduce poverty and they are the primary recipients of the EITC (Tax Policy Center 2006).

We find a significant age gradient in the maternal labor supply response to expansions of the EITC. Labor supply effects of the EITC are largest among mothers whose youngest child is under age three, followed by mothers with a youngest child aged 3 to 5, and much smaller – or no response for mothers with a youngest child aged 6 to 12 or 13 to 17 (the labor supply elasticities for each age group are: 0.31 [under age 3], 0.16 [3 to 5], 0.11 [6 to 12] and 0.10 [13 to 17]). These results are robust to a number of different model specifications that control for other state factors such as welfare generosity and the unemployment rate, as well as relying solely on either the federal or state variation in the EITC. Though the magnitudes of the labor supply responses differ, we also find a very similar age gradient when we restrict the time period of analysis to the period after welfare reform in 1996, reducing concerns that these labor supply patterns are driven by a strong economy in the 1990s, or policy changes associated with welfare reform in 1996 (Kleven 2019). Sensitivity analyses relying solely on state variation in the EITC further suggest that these labor supply effects are a result of the EITC.

Along with these labor supply responses that differ substantially by the age of the youngest child in the household, we also find that the EITC increases the use and cost of child care among mothers with very young children. Following a $1,000 increase in average EITC generosity, time spent in child care increases by about 10 hours per week among children under age three and costs increase by approximately $1,100 per year. Most of the shift into child care occurs on the informal care margin (relatives and non-relatives) rather than on the center-based care margin, which is more typically linked with higher quality. A back-of-the-envelope calculation suggests that increases in family income through the EITC and pre-tax earnings outweigh the additional costs incurred through child care expenses, though there are likely substantial increases in other costs associated with work, such as transportation costs, that are unobserved.

This study contributes to the larger literature on the effects of work-contingent policies on maternal labor supply and on children's care arrangements. Tax credits that target families with young children may be effective at increasing labor supply, income, and reducing poverty during early childhood, a critical developmental time period (e.g., Shonkoff and Phillips 2000) when income may have the strongest positive effects on child outcomes (e.g., Duncan et al 2017). However, our results also indicate a substantial rise in the use of informal child care among very young children, which has been linked with poorer child outcomes (e.g., Danzer et al. 2017; Magnuson, Ruhm and Waldfogel 2007). Although a number of studies have linked EITC expansions with improved outcomes for children (Bastian and Michelmore 2018; Dahl and Lochner 2012; Manoli and Turner 2018), recent research has found evidence that substitution away from parental care may be detrimental to children (Agostinelli and Sorrenti 2018). Our study also reinforces new work that documents the significance of counterfactual care arrangements (Danzer et al. 2017; Løken et al. 2018) and illustrates the importance of considering how mothers of young children respond to the EITC differently from mothers of older children. Overall, the findings from this study suggest that although tax credits targeted to young families will likely increase income, there may be unintended negative consequences of such policies on child outcomes.

The rest of the paper proceeds as follows. In Section I, we provide institutional background on the EITC as well as a theoretical framework for why mothers of young children may exhibit different labor supply responses to the EITC than mothers of older children. In Section II we discuss the data, Section III provides the empirical strategy, and we discuss the main results in Section IV. Section V concludes.

I. Background

A. The Earned Income Tax Credit

The Earned Income Tax Credit (EITC) was implemented in 1975 as a temporary credit (made permanent in 1978) intended to offset payroll taxes paid by low-income families. The EITC has a trapezoidal structure, with benefits increasing to a plateau and then decreasing as earnings increase (shown in Figure 1). The federal EITC has been expanded several times since its inception. In 1991, a larger benefit for two or more children was introduced, and between 1993 and 1996, the phase in rate was increased – differentiating between families with one child (34 cents per dollar) and those with two or more children (40 cents per dollar). In 2009, a larger tax credit was introduced for families with three or more children and the phase-in rate was further increased to 45 cents per dollar of earnings for those families. The credit is refundable, meaning that even households that have no tax liability can receive the benefit as part of their tax refund.

[Figure 1 about here]

In addition to the federal EITC, twenty-nine states and the District of Columbia have implemented their own EITCs as of 2019.[4] State EITCs are typically set as a share of the federal credit, ranging from 3.5 percent to 40 percent of the federal benefit. States vary in terms of when they implemented EITCs, their overall generosity, whether the credits are refundable, and many states have changed their generosity over time (most becoming more generous but some becoming less generous or eliminating their credits altogether; see Appendix Table 1 for details). Rhode Island was the first state to implement an EITC in 1986; California implemented an EITC for the 2016 tax year. States with EITCs vary in terms of size, region, and political orientation.[5]

B. Why Might the EITC Impact Maternal Labor Force Participation Differentially by Child's Age?

Although the EITC benefit structure does not vary by child's age, mothers with very young children face different challenges to employment than mothers with school-aged children. This leads to theoretically ambiguous predictions about how the labor supply effects of the EITC may vary according to child's age.

Child care costs and availability for young children present a significant barrier to women's employment, a barrier that is reduced once children enter school. Even among children

[4] Our study goes through 2016 and includes 26 state EITCs and D.C. (WA, SC and MT are not yet implemented; Hawaii was implemented in 2017; NC was removed in 2016).

[5] Previous research has explored whether state EITC generosity correlates with other state characteristics (Leigh 2010; Bastian and Michelmore 2018), with some evidence of positive associations between state GDP growth and EITC generosity, and negative associations between EITC generosity and state welfare benefits (Leigh 2010). We control for these, and other state characteristics in all of our models to reduce concerns that state EITC generosity is correlated with other factors that may influence maternal labor supply; we also illustrate that results are robust to relying solely on the federal variation in the EITC.

under the age of five, there is substantial variation in the availability of quality child care for infants (ages 0-1) and toddlers (1-2) relative to three and four year olds (Jessen-Howard et al. 2018; Henly and Adams, 2018), who may have access to Head Start or public preschool programs. [6] Additionally, infant care costs 60 percent more on average than care for a preschooler, with toddler care falling in between (Workman and Jessen-Howard 2018). By school age, children require fewer hours of care and costs are generally lower, but in middle childhood (ages 6-12) families still must find child care after school and during the summer (ChildCare Aware 2018). [7] In comparison, most adolescents (13-17) do not require child care. Child care costs alone may prevent mothers with young children from finding employment that exceeds their reservation wage, and may make them less responsive to work incentives than mothers with older children.

In addition to the cost of child care, mothers of younger children may have stronger preferences to stay home with their child (say if they are breastfeeding), preferences that change as children age and become independent. Differences in preferences also lead to predictions that mothers with very young children would be less responsive to work incentives compared to mothers with older, school-aged children.

On the other hand, there are also reasons why mothers of very young children might exhibit more elastic labor supply responses to the EITC relative to mothers of older children.

[6] Low-income families are eligible for government assistance with child care payments through the Child Care Development Fund (CCDF), state TANF programs, Social Service Block Grants or Head Start/Early Head Start, but nearly three-quarters of eligible children (based on income) do not receive assistance (Schmit et al. 2013). Additionally, programs like Head Start or public pre-k, generally only serve 4 year olds so there are few formal public care options available to younger children. Only about 4% of income eligible children received Early Head Start in 2012 (for children ages 0-3; Schmit et al. 2013). Evidence suggests that a lack of funding drives much of this gap as enrollment increases when funding increases (and the reverse) and many states have very long wait lists for child care spots. However, lack of knowledge or interest in using child care, limited hours of care, and other barriers likely also explain some of the low rates of usage (Colvard & Schmit, 2012).

[7] Estimates for annual costs of child care range from $9,000-15,000 per year depending on the type of child care (Workman & Jessen Howard, 2018). Center based care is more expensive than family day care arrangements. On average center-based infant care is about $1,000-$2,000 per year more than toddler care, which is about $1,000 per year more than preschool care (ChildCare Aware 2018).

Mothers whose youngest children are teenagers are already closer to full-employment rates (70%) than mothers whose youngest child is under age three (48%, see Table 1), with mothers of children ages 3 to 12 falling somewhere in between (61% for children ages 3-5; 68% for children ages 6-12). Likewise, annual earnings ($11,000, $17,000, $22,000 and $25,000) and hours worked per week (16, 22, 25 and 27) follow a similar pattern by youngest child's age (for ages 0-2, 3-5, 6-12 and 13-17, respectively). The marginal non-working mother with an older child may not work for a variety of health or structural reasons, the costs of which may be difficult to offset with a tax credit. Unmarried mothers with teenage children are also more likely to be divorced (rather than never-married) than mothers with infants or toddlers, and may rely on income from non-wage sources such as alimony and child support.[8] Thus, there may be more unmarried mothers of young children on the margin of employment, and they may have lower reservation wages than mothers of teenagers. Acting as a wage subsidy, the EITC may further reduce the reservation wage of mothers of very young children by offsetting any increase in child care costs associated with work. For these reasons, we may expect mothers of young children to be more responsive to the EITC compared to mothers of older children.

[Table 1 here]

Although trade-offs between personal income, time, and child care are likely key predictors of variation in response to the EITC, interactions with public benefits might also affect responses differentially by child's age.[9] We do not assess all possible program or tax interactions in this study, but at the extensive margin, entry into the labor force alone is unlikely to affect

[8] Whereas three-quarters of unmarried mothers with teenage children are widowed, separated, or divorced; this is true for only one-quarter of mothers with children under age three (though many reside with partners; authors' calculations from the Current Population Survey 1990-2016).

[9] Paid leave is uncommon in the U.S., especially among low-income populations. Only a handful of U.S. states offer paid leave. Thus, for low-income mothers with young children, leave is unlikely to affect their response to EITC expansions.

eligibility for most U.S. public assistance programs.[10] However, it is possible that benefit loss might affect maternal labor supply responses at the intensive margin, and this might vary by age. For example, both Medicaid and Supplemental Nutrition Assistance Program (SNAP/Food Stamps) phase out when earnings reach 130% of the federal poverty line (roughly $25,000 for a family of three, see Maag et al. 2012). In Table 1 we show that seventy-five percent of the mothers in our sample have incomes below 130% of the federal poverty line, but there is significant variation by age of the youngest child: Only 16% of mothers with children under age 3 have earnings above 130% of poverty, compared with 27%, 38% and 47% for mothers with children ages 3-5, 6-12 and 13-17, respectively. This suggests that mothers with older children may have incentives not to increase work hours in order to avoid loss of other public benefits, and may be less responsive to the EITC. This also suggests we may underestimate the labor supply response in the absence of interactions with other policies.

To preview our results, we find that mothers with very young children exhibit the most elastic labor supply response to the EITC. Unmarried mothers of teenagers, on the other hand, exhibit very inelastic labor supply responses, and in some models, cannot be distinguished from zero. As we illustrate in the robustness checks section, we find no evidence of negative responses to the EITC for any portion of the income or hours distribution using quantile regressions, reducing concerns that interactions with other policies result in negative employment effects among this population.

II. Data

Data come from the Current Population Survey Annual Social and Economic Supplement (CPS ASEC), a large, nationally representative data source with representation at the state level,

[10] In the U.S. work is increasingly a requirement to receive public assistance, although mothers with children are often exempt from these requirements (e.g., recent Medicaid and Food Stamp work requirements).

making it ideal for this analysis. The CPS data contain extensive income and demographic information on the non-institutionalized, civilian population and are collected annually. For this study we use data from 1990-2016. We restrict analyses to non-college-educated, unmarried mothers (never married, divorced, separated, or widowed) who are at least 19 years old, with at least one child under age 18 residing in the household.[11] We exclude college-educated unmarried mothers, who tend to be quite different from less-educated unmarried mothers, both in their labor supply, and their eligibility for the EITC.[12] After restrictions, the sample includes 150,691 unmarried mothers.

To examine the effects of the EITC on child care we use data from the Survey of Income and Program Participation (SIPP), a longitudinal survey representative of the civilian, non-institutionalized population of the U.S. The SIPP is a series of short panels (usually about 4 years in length) where households are administered a core survey every four months. At each follow up, the SIPP administers a topical module that asks additional detailed information about a specific topic. For this study we use the child care topical modules, which were administered six times over four panels (1996 panel, waves 2 and 10; 2001 panel, wave 1; 2004 panel, wave 4; 2008 panel, waves 5 and 8).[13] We restrict our sample to unmarried, non-college-educated

[11] We focus on unmarried mothers because they represent the majority of EITC claimants and expenditures. There is some concern that the EITC may affect the composition of unmarried mothers, either through marriage (dis)incentives or fertility incentives. Evidence on marriage incentives suggests relatively modest effects (Herbst, 2011; Michelmore, 2018). There is less research on the EITC and fertility, though the existing evidence does not find that the EITC encourages non-marital childbearing (Baughman and Dickert-Conlin, 2009). We also restrict our sample to unmarried mothers over the age of 18 to avoid situations where individuals could simultaneously be considered children and mothers. This sample restriction means that we do not include young teenager mothers in our analysis, who likely do not file independent tax returns.

[12] We run a placebo test on college educated mothers and married mothers (see Appendix Table 2) and generally find few significant results.

[13] Although child care information was collected in earlier panels of the SIPP, data limitations and substantial changes to the child care questions between the 1993 and 1996 SIPP makes it so that we cannot use the pre-1996 panels in our analysis (Laughlin 2013).

mothers with children under the age of 12, as child care arrangements are usually less relevant for older children. Our final sample is 14,617 unmarried mothers.[14]

A. Measures

Dependent variables: Labor supply. We examine five outcomes related to maternal labor supply. We first create an indicator equal to one if the unmarried mother worked at all in the week prior to the interview. We also examine labor supply on the intensive margin by creating a variable representing the number of hours worked in the past week. From this intensive margin information, we also create an indicator for whether the unmarried mother worked full-time, defined as more than 35 hours per week.

To understand how the EITC affects childhood poverty, we construct measures of mother's earnings and whether the family is above the federal poverty threshold. We analyze the impact of these tax credits on annual pre-tax maternal earnings, which includes only the earnings of the unmarried mother before tax and transfer income. The CPS ASEC conveniently contains information on annual income from the prior calendar year, reflecting taxable income from the previous year. Based on the number of children residing in the household, we also create several indicators of poverty using maternal pre-tax earnings (50% of poverty, 100%, 130% and 230%).[15] We examine different cut points to consider the distributional effects of the EITC on income. By studying 50% of poverty we can examine whether families are moved out of extreme poverty. The cut point of 130% of poverty is a common threshold above which families lose

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[14] SIPP is a panel, thus, there is some sample attrition over time. To examine whether attrition affected our sample, we ran an analysis examining the characteristics of mothers in our sample at each wave and found few differences in covariates across waves within panels.

[15] We calculate poverty ratios based on maternal pre-tax earnings and the number of children residing in the household because there is some evidence that the EITC affects household composition (Pilkauskas and Michelmore 2019), raising concerns about relying on the total number of family members in the household to calculate poverty ratios.

eligibility for some public programs, and 230% of poverty is roughly the point at which families are no longer eligible for the EITC.

Dependent variables: Child care. We study the use of any child care, total hours in child care, whether mothers made any child care payments and the log of monthly payments. Mothers also report the types of child care arrangements that they use on a regular basis, and may simultaneously report several types of child care arrangements (the categories are not mutually exclusive). Because a long literature demonstrates that center-based care is distinct from other care arrangements, we examine the use of any center-based care versus any other informal care arrangements. We also separately examine the use of Head Start (considered center-based care), a federally funded child care/early education program.

EITC measures. Because of endogeneity concerns, whereby differences in tax credit eligibility are correlated with other household characteristics that are likely correlated with the outcomes of interest, we create simulated measures of EITC benefits using the several federal and state policy changes over time (following a number of other studies; Currie and Gruber 1996; Jones, Milligan and Stabile 2015; Jones and Michelmore 2018; Pilkauskas and Michelmore 2019). Changes in the size of the benefits arise from differences in policy parameters from year to year, by number of children, and across and within states over time.

To construct the simulated EITC, we use a nationally representative sample of unmarried mothers (from the Survey of Income and Program Participation) in 1996 and inflate/deflate their income using the Consumer Price Index (CPI) for each year between 1989 and 2015, the tax years of interest.[16] Relying on a single year of data in a nationally representative sample holds

[16] We use 1996, but in extensions, have tested using different years and the results are not sensitive. We use data from the SIPP to use a nationally representative sample of unmarried mothers that is independent of the CPS, our main analytic dataset. However, we have also tested using a sample from the CPS and again the results were unchanged.

constant the income distribution from year to year, accounting only for changes in the income distribution from inflation. Fixing the income distribution this way ensures that any changes in benefits are due to changes in the policy, and not changes in the income distribution. We then use NBER's TAXSIM to calculate federal income tax liability in each year, which includes measures for the EITC.[17] We compute state EITC benefits using the entire, national sample of unmarried mothers and each state's EITC laws in each year between 1989 and 2015. Calculating state EITCs using the national sample of unmarried mothers reduces concerns of endogeneity of state demographic characteristics with respect to state EITC benefits.

Once we obtain measures of federal and state credits for the nationally representative sample of unmarried mothers, we then collapse the sample to the state-year-family size level. This produces a data set that contains a measure of the average federal and state EITC for a given family size (one, two, or three or more children), in a given state, in a given year. We match this information to our sample by year, state, and number of children residing in the household.[18]

After controlling for state, year, and family size fixed effects; variation in the simulated EITC is driven by the interaction of these three sources of variation. One source of variation is driven by comparing unmarried mothers with the same number of children, living in the same state, in different years. For example, an unmarried mother with two children living in New York in 1993 (the year before the state introduced an EITC) was, on average, eligible for an EITC of $953 (in 2016 dollars), whereas an unmarried mother with two children living in New York in 1997 could have received an average EITC of $2,541 (in 2016 dollars)—a difference of more

[17] We assume that the unmarried mothers claim all of their own children residing in the household on their taxes. Qualifying children must reside with the claimant for at least six months of the year. If some non-residential parents claim the children, this should attenuate the effect of the EITC on labor supply toward zero.
[18] This analysis implicitly assumes 100% take-up of EITC benefits. Previous research suggests that the take-up rate is over 80% for households with children and take-up rates are similar across family sizes (Jones 2014). We are aware of no evidence to suggest take-up rates are correlated with child's age.

than $1,500.[19] A second source of variation comes from comparing unmarried mothers living in the same state, in the same year, with different numbers of children. Finally, a third source of variation is driven by comparing unmarried mothers with the same number of children in the same year, where one lives in a state that has an EITC, and another lives in a state that either does not have an EITC, or has an EITC with a different generosity level.

Figure 2 shows the federal and state variation in the average EITC over time for one, two, and three child households. Panel A depicts variation in the average federal credit for one, two, and three or more child households over time, Panel B depicts the federal and state EITC benefits combined, and Panels C through E illustrate the variation in state EITCs, for one (C), two (D), and three or more (E) child households. From Panel A, it is clear that the average federal EITC increased substantially for households with two or more children beginning in the early 1990s, increasing the average benefit from just under $1,000 to $2,000 for those households (2016 dollars). In 2009, the federal credit was expanded for households with three or more children, increasing the average benefit by about $500 between 2009 and 2010.[20]

Panel B adds separate lines for each of the states that have implemented their own EITCs, which illustrates the substantial variation in combined federal and state EITCs over time. Panels C through E illustrate the state EITC variation (excluding the federal benefit) for different-sized households. Among one-child households (Panel C), living in a state with the most generous EITC policy would increase average benefits by about $500, relative to living in a state without an EITC. Two-child households (Panel D) are eligible for larger federal benefits, which also leads to larger state EITCs since many of the state benefits are calculated as a percentage of the

[19] In 1997, New York had an EITC worth 20% of the federal EITC. All estimates quoted here are calculated using the simulated EITC measure described above.

[20] We present this variation by child's age in Appendix Figure 1, and find that the federal and state variation over time is very similar across children's ages, which is not surprising since the EITC benefit schedule is the same regardless of child's age.

federal benefit. Among those living in a state with the most generous EITC policy, the average state benefit is about $1,000. Last, among three-child households (Panel E), the average benefit was the same as two-child households until 2009, when an expansion produced an average increase in EITC benefits of about $500 for families with three or more children. Over this time period, approximately 38% of our variation is captured by year-over-year (federal) changes in generosity, 44% is explained by variation across household size, and 6% is explained by variation across states.[21]

[Figure 2 about here]

To examine how well this simulated benefit approximates actual eligibility for the EITC among the unmarried mothers in our sample, and to examine how eligibility varies by child's age, we also calculate EITC-eligibility and benefit amount based on household size, state of residence, and family earnings (using TAXSIM). Average sample EITC eligibility and amounts based on earnings as well as the average simulated EITC amounts by child's age are shown in Table 1. We find similar rates of EITC eligibility among unmarried mothers regardless of the age of her youngest child—just over half are eligible based on her earnings, with a sample average benefit of about $1,500 (not conditional on eligibility). The simulated EITC is similar, at approximately $1,600 for mothers, though mothers with teenagers have both imputed and simulated EITC benefits that are about $150 less than the sample average. We attribute these small differences to the difference in the number of children residing in the household—mothers with teenagers have fewer children residing in the household relative to mothers with younger

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[21] Calculated by regressing the simulated benefit on state, year, and household size fixed effects and noting differences in the r-squared measure.

children. This is intuitive since the sample is limited to households where the youngest child is a teenager—older children are likely to have already left the house.

B. Descriptives by Age of the Child

Table 1 also presents demographic characteristics of the unmarried mothers overall, as well as separately according to the age of her youngest child. Not surprisingly, we find significant differences in the characteristics of mothers according to the age of her youngest child: mothers whose youngest child is 0-2 years old are younger (27 years old, on average), have more coresident children (1.97 children compared to 1.79 children in the sample overall), and are more likely to have not completed high school (26 percent compared to 21 percent of the sample overall). Mothers with teenagers, on the other hand, are older (43 years, on average), have fewer coresident children (1.34), and are more likely to have just one child in the household (71 percent). They are also more likely to have completed some college (40 percent).

To illustrate how maternal labor supply has changed over this time period, and how this differed for mothers of young children compared to mothers of older children, Figure 3 plots maternal labor supply by child's age and by year (between 1990 and 2016; Appendix Figure 2 plots additional labor supply measures). Vertical lines indicate years when federal EITC expansions occurred. Although employment rose for all unmarried mothers between 1990 and 2000 (then remaining largely flat with small fluctuations), the most dramatic rise was among mothers whose youngest child was under three. Employment increased by 59 percent for unmarried mothers with children under the age of three; from 34 percent in 1990 to 54 percent in 2000, precisely around the time when the federal EITC was expanded. Employment among other groups also increased, but the rate of change was much less steep: an increase of 33 percent for those whose youngest child was ages 3 to 5, 19 percent for ages 6 to 12, and 7 percent for mothers with children ages 13 to 17.[22]

[Figure 3 here]

III. Empirical Strategy

We begin our analysis by examining whether EITC generosity increases the labor supply of unmarried mothers, without differentiating patterns according to the age of the youngest child residing in the household. This exercise serves to replicate and update previous research on how the EITC affects maternal labor supply. We estimate models of the following form:

$$(1)\quad Y_{istc} = \beta_0 + \beta_1 EITC_{stc} + \beta_2 X_{istc} + \beta_3 \alpha_{st} + \delta_s + \gamma_t + \theta_c + \varepsilon_{istc}\ ,$$

where Y_{istc} represents the labor supply outcome of interest, measured for unmarried mother *i*, living in state *s*, in year *t*, with number of children residing in the household *c*. We model this as a function of EITC generosity, $EITC_{stc}$, which represents the one year-lagged average benefit for an unmarried mother residing in state *s*, at time *t*, with number of children *c*. The coefficient of interest, β_1, represents how maternal labor supply changes when the average EITC benefit increases by $1,000.

X_{istc} represents a vector of demographic characteristics, including race (non-Hispanic black, non-Hispanic white, Hispanic, and other), mother's age, and mother's education (less than high school, high school, or some college). α_{st} represent state-year level controls, including the

[22] We find a similar pattern by age over time for maternal hours and earnings, although somewhat less pronounced (see Appendix Figure 2). In Appendix Figure 3 we plot employment over time by child's age for college-educated and married mothers, groups we expect to be less responsive to the EITC, and we do not observe the same trends over time by child's age. Although the college-educated figure is noisy, both graphs show little change in maternal employment over time, and little variation by child's age.

state unemployment rate, whether the state had a welfare waiver in place prior to 1996, the maximum welfare benefit for a family of three, the maximum food stamp benefit for a family of three, the state minimum wage, and state GDP.[23] These state-year contextual variables control for other conditions at the state-year level that may be correlated with implementation and expansions of the federal and state EITCs.

State fixed effects (δ_s) control for state-level characteristics that may produce different levels of maternal labor supply and also correlate with state policy generosity. Year fixed effects (γ_t) control for national events, such as recessions, that may be correlated with both benefit generosity and maternal labor supply. Number-of-child fixed effects (θ_c) control for differences in maternal labor supply by number of children in the household.

Since our identifying variation comes from state policy changes that were implemented over time, as well as federal policies that expanded benefit generosity for larger households, with all controls in the model, we assume that there were no other policies or events that occurred at the same time that states implemented or expanded their EITCs, or at the same time as the federal expansions that disproportionately affected larger households. Since we control for state, year, and number of child fixed effects in our analysis, any threat to identification must occur at the intersection of these fixed effects (state-by-year, number-of-children-by-year, or number-of-children-by-state). We discuss the robustness of our results to several alternative model specifications that test for such threats in Section IV.D.

[23] Data on state-year contextual variables come from the University of Kentucky's Center for Poverty Research's National Welfare Data: http://ukcpr.org/resources/national-welfare-data.

A. Testing for Differences in Labor Supply Responses by Age

We next estimate how the EITC differentially affects maternal labor supply according to the age of her youngest child. To do this, we revise equation (1) above to include age interactions:

$$(2)\ Y_{istc} = \beta_0 + \beta_1 EITC_{stc} + \beta_2 f(age) + \beta_3 EITC_{stc} * f(age) + \beta_4 X_{istc} + \beta_5 \alpha_{st} + \delta_s + \gamma_t + \theta_c + \varepsilon_{istc}$$

Child's age at the time of the survey, $f(age)$, is modeled as a set of mutually exclusive indicators for age: 0 to 2, 3 to 5, 6 to 12, and 13 to 17 (reference). We interact these age indicators with the average EITC measure to estimate how a $1,000 policy-induced increase in tax credit generosity affects maternal labor supply differentially according to the age of her youngest child. We use the youngest child because this child is likely the binding constraint for mothers' labor market decisions (see, for example, Fitzpatrick 2012), and ensures that each mother is represented exactly once in the sample.[24] However, because other children in the household are likely to affect labor supply decisions, we also include indicators for the presence of other children in the household in each age range (0-2, 3-5, 6-12, or 13-17), as well as controls for the total number of children in the household.[25]

[24] We also conducted analyses using all children residing in the household and conduct the analysis at the child level. Although this approach increases precision over selecting the youngest child, the drawback of this approach is that mothers are in the sample multiple times. Nonetheless, results are quite similar and presented in Appendix Table 3.

[25] We test the robustness of our results to a number of different specifications (see Appendix Table 4). First, we allow each state-year contextual variable to affect the outcomes of interest differently according to the number of children residing in the household through an interaction term ($\theta_c * \alpha_{st}$). We additionally test the robustness of our findings to the inclusion of state-specific linear time trends and number-of-child-specific time trends. However, we also find evidence of dynamic effects of the EITC on labor supply (consistent with previous research [Dahl, DeLeire and Schwabish 2009; Neumark and Shirley 2020], see Appendix Table 5), which suggests that models that include such time trends do not fully capture the effect of the EITC on maternal labor supply, so our preferred specification excludes state and number-of-child-specific time trends.

IV. RESULTS

A. The EITC and Maternal Labor Supply

Before presenting results illustrating how maternal labor supply responses differ by the age of the youngest child, we replicate earlier research on the effects of the EITC on maternal labor supply, and illustrate how estimates differ using the traditional difference-in-differences model compared to the simulated benefit model. Much of the early research that evaluated the maternal labor supply effects of the EITC uses a traditional difference-in-differences approach exploiting the 1993 OBRA reform that expanded the credit disproportionately for two or more child households compared to households with exactly one child (as depicted in Figure 2). This identification strategy has recently been called into question because there were several changes to the broader social welfare system that occurred during this time period, making it difficult to disentangle the effects of the EITC from other factors (Kleven 2019). For instance, some states were granted welfare waivers in the years before the federal welfare reform in 1996, which may have also affected maternal labor supply, particularly among unmarried mothers.

We take three approaches to address these concerns. First, because welfare waivers likely impact larger households differently than smaller households, since households with more children are more likely to be eligible for welfare, following earlier research (Hoynes and Patel 2018; Kleven 2019), we include a set of state variables interacted with number-of-child fixed effects to allow state conditions to operate differently for larger families. Second, we test the robustness of the results to excluding all states that had welfare waivers prior to 1996. Finally, we show how estimates differ if we exploit the magnitude of the EITC policy changes over this time period at both the federal and state level using our simulated benefit, rather than treating the reform as a binary treatment. For consistency with earlier research, for this exercise (presented in

Table 2), we analyze the time period between 1992 and 1999 (tax years 1991 through 1998). In subsequent analyses, we also test the robustness of our main findings to examining the time period after federal welfare reform in 1996, and results are similar (see Table 7 and Appendix Table 8).

[Table 2]

Each column of Table 2 presents results from four different regression models—one using a traditional difference-in-differences model to analyze the effects of the 1993 OBRA EITC reform (row A), a second model using the simulated benefit measure of federal and state EITC variation over this time period (row B), and a third and fourth model that show the results when we separately analyze the effects of the simulated federal EITC (row C) and state EITCs (row D). In column 2, we allow the effects of state characteristics to vary by the number of children in the household, and in column 3 we exclude any state that had a welfare waiver prior to 1996.

Results indicate that unmarried mothers with two or more children were about 4.4 percentage points more likely to work following the 1993 OBRA reform compared to mothers with only one child (column 1, row A). Using the simulated EITC instead of the traditional difference-in-differences estimator, we find that a $1,000 increase in average EITC benefits during this time period increased maternal employment by 6.7 percentage points. Including state controls interacted with number of child fixed effects (column 2), in the difference-in-differences model, the point estimate attenuates to 1.8 percentage points and is no longer statistically significant. In the simulated EITC model, the estimate is also reduced somewhat (4.7 percentage points) but remains statistically significant. Excluding states that implemented welfare waivers (column 3) produces similar point estimates. We also find comparable point estimates regardless of whether we rely on the federal or state variation in the EITC to generate the simulated credit.

This exercise illustrates that the simulated benefit approach produces similar estimates as the difference-in-differences approach, but due to the richer variation used in the simulated approach, the results are more robust to the inclusion of state-by-number-of-child controls as well as the exclusion of states with welfare waivers. The remaining analyses will rely solely on the simulated benefits approach to evaluate the effect of the EITC on maternal labor supply.

Table 3 presents results for all of our outcomes of interest using the simulated EITC over the 1990 to 2016 time period, rather than the more limited time period using the traditional difference-in-differences design. Consistent with previous research, we find large increases in maternal labor supply and pre-tax earnings for all outcomes. Following a $1,000 increase in the average EITC benefit, we find increases in employment (6.4 percentage points), number of hours worked per week (2.4 hours), and full time work (35 hours or more, 4.7 percentage points). We also find that pre-tax earnings increase and poverty declines (though families are not lifted above 130% of poverty).

These estimates imply an employment elasticity of 0.17, which is slightly lower than the elasticities reported in a recent study of the effect of the EITC on poverty (Hoynes and Patel 2018). In their analyses of the federal EITC expansions in the 1980s and 1990s on maternal labor supply, Hoynes and Patel's estimates range from 0.26 to 0.47.[26] In percentage terms, however, our estimates are similar: we estimate a 9% increase in employment associated with a $1,000

[26] There are a number of reasons for differences across studies. Our analyses reflect a different time frame (1990 through 2016) and also include the many state EITCs that have been introduced over the last two decades, while Hoynes and Patel (2018) focus on the federal EITC expansions in the 1980s and 1990s. Hoynes and Patel also limit their analyses to single women aged 24-48, whereas we include all unmarried mothers over the age of 18 with at least one child under the age of 18 residing in the household. Results are quite similar when we make the same sample restrictions as Hoynes and Patel.

increase in the average EITC, whereas Hoynes and Patel (2018) estimate an 11% increase in employment.

[Table 3 about here]

B. Does the EITC Affect Maternal Labor Supply Differently by Child's Age?

Table 4 presents results illustrating how maternal labor supply responses to the EITC differ according to the age of the youngest child in the household. Since we omit the age category for children aged 13 to 17, all of the interaction terms can be interpreted as the change in the outcome of interest following a $1,000 increase in the average EITC benefit at the state, year, family size level among mothers with children in the given age category, relative to mothers whose youngest child is 13 to 17 years old. The coefficient on the simulated EITC (main effect) reflects the average labor supply response among mothers whose youngest child is 13 to 17. The total labor supply effect for mothers with children in each age group can be obtained by summing the coefficient on the main effect with the coefficient on the interaction term, which we present at the bottom of Table 4, along with p-values from F-tests indicating whether the total maternal labor supply response for each age range is significant, and the implied elasticities associated with each labor supply response.

[Table 4 about here]

Following a $1,000 increase in average EITC generosity, unmarried mothers whose youngest child is 13 to 17 are approximately 5 percentage points more likely to work. Mothers with children younger than three are much more responsive to increases in the EITC: they are 9 percentage points more likely to work following a $1,000 increase in the average EITC

(0.049+0.040=0.089, p-value on F-test=0.000). For mothers with children ages 3 to 12, we do not find significantly different effects on work relative to mothers with children aged 13 to 17.

This pattern is consistent across all of the employment outcomes we examine: we find the largest effects of the EITC on mothers whose youngest child is under age three, and smaller, sometimes statistically insignificant effects on mothers with teenagers. On the intensive margin, unmarried mothers with children under age three work 3.4 more hours per week following a $1,000 increase in the average EITC, while mothers with teenagers work about 2 hours more per week. Mothers with children under age three are also 6.6 percentage points more likely to work full-time, whereas mothers with teenagers are 4.5 percentage points more likely to work full-time. The effect of the EITC on full-time work for mothers with children under age three (6.6 percentage point increase) is about three-quarters the magnitude of the extensive margin labor supply effect, implying that much of the effect of the EITC on employment comes from shifting mothers into full-time work; we revisit this point below when examining quantile treatment effects.

Consistent with these increases in labor supply, we find substantial increases in pre-tax earnings and reductions in poverty associated with EITC expansions, particularly for mothers with very young children. A $1,000 increase in average EITC generosity increases pre-tax earnings among mothers with children under age three by more than $2,400. This increase in pre-tax earnings also translates into reductions in poverty of approximately 5 percentage points, and reductions in the likelihood of living in extreme poverty of nearly 9 percentage points. We also find small increases in the likelihood that mothers of young children have earnings above 130% and 230% of the federal poverty line, by 3 and 1.5 percentage points, respectively. In contrast, while we find some evidence that mothers with children 6 to 17 years old have higher pre-tax earnings as a function of the EITC, we find no statistically significant reductions in poverty rates among these same mothers.[27]

Because mothers with very young children have lower baseline employment and earnings, these larger point estimates also imply larger effect sizes and larger elasticities among mothers with children under age three, relative to mothers with older children. For employment, an increase in work by 9 percentage points translates into a 19 percent increase in employment among mothers with children under age three, or an elasticity of approximately 0.31. Elasticities for mothers of older children are much smaller than those of mothers with children under three, and range from 0.10 to 0.16. In sum, these results suggest that the EITC has a larger effect on employment among mothers with infants relative to mothers with teenagers.

C. Alternative Age Specifications

In Figure 4, we test the sensitivity of the results to two different age specifications: a cubic function interacted with EITC generosity and a fully-interacted age specification with EITC generosity. Consistent with our main results, we find the largest effects for mothers with very young children regardless of how we specify age, with steep declines in the labor supply response for mothers for each one-year increase in child's age until about age 8. Although the fully interacted model is much noisier (with a possible bump up between ages 6 and 8, perhaps due to children entering full-day school), both the cubic and fully interacted models suggest that mothers with children older than 8 are much less responsive to EITC expansions compared to mothers with children under three.

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[27] These findings are consistent with analyses (available in Appendix Table 6) that use the American Community Survey data 2001-2016 and the 1990 and 2000 decennial Censuses to examine the same set of outcomes (data come from IPUMS; Ruggles et al, 2020). The age gradient is very similar. For example, for employment we find a 6.8 pp higher probability of working for mothers whose youngest child is 0-2; 4.1 pp for 3-5; 3.5 for 6-12 and 2.1 for 13-17.

[Figure 4 about here]

Although we control for a host of demographic and state contextual variables in our main analysis, there may be some concern that unobserved differences in characteristics between mothers with young children and mothers with older children explain the differential employment responses to the EITC. We address this concern by stratifying our sample based on the age of the youngest child in the household, conducting separate analyses for mothers with children aged 0 to 2, 3 to 5, 6 to 12, and 13 to 17. In this analysis (see Table 5), rather than compare the labor supply responses of mothers with young children to that of mothers with older children, we compare mothers with similarly aged children who are exposed to different average EITC benefits due to the year, state, or number of children in the household. This analysis compares, for instance, a mother with one two-year-old child living in New York in 1990, to a mother with one two-year-old child living in New York in 1996.

[Table 5 about here]

Results from this analysis produce a less clear age gradient among mothers whose youngest child is under age 13; however, we consistently find no effects on mothers whose youngest child is aged 13 to 17. We find similar employment responses among mothers with children aged 0 to 2, 3 to 5, and 6 to 12. Following a $1,000 increase in the average EITC benefit, unmarried mothers with children aged 0 to 5 are 6 percentage points more likely to work and mothers with 6 to 12 year olds are 5 percentage points more likely to work. Mothers with teenagers appear unresponsive to expansions to the EITC in their employment. Because mothers with young children have lower baseline employment rates, elasticities remain larger for mothers whose youngest child is 0 to 2 as compared to mothers with older children, though for many of the outcomes, the point estimates and elasticities are similar for all unmarried mothers with children under the age of 5.[28]

In sum, both the cubic and fully interacted models support the finding that the labor supply effects are strongest for mothers with infants and toddlers, mirroring our preferred specification (in Table 4) interacting EITC generosity with age of the youngest child.[29] The stratified approach (in Table 5), suggests the differences by child's age are more muted and in particular, differences between 0-2 and 3-5 are small. To interrogate the differences in the age gradient between Tables 4 and 5, we test the inclusion of interactions between the demographic and state characteristics and child's age (see Appendix Table 4, column 11) and we continue to find a similar age gradient. This suggests that differences in observed characteristics by child's age do not explain why we find larger labor supply responses to the EITC among mothers with very young children compared to mothers with older children. Including interactions between child's age and year (column 12) mutes the age differences (mirroring Table 5); however, including these interactions may be over controlling, as much of the variation we explore relies on changes across years. Thus, although the differences in early childhood are more muted in the stratified models (note, this is not the case in the SIPP where stratified models demonstrate a strong age gradient, see Table 7) we believe the findings continue to demonstrate a robust difference in maternal labor supply response by age, and together can be considered bounds on the age effects.

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[28] We also conduct this analysis using the ACS, and find similar results. See Appendix Table 7.

[29] This is our preferred specification as it allows us to test our main question of interest, which is to compare responses among mothers with young children to those with older children. The stratified models instead compare responses to EITC expansions within groups (i.e., comparing mothers with 0-2 year olds to other 0-2 year olds).

D. Summary of robustness checks

In addition to testing the robustness to a number of age specifications (section IV.C), to placebo tests for college-educated and married women (Appendix Table 2) and to including all children in the analyses (Appendix Table 3), we test the inclusion of a number of additional control variables, such as state- and number-of-child-specific time trends (see Appendix Table 4), and again, the age gradient findings are robust. In Appendix Tables 6 and 7, we show that the findings are also robust to the use of another large-scale nationally representative data source– the American Community Survey (ACS).

We further test the robustness of our results by age to using a traditional difference-in-differences framework in Appendix Table 8, modifying the analysis to include interactions with child's age for both the CPS and the ACS. Again, we find a consistent pattern of results by child's age for the OBRA expansion and a weaker, but similar pattern for the ARRA expansion in 2009. Although the employment effects are weaker following the 2009 reform, we find robust effects (and differences by child's age) for full-time work and earnings. In Appendix Table 9, we partition the variation of the EITC into its federal and state components to examine the differences by child's age, and again find a similar age gradient for both state and federal EITCs. Although the point estimates and precision differ across models, the evidence suggests that labor supply effects of the EITC are largest for mothers with very young children relative to those with older children.

Finally, we conduct a quantile regression analysis to examine variation in the effects of the EITC across the distributions of earnings and hours, and how these effects vary by age of the youngest child in the household. To conduct these analyses, we run separate quantile regressions for each decile between the 10th and the 90th percentile of the distribution for annual pre-tax earnings and number of hours worked per week. To test how effects differ for mothers with young children relative to mothers with older children, we include interactions of the simulated EITC benefit with age of the youngest child categories (as in models displayed in Table 4). Results, shown in Appendix Figure 4, indicate that for both earnings and hours worked, effects are largest in the top half of the distribution. However, the patterns differ between the two outcomes: while we find monotonic, increasing effects of the EITC for those at the top of the earnings distribution, we find the largest effects of the EITC on hours worked near the middle of the distribution, with virtually no effect at the very top of the distribution. This is likely because those at the top of the distribution are already working 40 hours or more per week. Still, we find no evidence of negative effects of the EITC for any point in the distribution of earnings or hours worked, which suggests that the EITC does not significantly reduce incentives to work for higher-earning unmarried mothers.

E. Child care arrangements

What happens to these young children when mothers go to work? A number of studies suggest maternal employment in the first year of life might be detrimental to children (e.g., Brooks-Gunn, Han and Waldfogel 2010; Baum 2003; Ruhm 2004; James-Burdumy 2005; Herbst 2017). Yet newer research emphasizes the importance of considering the counterfactual care arrangement for children when mothers move into work (Løken et al. 2018) suggesting detrimental impacts may be concentrated among children who move to informal care (Danzer et al. 2017). A relatively large and growing literature suggests that high-quality, formal, center-based care settings are linked with better outcomes for children than informal home-based care arrangements (like care provided by relatives or by family care providers), especially for low-income children (Chaudry, Morrissey, Weiland and Yoshikawa 2017; Magnuson, Ruhm, and Walfogel 2007; NICHD ECCRN 2002; Votruba-Drzal et al. 2010). However, in the U.S., center-based care is less available, less flexible (in terms of hours) and more costly than informal care, especially for infants and toddlers (Workman and Jessen-Howard 2017; Li-Grining and Coley 2006). Additionally, due to limited government funding, only about one-quarter of income eligible children receive any form of child care subsidy (Schmit et al. 2013). While tax credits may help pay for child care, they may not be enough to change personal preferences or lift financial or availability constraints that lead mothers to use informal care.

Although a large literature has considered how child care costs influence maternal employment (e.g., Herbst 2010; see Morrissey 2017 for a review), and other work has emphasized the importance of maternal time with children in explaining negative effects of employment on children (Agostinelli and Sorrenti 2018), to our knowledge, no study has examined if the EITC affects non-parental child care use and arrangements.[30] To study these questions, we use data from the Survey of Income and Program Participation (SIPP) from 1996 to 2008 employing the same parameterized difference-in-differences strategy as in our employment analysis. Because child care arrangements differ substantially across age ranges, and the SIPP asks different questions for children under age six and children six and older, we estimate separate models for each age range, and limit our analysis to 0 to 2 year olds, 3 to 5 year olds, and 6 to 12 year olds (child care arrangement information is not available for older children). Table 6 presents summary statistics for this sample, and Table 7 presents regression results.

We find that about two-thirds of mothers whose youngest child is under age three report that their child is in some type of child care arrangement on a regular basis (for about 22 hours

[30] An unpublished conference paper examined state EITCs and the stability of center-based care; Caramanis, 2018.

per week), with mothers of 3 to 5 year olds reporting slightly higher rates of child care (71 percent; 24 hours) and mothers of 6-12 year olds using far fewer hours of care but at similar rates (65%; 15 hours).[31] When we examine the effects of the EITC, we find that EITC expansions lead to substantial increases in the likelihood of using any type of regular child care among mothers whose youngest child is 0 to 2, and no significant effects for mothers whose youngest child is ages 3-5 or 6-12. Following a $1,000 increase in the average EITC, mothers with children under age three are 23 percentage points more likely to be using any type of child care arrangement, and spend about 9.5 hours more per week in some type of child care arrangement.

Although these are very large effects, we also find a much larger employment response among mothers with children under age three in the SIPP data (25 ppt) relative to our estimates in the CPS (9 ppt).[32] The SIPP has a much smaller sample size than the CPS, and we use a narrower time window (1996 through 2011). When we conduct the CPS analysis for the same time period as the SIPP (shown below the SIPP employment effects in Table 7), we continue to find evidence of an age gradient in the labor supply response to the EITC in the CPS, but the magnitude of the response for mothers with very young children is much smaller than that found in the SIPP (2 ppt in the CPS vs 25 ppt in the SIPP). For these reasons, we interpret the magnitude of these coefficients with caution, and focus primarily on the sign of the effects. We do not find any significant effects of the EITC on employment or child care arrangements for mothers with children ages 3 to 5 or 6 to 12, which is consistent with our estimates in the CPS for the same time period.

[Table 6 about here]

[31] Mothers can report multiple regular care arrangements.
[32] In results not shown, we find increases in the joint likelihood that mothers of very young children work and use child care of the same magnitude as the child care outcomes alone, providing further confidence that the increases in use of child care are concentrated among mothers who work.

Given previous research indicating that the type of care is important for child outcomes, we also investigate whether this increase in child care use occurs on the informal or formal margin. Relatively few children in our sample are cared for in a center-based arrangement on a regular basis (13 percent among children under three, 26 percent among children aged 3 to 5, and 6 percent among children aged 6 to 12), whereas roughly half (across all ages) are cared for in an informal arrangement (like a grandparent). Although we find that the EITC leads to increases in the use of center-based care (11 percentage points) among mothers whose youngest child is under age three; the increase in informal care is nearly twice as large (20 percentage points), suggesting that much of the increase in use of child care occurs on the informal care margin. We find no effect of the EITC on the type of child care used for children over age two.

[Table 7 about here]

Finally, we examine child care costs, which range from about $50-100 per month on average (including those who do not pay for or use care). We find the EITC increases both the likelihood of making any child care payments and the amount paid for child care. Following a $1,000 increase in the average EITC benefit, mothers are about 25 percentage points more likely to make a payment for child care, and their costs increase by about 120% per month. Notably, this 25 percentage point increase in any payment is very consistent with the increase in use of any child care (23 percentage points) and in employment (25 percentage points).

These findings imply that the EITC increases child care payments by about $94 per month (120% of $78), or about $1,100 per year for mothers whose youngest child is 0 to 2 years old. Given that the EITC increases average pre-tax earnings by approximately $2,400 per year for this group, this suggests that nearly half (47%) of the increase in earnings is offset by increases in child care costs, though this does not include the increase in household income generated by the EITC benefit itself, and other tax credits associated with children such as the Child Tax Credit (CTC), and the Child and Dependent Care Credit (CDCC), all of which could offset some of the added costs of child care.

This back-of-the-envelope calculation suggests that, on average, child care costs for mothers with very young children, while significant, are less than the increase in earnings and EITC benefits mothers receive. This analysis does not take into account differences in cost (and payment) between informal and center-based care arrangements. Though the costs of center-based care and informal care are similar among mothers who pay for child care ($400 per month for center based care, compared to $329 for informal care), mothers who rely on informal care are far more likely to receive free child care compared to mothers who rely on center-based care.[33] Only 25-36% of mothers using informal care make any payments, compared to 65-83% of mothers using center-based care. Thus, expected child care costs are much higher for center-based care than for informal care: the expected costs of center-based care are about $280 per month, or $3,360 per year, while the expected costs of informal care are about $100 per month, or $1,200 per year. Given the substantially higher costs of center-based care relative to informal care, and a lack of subsidized center-based care in the U.S., it is not surprising that much of the increase in child care use we find is driven by movements into informal care, rather than center-based care.

V. Conclusion

Using a parameterized difference-in-differences analysis exploiting the many federal and state policy changes to the EITC over the last 25 years, we illustrated that women with infants and toddlers were the most likely to respond to policy expansions in the EITC by increasing

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[33] Mothers may receive free care from family or friends, because of child care vouchers, or because they use subsidized center-based care (like Head Start which is free for low-income families).

employment, hours worked, and earnings. Mothers of preschool aged children also increased their employment, work hours and earnings, but the magnitude of the effect was about half the size of that observed for mothers with children under age three (except in the stratified model where the effects were similar). For mothers with children ages 6 and older, we found some evidence of increases in labor supply, but the effects were much smaller and were not consistent across all model specifications. These findings were robust to employing a traditional difference-in-differences model, parsing the variation into its federal and state components, several federal and state-level controls and time trends, and to different specifications of child's age. Although findings were more muted when analyses were stratified by child's age in the CPS, the elasticities still pointed to an age gradient and the bulk of the evidence presented here demonstrates a significant age gradient in labor supply responses to the EITC.

Along with this large increase in maternal labor supply, we found substantial increases in the use of informal child care for mothers with children under age three. These young children were substantially more likely to be cared for in an informal care arrangement (relatives and non-relatives), and spent about 9.5 hours more per week in child care compared to children exposed to smaller EITC benefits. Child care payments also increased: mothers with children under three were substantially more likely to make payments for child care, and costs increased by about $1,100 per year. The cost estimates suggest that although the financial benefits from the EITC (through the benefit itself as well as the effect on pre-tax earnings) outweigh the increased child care costs, monthly costs of center-based care are prohibitive and, as a result, we find that children are far more likely to spend time in informal arrangements (where average costs are lower).

Interpreting these findings in terms of adult and child wellbeing is not straight forward, as there are reasons to expect both positive and negative effects of moving mothers with very young children into the labor force. Increasing income of households with very young children is likely to have long-term positive impacts on children, as poverty in early childhood is thought to be particularly detrimental to development (e.g. Duncan et al. 2010, 2012). Yet a number of studies suggest that employment in the first year of life is associated with poorer outcomes for kids (e.g., Waldfogel 2006; Herbst 2017)[34] and that if income is not sufficiently increased (or if there are losses of other benefits), then there may be negative effects of maternal employment on children (Morris et al. 2001; Mogstad and Pronzato 2012). Children may be particularly negatively affected if employment reduces maternal time with children (Agostinelli and Sorrenti 2018) or if children do not move into high quality formal care (Danzer et al. 2017). That we find children mostly move into informal care arrangements raises further concerns.[35] Despite these concerns, a number of studies have linked the EITC with improved child outcomes, both in early childhood (birth weight; Hoynes et al. 2015; student test scores; Dahl and Lochner 2012) and into early adulthood (e.g. college enrollment; Bastian and Michelmore 2018, Manoli and Turner 2018).

Even if the weight of evidence suggests positive overall impacts of the EITC on children and mothers, that the EITC moves mothers with very young children into the labor force in particular, merits further consideration. Although beyond the scope of this paper, it may be the case that the steep labor supply response of mothers with very young children is in part due to an absence of other income support policies for mothers with young children. Unlike other Western

[34] However, this relationship is less clear in studies of the effects of paid leave in other country contexts (e.g., Danzer et al. 2017).

[35] In the U.S., child care is often hard to obtain due to low availability, high costs of care and low levels of public child care funding/subsidized slots (e.g., Hardy et al., 2020). Although examining child care policy is beyond the scope of this paper, these findings suggest that informal care may be the only option available for many lower-income mothers. Future research should consider how public policy might best address child care issues for this population.

countries, in the U.S., low-income mothers with very young children have few alternatives to working to make ends meet. Policies like family or maternity leave, little availability of subsidized or free child care, and a lack of a child benefit, may in part explain why we see such large effects of the EITC in early childhood, and why we find large increases in the use of informal care relative to center-based care. More research is needed to understand the interaction between child's age, the EITC, and other policies.

In sum, our findings suggest much of the EITC's positive labor supply effects are driven by mothers with children under age three. Whether this is the desired outcome for mothers, society, or public policy, is open to debate. However, given prior research on the detrimental effects of early childhood poverty, our findings suggest that expansions to the EITC, and targeted expansions in particular, are likely to be effective at raising income among these families.

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Table 1. Descriptive statistics, unmarried mothers with youngest child under age 18, tax years 1989-2015, by age of the youngest child in the household

		Age of the youngest child in the household			
	All	Aged 0-2	Aged 3-5	Aged 6-12	Aged 13-17
Labor supply					
Worked last week	0.62	0.48	0.61	0.68	0.70
Worked at least 35 hours/week	0.40	0.26	0.38	0.46	0.51
Number of hours worked/week	23.08	16.19	21.67	25.23	27.12
	(19.75)	(18.72)	(19.48)	(19.503)	(20.002)
Economic wellbeing					
Pre-tax earnings (2016$)	18,684	11,360	16,919	21,699	24,681
	(26308)	(20276)	(28146)	(25761)	(29579)
Earnings above 50% of poverty	0.58	0.40	0.55	0.65	0.70
Earnings above 100% of poverty	0.41	0.24	0.37	0.48	0.56
Earnings above 130% of poverty	0.32	0.16	0.27	0.38	0.47
Earnings above 230% of poverty	0.12	0.04	0.08	0.14	0.21
EITC					
Eligible for the EITC	0.54	0.51	0.56	0.55	0.51
Household annual EITC benefit (unconditional on eligibility, 2016$	1493	1406	1604	1576	1358
	(1763)	(1743)	(1802)	(1798)	(1677)
Simulated EITC (annual, unconditional on eligibility, 2016$)	1622	1649	1672	1675	1452
	(621)	(633)	(634)	(638)	(527)
Mother's demographic characteristics					
Age	34.05	26.75	30.25	36.36	43.17
	(9.22)	(6.64)	(7.01)	(7.354)	(7.028)
Number of children in household					
Mean number of children	1.79	1.97	1.93	1.84	1.34
	(0.99)	(1.15)	(1.05)	(0.917)	(0.586)
Share with one child	0.49	0.44	0.43	0.43	0.71
Share with two children	0.32	0.31	0.33	0.37	0.25
Share with three or more children	0.19	0.26	0.24	0.20	0.04
Education					
Less than high school	0.21	0.26	0.22	0.19	0.19
High school degree	0.41	0.41	0.41	0.40	0.41
Some college	0.38	0.33	0.38	0.41	0.40
Race/ethnicity					
Non-Hispanic White	0.42	0.35	0.39	0.45	0.49
Non-Hispanic Black	0.32	0.35	0.33	0.30	0.29
Hispanic	0.20	0.23	0.21	0.19	0.17
Other	0.06	0.07	0.06	0.06	0.05
Number of Observations	150,689	35,730	30,055	53,186	31,718

Notes: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. All dollars in 2016$. All values are weighted using sampling weights. Standard deviations in parentheses.

Table 2. Effect of the EITC on maternal employment; 1991-1998 tax years

	(1)	(2)	(3)
Difference-in-differences design			
A. Post1993*2 or more kids	0.044	0.018	0.015
	(0.01)	(0.015)	(0.015)
Simulated benefit			
B. Federal and state EITC	0.067	0.047	0.045
	(0.015)	(0.021)	(0.022)
C. Federal EITC	0.073	0.052	0.050
	(0.016)	(0.025)	(0.027)
D. State EITC	0.053	0.047	0.047
	(0.037)	(0.04)	(0.065)
Demographics	X	X	X
Number of child indicators	X	X	X
State variables*number of child fixed effects		X	X
Exclude states with AFDC waivers			X
Number of Observations	34,612	34,612	22,997

Notes: Current Population Survey (ASEC)1992-1999. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. Each cell represents a separate regression. Row A displays results from a regression of an indicator for employment in the last week on an indicator for post-1993 tax year, when the federal EITC was expanded more for households with two or more children relative to households with one child, an indicator for whether the household had at least two children, and the interaction of the two. Point estimates displayed are the interaction terms of post-1993 and two-or-more-children in the household. Row B instead uses the simulated EITC used in Tables 3, 4, 5, and 7 as the primary independent variable, combining the federal and state variation in the EITC between 1991 and 1998 for households with 1, 2, or 3 or more children. Rows C and D display results from regressions that separately include the simulated federal EITC and the simulated state EITC over the same time period. All regressions include demographic (parental age, educational attainment, race) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Column 2 adds interactions of state characteristics with number of child fixed effects; column 3 excludes all states that had an AFDC waiver prior to welfare reform. Standard errors clustered at the state level. Simulated credits in thousands of 2016$.

Table 3. Effect of the EITC on maternal labor force outcomes; 1989-2015 tax years

	Simulated EITC	Implied Elasticity
Worked last week	0.064	0.17
	(0.014)	
Number of hours worked last week	2.439	0.17
	(0.555)	
Worked at least 35 hours last week	0.047	0.19
	(0.012)	
Pre-tax earnings ($1,000s of 2016$)	1.679	0.15
	(0.393)	
Above 50% of poverty	0.061	0.17
	(0.011)	
Above 100% of poverty	0.027	0.11
	(0.007)	
Above 130% of poverty	0.009	0.05
	(0.006)	
Above 230% of poverty	0.001	0.01
	(0.004)	
Number of observations	150,691	

Notes: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$. All regressions include demographic (parental age, educational attainment, race) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, number of child fixed effects. Each row reports the coefficient for the simulated EITC (in thousands of $2016) from separate regressions. Standard errors clustered at the state level. Poverty thresholds based on earnings. Implied elasticities based on sample means presented in column 2.

Table 4: Effect of the EITC on maternal labor force outcomes: Variation by age of the youngest child

	Worked last week	Number of hours worked	Worked at least 35 hours	Pre-tax earnings ($1,00s of 2016$)	Above poverty threshold*: 50%	100%	130%	230%
Simulated EITC	0.049	1.974	0.045	1.060	0.045	0.011	0.000	-0.008
	(0.015)	(0.624)	(0.015)	(0.622)	(0.016)	(0.012)	(0.001)	(0.006)
Simulated EITC*aged 0-2	0.040	1.466	0.021	1.383	0.042	0.041	0.032	0.022
	(0.009)	(0.3)	(0.007)	(0.413)	(0.008)	(0.008)	(0.006)	(0.004)
Simulated EITC*aged 3-5	0.008	0.261	0.004	0.624	0.006	0.006	-0.001	0.010
	(0.009)	(0.394)	(0.01)	(0.461)	(0.011)	(0.01)	(0.008)	(0.004)
Simulated EITC*aged 6-12	-0.005	-0.392	-0.016	-0.071	-0.005	0.001	-0.005	0.002
	(0.008)	(0.345)	(0.009)	(0.391)	(0.009)	(0.008)	(0.006)	(0.004)
Simulated EITC*aged 13-17 (reference)								
Total, aged 0-2	0.089	3.440	0.066	2.443	0.087	0.052	0.032	0.014
Total, aged 3-5	0.057	2.235	0.049	1.684	0.051	0.017	-0.001	0.002
Total, aged 6-12	0.044	1.582	0.029	0.989	0.040	0.012	-0.005	-0.006
Total, aged 13-17	0.049	1.974	0.045	1.060	0.045	0.011	0.000	-0.008
p(F-statistic), aged 0-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
p(F-statistic), aged 3-5	0.000	0.001	0.001	0.001	0.000	0.036	0.994	0.705
p(F-statistic), aged 6-12	0.002	0.004	0.010	0.014	0.001	0.089	0.500	0.152
p(F-statistic), aged 13-17	0.002	0.003	0.005	0.095	0.006	0.367	0.925	0.179
Implied elasticity, aged 0-2	0.31	0.35	0.41	0.35	0.36	0.36	0.33	0.57
Implied elasticity, aged 3-5	0.16	0.17	0.22	0.17	0.15	0.08	-0.01	0.04
Implied elasticity, aged 6-12	0.11	0.11	0.11	0.08	0.10	0.04	-0.02	-0.07
Implied elasticity, aged 13-17	0.10	0.11	0.13	0.06	0.09	0.03	0.00	-0.05
Number of Observations				150,691				

Notes: Current Population Survey (ASEC)1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$, interacted with indicators for the age of the youngest child in the household (categorized as 0-2, 3-5, 6-12 and 13-17 (reference) years old). All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each column represents a separate regression. Standard errors clustered at the state level. Coefficients presented are the interaction of the simulated credit with age of the youngest child in the household. Total effect, measured as the sum of the main effect of the simulated credit and the interaction term, is presented for each age group below the regression estimates, with p-values associated with the F-statistic on the combined effect below. Implied elasiticies calculated based on the mean value of the outcome and simulated EITC among mothers with youngest child in each age category.

*Based on pre-tax earnings

Table 5: Effect of the EITC on maternal labor force outcomes: Stratified by age of the youngest child

	Aged 0-2	Aged 3-5	Aged 6-12	Aged 13-17
Worked last week	0.062	0.064	0.051	0.004
	(0.014)	(0.018)	(0.019)	(0.014)
Elasticity	0.21	0.18	0.13	0.01
Number of hours worked last week	2.298	2.522	2.003	0.393
	(0.524)	(0.708)	(0.756)	(0.606)
Elasticity	0.23	0.19	0.13	0.02
Worked at least 35 hours last week	0.047	0.051	0.041	0.015
	(0.013)	(0.018)	(0.017)	(0.013)
Elasticity	0.29	0.23	0.15	0.04
Pre-tax earnings ($1,000s of 2016$)	1.790	2.224	1.600	-0.214
	(0.491)	(0.819)	(0.492)	(0.861)
Elasticity	0.26	0.22	0.12	-0.01
Above 50% of poverty[1]	0.059	0.075	0.050	0.001
	(0.014)	(0.016)	(0.012)	(0.017)
Elasticity	0.24	0.23	0.13	0.00
Above 100% of poverty[1]	0.026	0.055	0.039	-0.016
	(0.012)	(0.014)	(0.011)	(0.014)
Elasticity	0.18	0.25	0.14	-0.04
Above 130% of poverty[1]	0.013	0.024	0.026	-0.005
	(0.01)	(0.014)	(0.008)	(0.013)
Elasticity	0.13	0.15	0.12	-0.02
Above 230% of poverty[1]	0.012	0.003	0.010	0.024
	(0.006)	(0.007)	(0.006)	(0.014)
Elasticity	0.49	0.06	0.12	0.16
Number of Observations	35,730	30,056	53,186	31,719

Notes: Current Population Survey (ASEC)1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$. Separate models conducted for each of the four age categories for the youngest child in the household: 0-2, 3-5, 6-12, and 13-17. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each set of cells represent a separate regression. Standard errors clustered at the state level. Poverty threshold is based on pre-tax earnings. Implied elasiticies calculated based on the mean value of the outcome and simulated EITC among mothers with youngest child in each age category.

[1]: Marginal effects from logistic regression.

Table 6. Descriptive statistics on child care arrangements by age of the youngest child, Survey of Income and Program Participation 1996-2008

	Age of the youngest child in the household		
	Aged 0-2	Aged 3-5	Aged 6-12
Worked last week	0.44	0.57	0.66
Any child care	0.66	0.71	0.65
Total hours	21.98	23.97	15.13
	(23.82)	(24.19)	(20.09)
Arrangements used on a regular basis (select all that apply)			
Any center-based care	0.13	0.26	0.06
Any Head Start	0.00	0.04	0.00
Any informal care	0.52	0.50	0.50
Any parent care	0.14	0.12	0.12
Payments			
Any payments	0.22	0.29	0.20
Monthly payment (2016$)	77.60	102.32	46.86
	(196.29)	(218.68)	(132.5)
Monthly payment among those using child care	117.34	144.66	71.58
	(231.52)	(247.97)	(158.3)
Monthly payment among those making any payments	345.44	350.73	230.83
	(281.12)	(277.17)	(209.85)
Any payments among those using center-based care	0.72	0.65	0.83
Monthly payment among those using center-based care (2016$)	281.44	251.08	254.79
	(335.25)	(304.24)	(235.04)
Monthly payment among those using center-based care and making any payments (	391.66	386.28	308.34
	(336.52)	(300.29)	(224.33)
Any payments among those using informal care	0.31	0.36	0.25
Monthly payment among those using informal care (2016$)	102.96	116.97	56.01
	(213.55)	(226.8)	(145.43)
Monthly payment among those using informal care and making any payments (201	329.36	325.87	223.42
	(267.12)	(274.34)	(216.79)
Number of Observations	4,852	4,014	5,768

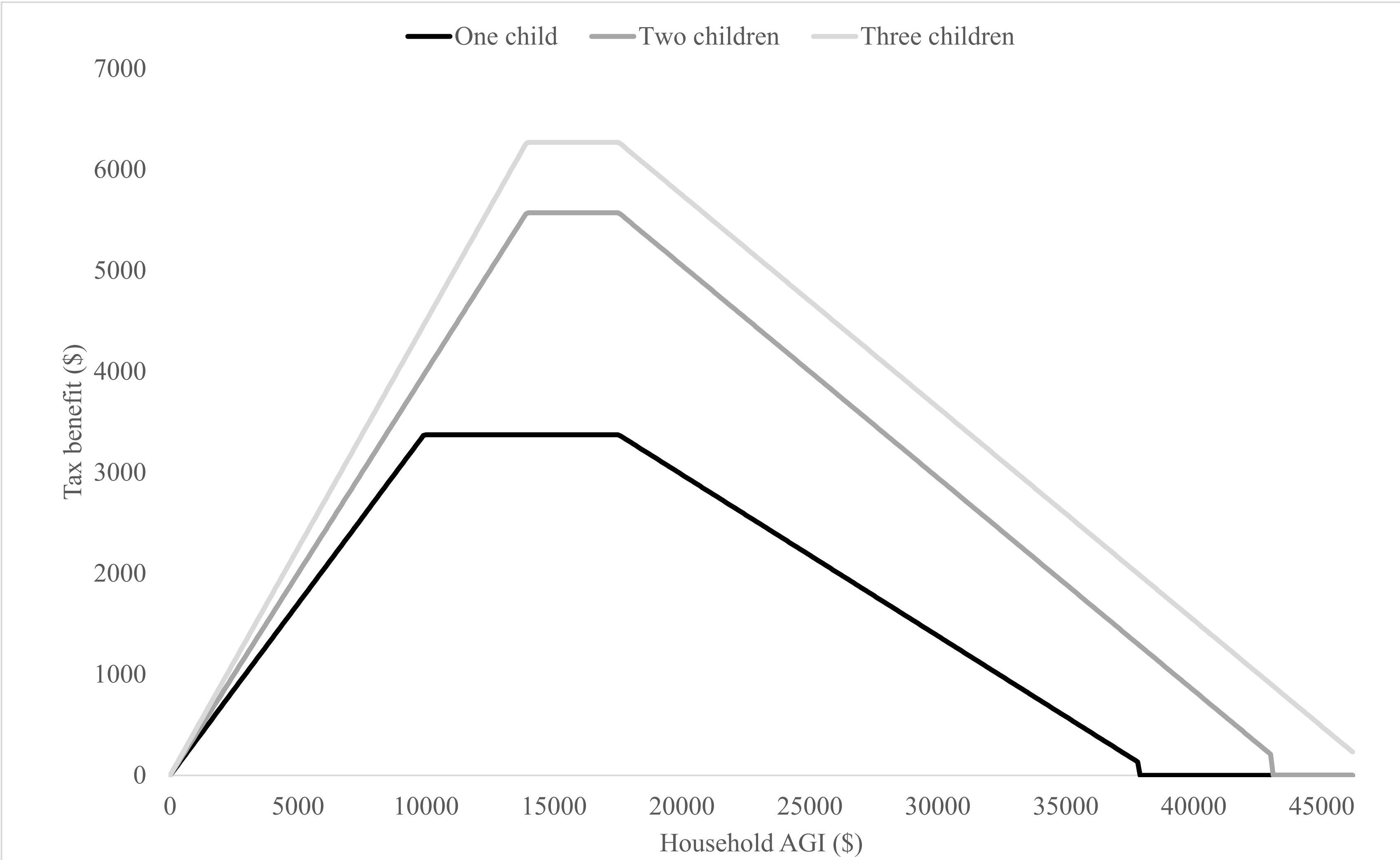
Notes: Survey of Income and Program Participation panels 1996-2008. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 residing in the household. All ages refer to the age of the youngest child in the household. Child care arrangements are not mutually exclusive; mothers may choose multiple arrangements used on a regular basis. All dollars in 2016$.

Table 7. Effect of the EITC on maternal labor force outcomes and child care arrangements, by age of the youngest child, Survey of Income and Program Participation 1996-2008

	Aged 0-2	Aged 3-5	Aged 6-12
Employment			
Worked last week	0.246	-0.019	-0.009
	(0.095)	(0.102)	(0.08)
Worked last week (CPS)	0.023	0.008	0.005
	(0.017)	(0.019)	(0.018)
Use and time spent in child care			
Any child care	0.228	-0.03	-0.116
	(0.06)	(0.072)	(0.082)
Total hours	9.487	-3.624	0.214
	(2.644)	(4.393)	(3.148)
Type of arrangement			
Any center-based care	0.106	-0.049	0.057
	(0.048)	(0.075)	(0.033)
Any Head Start	0.010	0.047	n/a
	(0.013)	(0.029)	
Any informal care	0.196	0.013	-0.136
	(0.074)	(0.089)	(0.083)
Any parent care	0.011	-0.123	-0.034
	(0.049)	(0.054)	(0.047)
Payments			
Any payments	0.246	-0.014	0.034
	(0.064)	(0.087)	(0.069)
Log monthly payment	1.20	-0.04	0.24
	(0.364)	(0.487)	(0.335)
Number of Observations	4,840	4,012	5,765

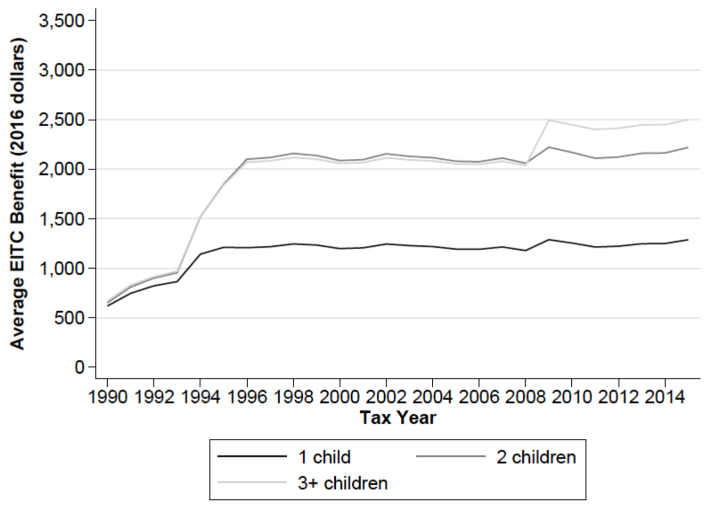
Notes: Survey of Income and Program Participation panels 1996-2008. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18. All ages refer to the age of the youngest child in the household. Regressions of labor market and child care characteristics on simulated combined federal and state EITC, measured in thousands of 2016$. Regressions run separately by each age group. Child care categories are not mutually-exclusive; mothers may choose multiple arrangements used on a regular basis. Each regression includes demographic controls (mother's education, mother's age, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17), state controls (unemployment rate, state GDP, maximum welfare benefits for a family of three, minimum wage, maximum food stamp benefits for a family of three), month, state, year, and number of child fixed effects. Each set of cells represent a separate regression. Standard errors clustered at the state level.

Figure 1. EITC benefit schedule for head of household filer, by number of children, 2015 tax year

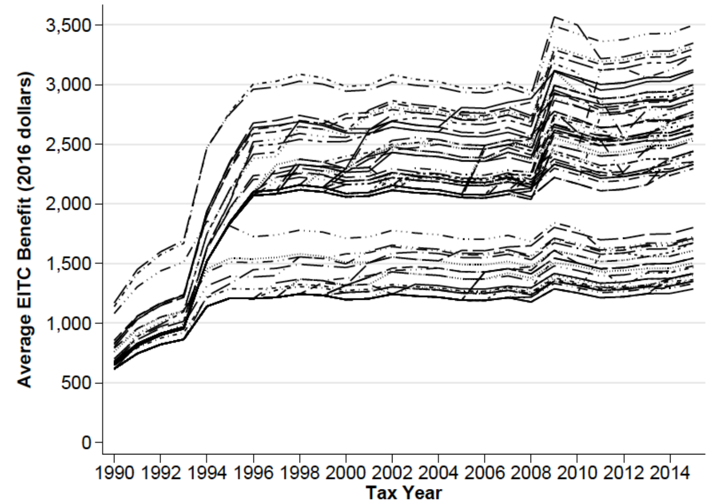


Notes: Authors' calculations. AGI = Adjusted Gross Income

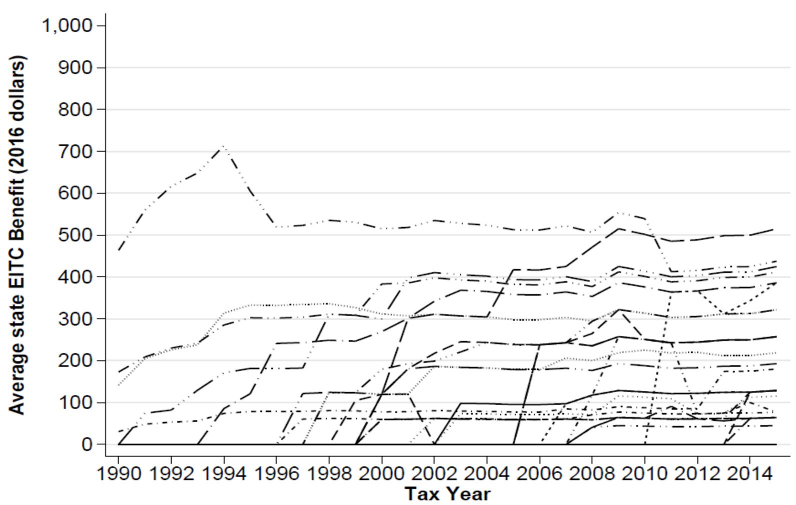
Figure 2. Variation in federal and state simulated EITC, by number of children residing in the household



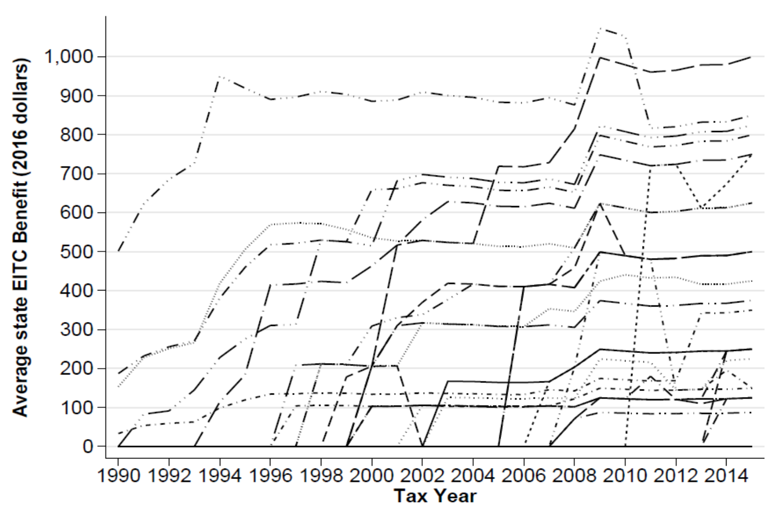
A. Variation in Federal EITC by number of children



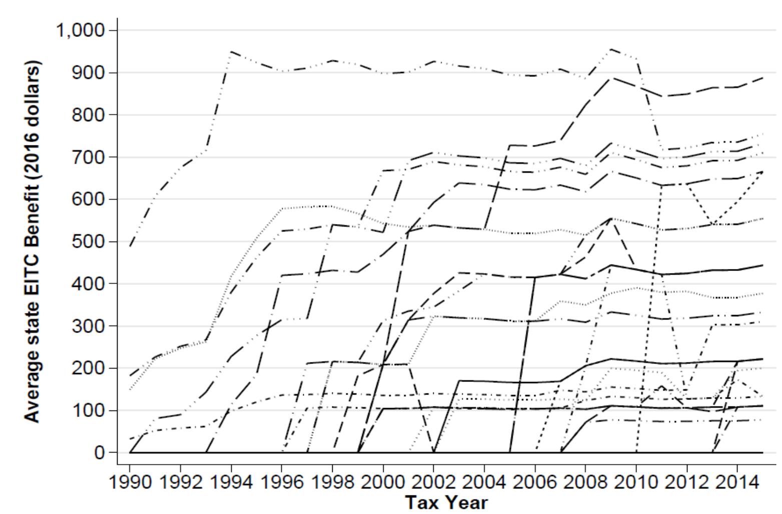
B. Variation in Federal and State EITC combined, all households



C. State EITC: One child



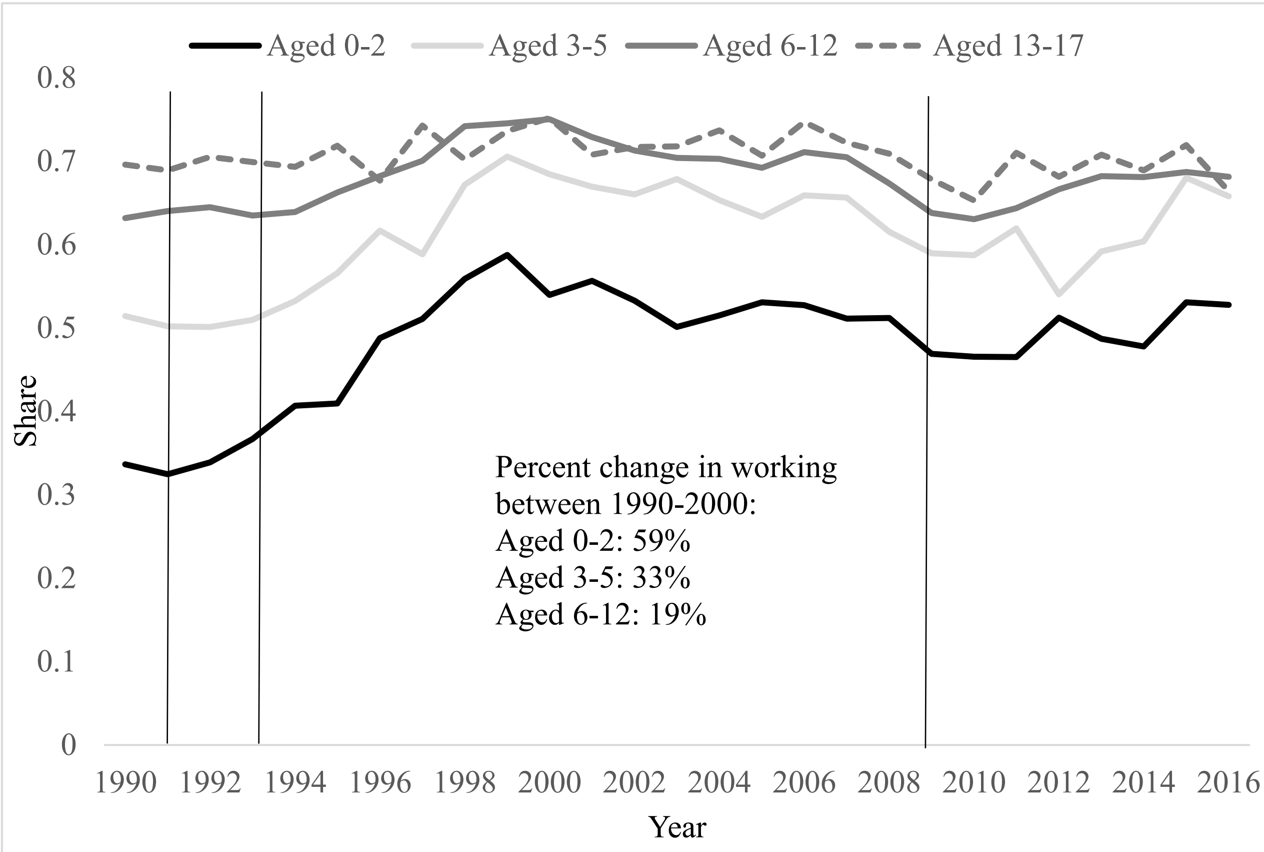
D. State EITC: Two children



E. State EITC: Three or more children

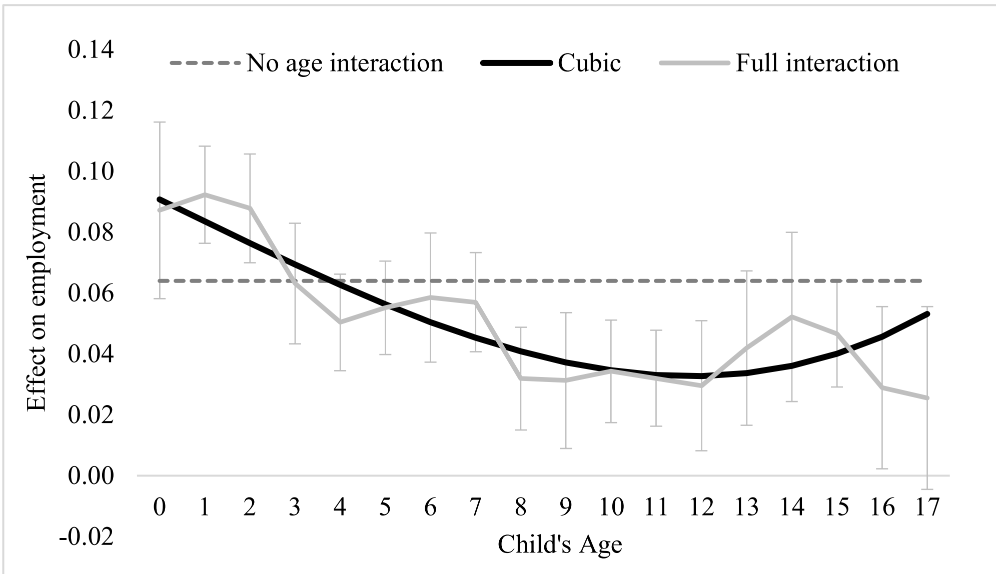
Notes: Survey of Income and Program Participation 1996 Survey and NBER's TAXSIM. Unmarried mothers aged 25-65 with at least one child under the age of 19 residing in the household. Average household state and federal EITC benefits from 1990-2015 in 2016$. For panels B-E, each line represents a separate state. See description of simulated EITC in the text for more details.

Figure 3. Share of umarried mothers working 1990-2016, by age of youngest child

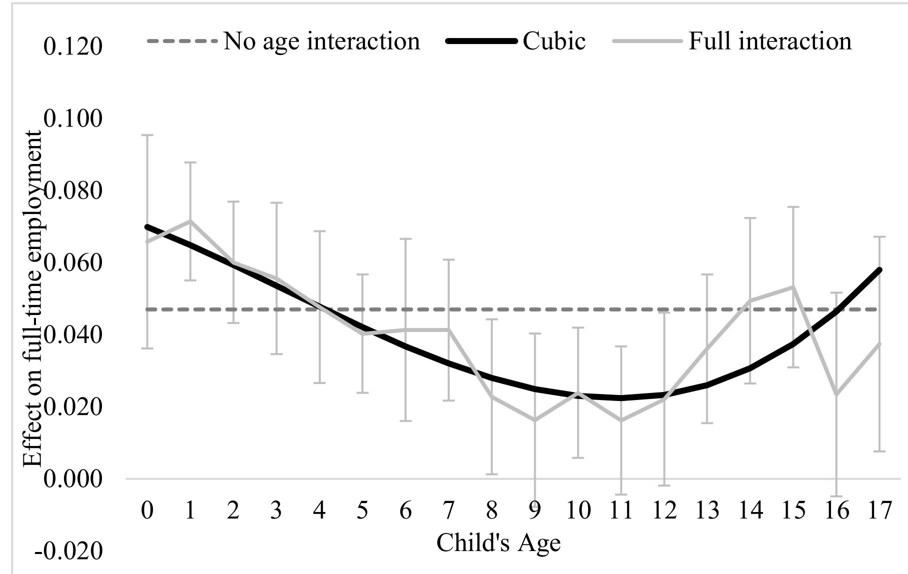


Notes: Author's calculations from Current Population Survey (ASEC) from 1990 through 2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Vertical bars indicate years of federal EITC expansions.

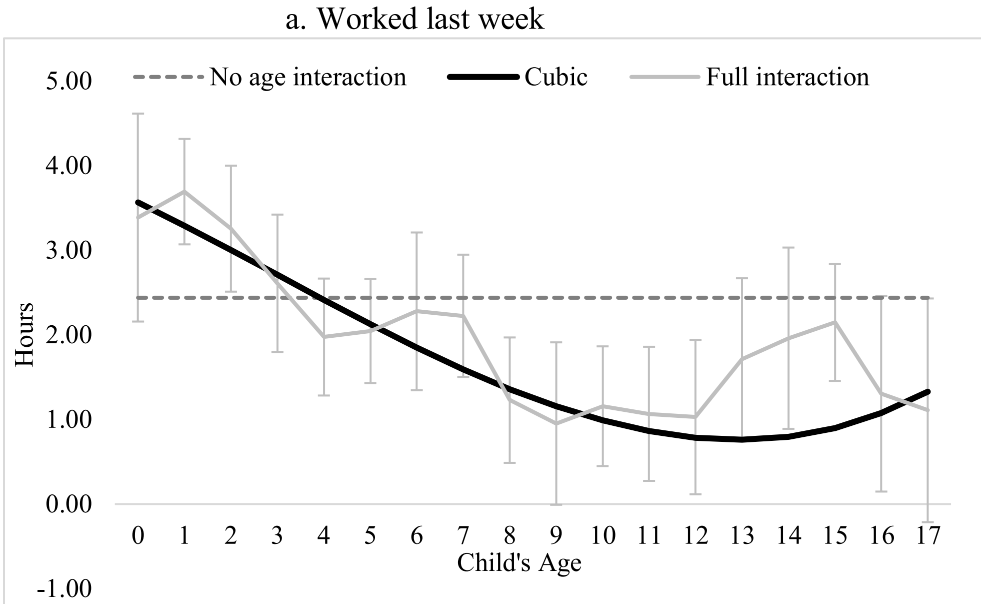
Figure 4. Effect of the EITC on maternal labor force outcomes by age of the youngest child: cubic and fully-interacted age models



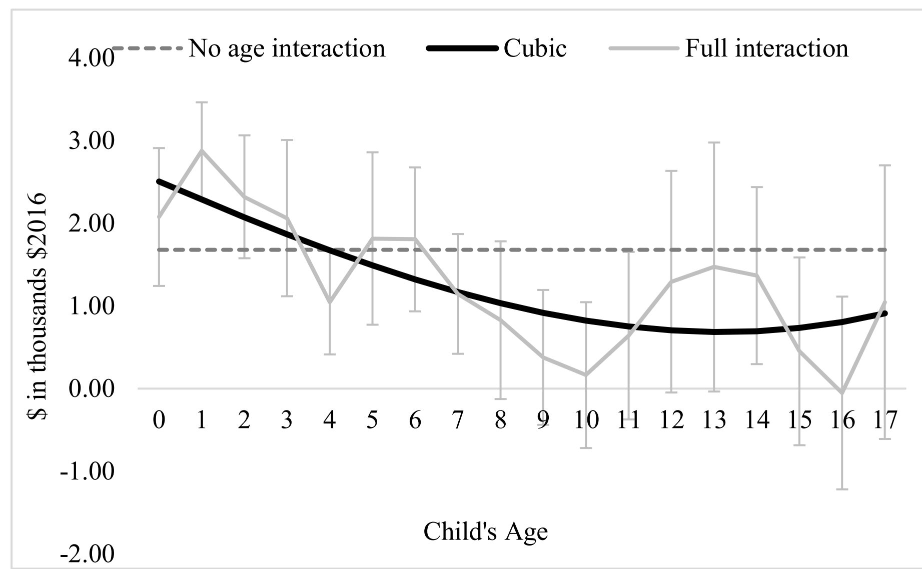
a. Worked last week



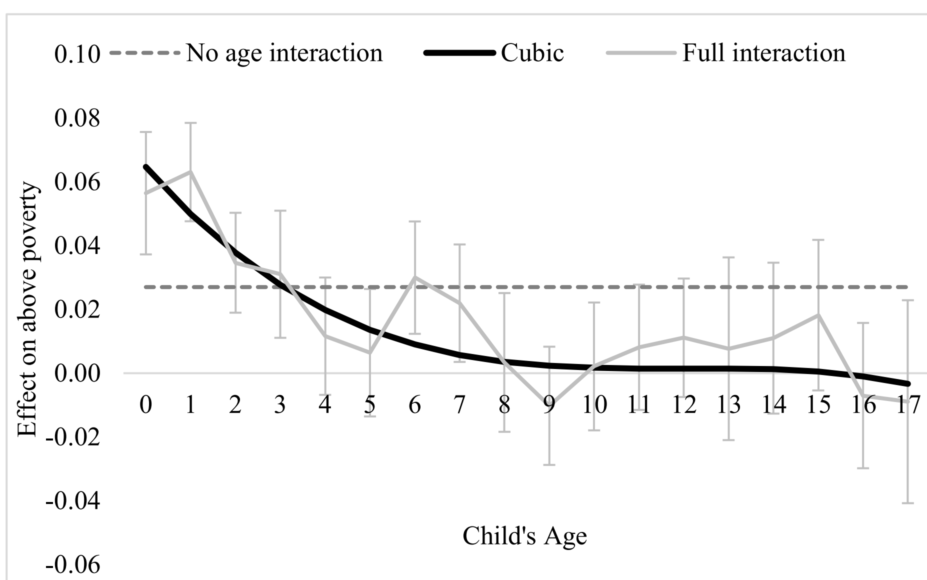
b. Worked at least 35 hours



c. Number of hours worked



d. Pre-tax earnings



e. Above 100% of poverty

Notes: Current Population Survey (ASEC) 1990-2016, representing tax years 1989-2015. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$. Dashed line represents a regression with no child age interactions; black solid line represents a regression interacting simulated EITC with a cubic function for age of the youngest child in the household; grey solid line represents a regression interacting simulated EITC with age of youngest child fixed effects. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Standard errors clustered at state level. Poverty threshold is based on pre-tax earnings.

Appendix Table 1. State EITC generosity by year, expressed as a share of the federal EITC

Tax Year	CA†	CO	CT	DC	DE**	HI**	IL	IN	IA	KS	LA	ME**	MD	MA	MI	MN*	MT	NE	NJ	NM	NY	NC	OH**	OK	OR	RI	SC**	VT	VA**	WA	WI (1)	WI (2)	WI (3)
1986																										0.22**							
1987																										0.23**							
1988																										0.23**		0.23					
1989																										0.23**		0.25			0.05	0.25	0.75
1990									0.05**																	0.23**		0.28			0.05	0.25	0.75
1991									0.065**							0.10										0.275**		0.28			0.05	0.25	0.75
1992									0.065**							0.10										0.275**		0.28			0.05	0.25	0.75
1993									0.065**							0.15										0.275**		0.28			0.05	0.25	0.75
1994									0.065**							0.15					0.08					0.275**		0.25			0.044	0.208	0.625
1995									0.065**							0.15					0.10					0.275**		0.25			0.04	0.16	0.50
1996									0.065**							0.15					0.20					0.275**		0.25			0.04	0.14	0.43
1997									0.065**					0.10		0.15					0.20				0.05**	0.275**		0.25			0.04	0.14	0.43
1998									0.065**	0.10			0.10	0.10		0.25					0.20				0.05**	0.27**		0.25			0.04	0.14	0.43
1999		0.085							0.065**	0.10			0.10	0.10		0.25					0.20				0.05**	0.265**		0.25			0.04	0.14	0.43
2000		0.10		0.10			0.05**		0.065**	0.10		0.05	0.15	0.10		0.25			0.10		0.23				0.05**	0.26**		0.32			0.04	0.14	0.43
2001		0.10		0.25			0.05**		0.065**	0.10		0.05	0.16	0.15		0.33			0.15		0.25				0.05**	0.255**		0.32			0.04	0.14	0.43
2002		0		0.25			0.05**		0.065**	0.15		0.05	0.16	0.15		0.33			0.18		0.28			0.05	0.05**	0.25**		0.32			0.04	0.14	0.43
2003		0		0.25			0.05	0.06	0.065**	0.15		0.05	0.18	0.15		0.33		0.08	0.20		0.30			0.05	0.05**	0.25		0.32			0.04	0.14	0.43
2004		0		0.25			0.05	0.06	0.065**	0.15		0.05	0.20	0.15		0.33		0.08	0.20		0.30			0.05	0.05**	0.25		0.32			0.04	0.14	0.43
2005		0		0.35			0.05	0.06	0.065**	0.15		0.05	0.20	0.15		0.33		0.08	0.20		0.30			0.05	0.05	0.25		0.32			0.04	0.14	0.43
2006		0		0.35	0.20		0.05	0.06	0.065**	0.15		0.05	0.20	0.15		0.33		0.08	0.20		0.30			0.05	0.05	0.25		0.32	0.20		0.04	0.14	0.43
2007		0		0.35	0.20		0.05	0.06	0.07	0.17		0.05	0.20	0.15		0.33		0.08	0.20	0.08	0.30			0.05	0.05	0.25		0.32	0.20		0.04	0.14	0.43
2008		0		0.40	0.20		0.05	0.06	0.07	0.17	0.035	0.05	0.25	0.15	0.10	0.33		0.10	0.23	0.10	0.30	0.035		0.05	0.06	0.25		0.32	0.20	0.1***	0.04	0.14	0.43
2009		0		0.40	0.20		0.05	0.09	0.07	0.17	0.035	0.05	0.25	0.15	0.20	0.33		0.10	0.25	0.10	0.30	0.05		0.05	0.06	0.25		0.32	0.20	0.1***	0.04	0.14	0.43
2010		0		0.40	0.20		0.05	0.09	0.07	0.18	0.035	0.05	0.25	0.15	0.20	0.33		0.10	0.20	0.10	0.30	0.05		0.05	0.06	0.25		0.32	0.20	0.1***	0.04	0.14	0.43
2011		0	0.30	0.40	0.20		0.05	0.09	0.07	0.18	0.035	0.05	0.25	0.15	0.20	0.33		0.10	0.20	0.10	0.30	0.05		0.05	0.06	0.25		0.32	0.20	0.1***	0.04	0.11	0.34
2012		0	0.30	0.40	0.20		0.05	0.09	0.07	0.18	0.035	0.05	0.25	0.15	0.06	0.33		0.10	0.20	0.10	0.30	0.05		0.05	0.06	0.25		0.32	0.20	0.1***	0.04	0.11	0.34
2013		0	0.30	0.40	0.20		0.05	0.06	0.07	0.18	0.035	0.05	0.25	0.15	0.06	0.33		0.10	0.20	0.10	0.30	0.05		0.05	0.06	0.25		0.32	0.20	0.1***	0.04	0.11	0.34
2014		0.10	0.28	0.40	0.20		0.10	0.09	0.14	0.17	0.035	0.05	0.25	0.15	0.06	0.33		0.10	0.20	0.10	0.30	0.05	0.05	0.05	0.08	0.25		0.32	0.20	0.1***	0.04	0.11	0.34
2015		0.10	0.30	0.40	0.20		0.10	0.09	0.14	0.17	0.035	0.05	0.25	0.15	0.06	0.33		0.10	0.20	0.10	0.30	0.05	0.05	0.05	0.06	0.25		0.32	0.20	0.1***	0.04	0.11	0.34
2016	0.85	0.10	0.28	0.40	0.20		0.10	0.09	0.15	0.17	0.035	0.05	0.26	0.23	0.06	0.33		0.10	0.30	0.10	0.30	0	0.10	0.05	0.08	0.13		0.32	0.20	0.1***	0.04	0.11	0.34
2017	0.85	0.10	0.28	0.40	0.20	0.20	0.14	0.09	0.15	0.17	0.035	0.05	0.27	0.23	0.06	0.33		0.10	0.35	0.10	0.30	0	0.10	0.05	0.08	0.15	1.25***	0.32	0.20	0.1***	0.04	0.11	0.34
2018							0.15						0.28																				
2019																	0.03***																

Sources: Leigh (2010); Tax Policy Center (2015): http://www.taxpolicycenter.org/statistics/state-eitc-based-federal-eitc

*Minnesota has a different strucuture to its state EITC that is not a direct share of the federal EITC starting in 2001. The average benefit level is listed from 2001 onward for Minnesota

**Denotes non-refundable credit.

***Announced, but not implemented yet.

† California has a smaller range of eligible income than the federal EITC.

Wisconsin has a different rate depending on the number of children in the household.

Hawaii implemented in 2017, a non-refunable 20% of federal credit. South Carolina implemented in 2017, worth 125% of federal credit, but non-refundable. Montana passed 3% refundable EITC does not go into effect until 2020.

Appendix Table 2. Effect of the EITC on maternal labor force outcomes : Variation by age of the youngest child - (a) college-educated unmarried mothers and (b) married mothers

	Worked last week	Number of hours worked	Worked at least 35 hours	Pre-tax earnings ($1,000s of 2016$)
Panel A. College-educated unmarried mothers				
Simulated EITC	-0.001	0.576	0.038	-0.998
	(0.011)	(0.65)	(0.017)	(2.731)
Simulated EITC*aged 0 to 2	0.022	1.797	0.046	4.766
	(0.017)	(0.833)	(0.022)	(2.477)
Simulated EITC*aged 3 to 5	0.016	0.831	0.013	-0.141
	(0.013)	(0.658)	(0.019)	(1.602)
Simulated EITC*aged 6 to 12	0.011	0.312	-0.006	3.677
	(0.01)	(0.497)	(0.013)	(1.926)
Simulated EITC*aged 13-17 (reference)				
Total, aged 0-2	0.021	2.373	0.084	3.768
Total, aged 3-5	0.015	1.407	0.051	-1.139
Total, aged 6-12	0.010	0.888	0.032	2.679
Total, aged 13-17	-0.001	0.576	0.038	-0.998
p(F-statistic), aged 0-2	0.25	0.02	0.00	0.10
p(F-statistic), aged 3-5	0.30	0.04	0.00	0.60
p(F-statistic), aged 6-12	0.37	0.16	0.04	0.07
p(F-statistic), aged 13-17	0.93	0.38	0.03	0.72
Number of Observations		24,772		
Panel B. Married mothers				
Simulated EITC	0.014	0.774	0.016	1.1204
	(0.008)	(0.326)	(0.008)	(0.321)
Simulated EITC*aged 0 to 2	-0.022	-0.951	-0.018	-1.539
	(0.007)	(0.301)	(0.006)	(0.354)
Simulated EITC*aged 3 to 5	-0.029	-1.338	-0.03	-1.63
	(0.007)	(0.326)	(0.008)	(0.319)
Simulated EITC*aged 6 to 12	-0.026	-1.15	-0.024	-1.245
	(0.006)	(0.229)	(0.006)	(0.261)
Simulated EITC*aged 13-17 (reference)				
Total, aged 0-2	-0.008	-0.177	-0.002	-0.419
Total, aged 3-5	-0.015	-0.564	-0.014	-0.510
Total, aged 6-12	-0.012	-0.376	-0.008	-0.125
Total, aged 13-17	0.014	0.774	0.016	1.120
p(F-statistic), aged 0-2	0.15	0.46	0.68	0.12
p(F-statistic), aged 3-5	0.05	0.05	0.03	0.09
p(F-statistic), aged 6-12	0.04	0.08	0.12	0.63
p(F-statistic), aged 13-17	0.07	0.02	0.06	0.00
Number of Observations		244,741		

Sources: Current Population Survey (ASEC) 1990-2016. Panel A sample is restricted to unmarried mothers over the age of 18 with a college degree who have at least one child under the age of 18 in the household. Panel B sample is restricted to married mothers over the age of 18 with at least one child in the household under the age of 18. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$, interacted with indicators for the age of the youngest child in the household (categorized as 0-2, 3-5, 6-12 and 13-17 (reference) years old). All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each panel-column represents a separate regression. Standard errors clustered at the state level. Total effect, measured as the sum of the main effect of the simulated credit and the interaction term, is presented for each age group below the regression estimates, with p-values associated with the F-statistic on the combined effect below.

Appendix Table 3: Effect of the EITC on maternal labor force outcomes: Variation by age (all children)

	Worked last week	Number of hours worked	Worked at least 35 hours	Pre-tax earnings ($1,000s of 2016$)	Above 100% of poverty*
Simulated EITC	0.055	2.093	0.043	1.493	0.016
	(0.016)	(0.68)	(0.016)	(0.531)	(0.01)
Simulated EITC*aged 0-2	0.036	1.658	0.033	1.581	0.051
	(0.005)	(0.173)	(0.005)	(0.215)	(0.005)
Simulated EITC*aged 3-5	0.013	0.692	0.017	0.634	0.011
	(0.005)	(0.207)	(0.005)	(0.247)	(0.005)
Simulated EITC*aged 6-12	0.005	0.107	-0.002	0.104	0.003
	(0.004)	(0.153)	(0.004)	(0.2)	(0.003)
Simulated EITC*aged 13-17 (reference)					
Total, aged 0-2	0.091	3.751	0.076	3.074	0.067
Total, aged 3-5	0.068	2.785	0.060	2.127	0.027
Total, aged 6-12	0.060	2.200	0.041	1.597	0.019
Total, aged 13-17	0.055	2.093	0.043	1.493	0.016
p(F-statistic), aged 0-2	0.000	0.000	0.000	0.000	0.000
p(F-statistic), aged 3-5	0.000	0.000	0.000	0.000	0.001
p(F-statistic), aged 6-12	0.005	0.001	0.004	0.001	0.021
p(F-statistic), aged 13-17	0.002	0.003	0.008	0.007	0.102
Number of Observations			263,898		

Notes: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$, interacted with indicators for the age of the child in the household (categorized as 0-2, 3-5, 6-12 and 13-17 (reference) years old). Mothers of multiple children represented multiple times. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, number of child fixed effects. Each column represents a separate regression. Standard errors clustered at the state level. Total effect, measured as the sum of the main effect of the simulated credit and the interaction term, is presented for each age group below the regression estimates, with p-values associated with the F-statistic on the combined effect below.

*Based on earnings

Appendix Table 4. Effect of the EITC on maternal employment: Test different specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						Panel A. No age interactions						
Simulated EITC	0.009	0.009	0.053	0.070	0.066	0.055	0.038	0.027	0.032	0.049	n/a	n/a
	(0.005)	(0.005)	(0.008)	(0.014)	(0.014)	(0.019)	(0.014)	(0.014)	(0.014)	(0.037)		
Implied elasticity	0.02	0.02	0.14	0.18	0.17	0.14	0.10	0.07	0.08	0.13		
Number of observations						150,691						
						Panel B. Age interactions						
Simulated EITC	0.009	0.002	0.041	0.052	0.049	0.041	0.023	0.013	0.021	-0.024	0.001	0.015
	(0.005)	(0.005)	(0.007)	(0.015)	(0.015)	(0.019)	(0.015)	(0.014)	(0.016)	(0.02)	(0.012)	(0.014)
Simulated EITC*aged 0-2	0.026	0.071	0.044	0.040	0.040	0.039	0.040	0.039	0.035	0.051	0.084	0.04
	(0.01)	(0.01)	(0.009)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.015)	(0.019)
Simulated EITC*aged 3-5	0.002	0.036	0.010	0.008	0.008	0.007	0.008	0.007	0.005	0.019	0.059	0.045
	(0.009)	(0.01)	(0.01)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.013)	(0.017)
Simulated EITC*aged 6-12	-0.003	0.009	-0.004	-0.006	-0.005	-0.006	-0.005	-0.005	-0.006	0.001	0.039	0.037
	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.013)	(0.016)
Simulated EITC*aged 13-17 (reference)												
Total, aged 0-2	0.035	0.073	0.085	0.092	0.089	0.080	0.063	0.052	0.056	0.027	0.085	0.055
Total, aged 3-5	0.011	0.038	0.051	0.060	0.057	0.048	0.031	0.020	0.026	-0.005	0.060	0.060
Total, aged 6-12	0.006	0.011	0.037	0.046	0.044	0.035	0.018	0.008	0.015	-0.023	0.040	0.052
Total, aged 13-17	0.009	0.002	0.041	0.052	0.049	0.041	0.023	0.013	0.021	-0.024	0.001	0.015
p(F-statistic), aged 0-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.147	0.000	0.000
p(F-statistic), aged 3-5	0.08	0.00	0.00	0.00	0.00	0.02	0.05	0.17	0.11	0.766	0.000	0.000
p(F-statistic), aged 6-12	0.23	0.12	0.00	0.00	0.00	0.07	0.16	0.54	0.29	0.153	0.006	0.003
p(F-statistic), aged 13-17	0.15	0.75	0.00	0.00	0.00	0.03	0.13	0.35	0.21	0.235	0.923	0.271
Implied elasticity, aged 0-2	0.12	0.25	0.29	0.32	0.31	0.28	0.22	0.18	0.19	0.09	0.29	0.19
Implied elasticity, aged 3-5	0.03	0.10	0.14	0.17	0.16	0.13	0.09	0.06	0.07	-0.01	0.17	0.17
Implied elasticity, aged 6-12	0.01	0.03	0.09	0.11	0.11	0.09	0.04	0.02	0.04	-0.06	0.10	0.13
Implied elasticity, aged 13-17	0.02	0.00	0.08	0.11	0.10	0.08	0.05	0.03	0.04	-0.05	0.00	0.03
Demographic controls		X	X	X	X	X	X	X	X	X	X	X
Number of child fixed effects			X	X	X	X	X	X	X	X	X	X
Year fixed effects				X	X	X	X	X	X	X	X	X
State fixed effects				X	X	X	X	X	X	X	X	X
State contextual variables					X	X	X	X	X	X	X	X
State contextual variables*child fixed effects						X	X	X	X			
State time trends							X	X	X			
Number of child time trends								X	X			
All demographic and state variables*EITC									X	X		
All demographic and state variables*age categories											X	X
Year fixed effects* age categories												X
Number of observations						150,691						

Notes: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$ (Panel A), and interacted with indicators for the age of the child in the household (categorized as 0-2, 3-5, 6-12 and 13-17 (reference) years old) (Panel B). Demographic controls include parental age, educational attainment, race and indicators for presence of children aged 0-2, 3-5, 6-12, 13-17. State-year contexual variables include: whether state had a welfare waiver pre-welfare reform (time-varying), welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP. Each column (and panel) represents a separate regression. Standard errors clustered at the state level. In Panel B, total labor supply effect, measured as the sum of the main effect of the simulated credit and the interaction term, is presented for each age group below the regression estimates, with p-values associated with the F-statistic on the combined effect below. Implied elasiticies calculated based on the mean value of the outcome and simulated EITC among mothers with youngest child in each age category.

Appendix Table 5. Dynamic effects of the EITC on maternal employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Simulated EITC	0.064	0.053	0.022	-0.004	-0.006	-0.01	0.000	0.000	-0.004
	(0.014)	(0.012)	(0.011)	(0.014)	(0.009)	(0.009)	(0.014)	(0.011)	(0.009)
1 year lagged simulated EITC				0.047	0.067	0.050	0.007	0.004	-0.002
				(0.017)	(0.009)	(0.011)	(0.031)	(0.027)	(0.026)
2 year lagged simulated EITC							0.030	0.029	0.030
							(0.034)	(0.035)	(0.035)
3 year lagged simulated EITC							0.028	0.024	0.022
							(0.024)	(0.024)	(0.025)
Demographic controls	X	X	X	X	X	X	X	X	X
State-year contextual variables	X	X	X	X	X	X	X	X	X
State fixed effects	X	X	X	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X	X	X	X
Number-of-child fixed effects	X	X	X	X	X	X	X	X	X
State time trends		X	X		X	X		X	X
Number-of-child-time trends			X			X			X
Number of observations	150,691								

Sources: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each column reports the coefficient for the simulated EITC from a separate regression. Standard errors clustered at the state level.

Appendix Table 6: Effect of the EITC on maternal labor force outcomes: American Community Survey/Census

	Worked last week	Number of hours worked	Worked at least 35 hours	Pre-tax earnings ($1,000s of 2016$)	Above poverty threshold* 50%	100%	130%	230%
Simulated EITC	0.021	0.963	0.02	0.893	0.023	0.015	0.000	-0.014
	(0.005)	(0.216)	(0.007)	(0.262)	(0.007)	(0.005)	(0.005)	(0.004)
Simulated EITC*aged 0-2	0.047	1.55	0.042	1.637	0.036	0.048	0.055	0.048
	(0.003)	(0.127)	(0.004)	(0.271)	(0.003)	(0.004)	(0.004)	(0.006)
Simulated EITC*aged 3-5	0.02	0.661	0.011	0.344	0.002	0.001	0.007	0.026
	(0.005)	(0.157)	(0.004)	(0.244)	(0.005)	(0.004)	(0.004)	(0.004)
Simulated EITC*aged 6-12	0.014	0.423	0.006	-0.097	0.006	-0.004	-0.004	0.001
	(0.003)	(0.116)	(0.003)	(0.133)	(0.004)	(0.003)	(0.003)	(0.002)
Simulated EITC*aged 13-17 (reference)								
Total, aged 0-2	0.068	2.513	0.062	2.530	0.059	0.063	0.055	0.034
Total, aged 3-5	0.041	1.624	0.031	1.237	0.025	0.016	0.007	0.012
Total, aged 6-12	0.035	1.386	0.026	0.796	0.029	0.011	-0.004	-0.013
Total, aged 13-17	0.021	0.963	0.020	0.893	0.023	0.015	0.000	-0.014
F-statistic, aged 0-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
F-statistic, aged 3-5	0.000	0.000	0.000	0.000	0.000	0.001	0.096	0.000
F-statistic, aged 6-12	0.000	0.000	0.000	0.003	0.000	0.013	0.270	0.004
F-statistic, aged 13-17	0.000	0.000	0.003	0.001	0.001	0.007	0.982	0.001
Number of Observations				1,078,016				

Notes: American Community Survey (ACS)/U.S. Census 1990, 2000-2016. Sample is restricted to unmarried mothers without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2, 3-5, 6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each column represents a separate regression. Standard errors clustered at the state level. Simulated credits in thousands of 2016$.

*Based on earnings

Data from IPUMS: Ruggles, S., Flood, S., Goeken, R., Grover, J., Meyer, E., Pacas, J. & Sobek, M (2020). IPUMS USA: Version 10.0 [dataset]. Minneapolis, MN: IPUMS. https://doi.org/10.18128/D010.V8.0

Appendix Table 7 : Effect of the EITC on maternal labor force outcomes: Stratified by age of the youngest child, ACS

	Aged 0-2	Aged 3-5	Aged 6-12	Aged 13-17
Worked last week	0.043	0.039	0.031	0.009
	(0.008)	(0.007)	(0.008)	(0.007)
Elasticity	0.13	0.10	0.07	0.02
Number of hours worked/week	2.255	2.062	1.15	0.626
	(0.289)	(0.341)	(0.248)	(0.312)
Elasticity	0.16	0.12	0.06	0.03
Worked at least 35 hours/week	0.052	0.053	0.025	0.017
	(0.009)	(0.009)	(0.006)	(0.009)
Elasticity	0.21	0.18	0.07	0.04
Pre-tax earnings	1.378	1.906	1.287	0.686
	(0.227)	(0.270)	(0.391)	(0.504)
Elasticity	0.18	0.18	0.10	0.04
Above 50% of poverty[1]	0.034	0.035	0.026	0.008
	(0.008)	(0.007)	(0.007)	(0.008)
Elasticity	0.13	0.10	0.07	0.02
Above 100% of poverty[1]	0.032	0.035	0.021	-0.002
	(0.007)	(0.008)	(0.006)	(0.009)
Elasticity	0.21	0.16	0.08	-0.01
Above 130% of poverty[1]	0.015	0.026	0.014	-0.012
	(0.005)	(0.009)	(0.006)	(0.010)
Elasticity	0.14	0.16	0.06	-0.04
Above 230% of poverty[1]	0.004	0.014	0.009	0.007
	(0.003)	(0.005)	(0.006)	(0.010)
Elasticity	0.14	0.27	0.10	0.05
Number of Observations	251,734	188,396	350,276	245,782

Notes: American Community Survey (ACS)/U.S. Census 1990, 2000-2016 (Ruggles et al., 2020). Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$. Separate models conducted for each of the four age categories for the youngest child in the household: 0-2, 3-5, 6-12, and 13-17. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each set of cells represent a separate regression. Standard errors clustered at the state level. Poverty threshold is based on pre-tax earnings. Implied elasiticies calculated based on the mean value of the outcome and simulated EITC among mothers with youngest children in each age category.

[1]: Marginal effects from logistic regression.

Appendix Table 8. Effect of the OBRA and ARRA expansions of the EITC on maternal labor supply outcomes by age of the youngest child

	Worked last week	Number of hours worked	Worked at least 35 hours	Pre-tax earnings ($1,000s of 2016$)	Above 100% of poverty*
Panel A: CPS, OBRA (1989-1998)					
Post1993*2kids	0.05	1.737	0.044	0.64	0.017
	(0.023)	(0.884)	(0.018)	(0.957)	(0.016)
Post1993*2kids*aged 0-2	0.03	1.062	0.011	1.531	0.042
	(0.023)	(0.88)	(0.017)	(0.943)	(0.018)
Post1993*2kids*aged 3-5	-0.018	-0.464	-0.013	0.499	-0.007
	(0.022)	(0.902)	(0.023)	(0.931)	(0.019)
Post1993*2kids*aged 6-12	-0.033	-1.222	-0.033	-0.2	-0.021
	(0.027)	(1.046)	(0.021)	(0.849)	(0.017)
Post1993*2kids*aged 13-17 (reference)					
Total, aged 0-2	0.08	2.799	0.055	2.171	0.059
Total, aged 3-5	0.032	1.273	0.031	1.139	0.01
Total, aged 6-12	0.017	0.515	0.011	0.44	-0.004
Total, aged 13-17	0.05	1.737	0.044	0.64	0.017
p(F-statistic), aged 0-2	0.000	0.000	0.000	0.000	0.000
p(F-statistic), aged 3-5	0.015	0.014	0.022	0.047	0.460
p(F-statistic), aged 6-12	0.199	0.363	0.326	0.257	0.768
p(F-statistic), aged 13-17	0.032	0.055	0.021	0.507	0.304
Number of Observations			43,665		
Panel B: CPS, ARRA (2005-2015)					
Post2009*3kids	-0.013	-0.613	-0.014	0.39	-0.004
	(0.031)	(1.185)	(0.027)	(1.313)	(0.025)
Post2009*3kids*aged 0-2	0.023	1.763	0.055	2.063	0.077
	(0.035)	(1.355)	(0.03)	(1.525)	(0.207)
Post2009*3kids*aged 3-5	-0.027	-0.198	0.007	-0.892	-0.023
	(0.034)	(1.294)	(0.029)	(1.537)	(0.027)
Post2009*3kids*aged 6-12	-0.004	-0.044	0.0004	-1.261	-0.019
	(0.032)	(1.26)	(0.028)	(1.233)	(0.025)
Post2009*3kids*aged 13-17 (reference)					
Total, aged 0-2	0.01	1.15	0.041	2.453	0.073
Total, aged 3-5	-0.04	-0.811	-0.007	-0.502	-0.027
Total, aged 6-12	-0.017	-0.657	-0.0136	-0.871	-0.023
Total, aged 13-17	-0.013	-0.613	-0.014	0.39	-0.004
p(F-statistic), aged 0-2	0.502	0.064	0.007	0.001	0
p(F-statistic), aged 3-5	0.008	0.128	0.671	0.578	0.038
p(F-statistic), aged 6-12	0.152	0.152	0.194	0.215	0.08
p(F-statistic), aged 13-17	0.677	0.607	0.606	0.767	0.872
Number of Observations			72,117		

Panel C: ACS, ARRA (2005-2015)					
Post2009*3kids	0.000	-0.172	-0.002	-0.206	-0.012
	(0.009)	(0.311)	(0.009)	(0.454)	(0.008)
Post2009*3kids*aged 0-2	0.007	0.429	0.029	2.390	0.085
	(0.010)	(0.397)	(0.011)	(0.527)	(0.009)
Post2009*3kids*aged 3-5	-0.02	-0.508	-0.008	0.501	0.015
	(0.010)	(0.344)	(0.008)	(0.483)	(0.009)
Post2009*3kids*aged 6-12	-0.009	-0.308	-0.012	-0.423	-0.004
	(0.008)	(0.315)	(0.009)	(0.439)	(0.008)
Post2009*3kids*aged 13-17 (reference)					
Total, aged 0-2	0.007	0.257	0.027	2.184	0.073
Total, aged 3-5	-0.02	-0.68	-0.01	0.294	0.003
Total, aged 6-12	-0.009	-0.48	-0.014	-0.630	-0.016
Total, aged 13-17	0.000	-0.172	-0.002	-0.206	-0.012
p(F-statistic), aged 0-2	0.425	0.417	0.000	0.000	0.000
p(F-statistic), aged 3-5	0.001	0.000	0.066	0.275	0.268
p(F-statistic), aged 6-12	0.125	0.015	0.004	0.000	0.000
p(F-statistic), aged 13-17	0.954	0.583	0.817	0.651	0.121
Number of Observations	747,310				

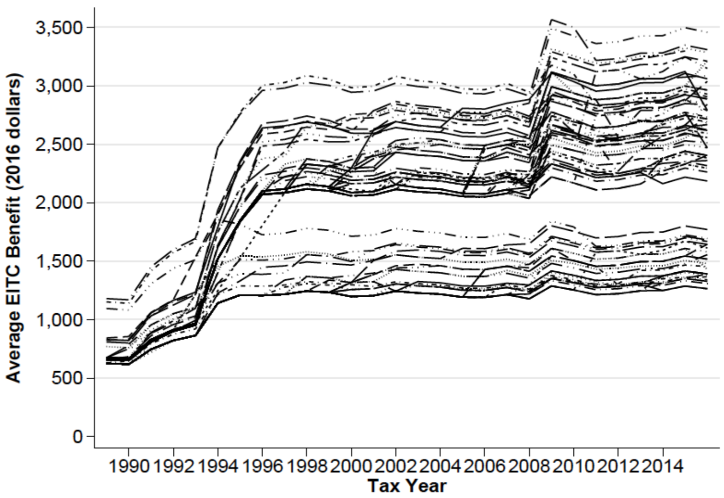
Notes: Current Population Survey (ASEC) and American Community Survey (ACS). Panel A restricted to tax years 1989-1998. Panels B and C restricted to tax years 2005-2015. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Panel A regresses labor market outcome on indicators for post-1993 tax year, having two or more children, and age of the youngest child in the household, the interaction of post-1993 with two or more children, as well as the triple interaction of the three terms; Panel B regresses labor market outcome on indicators for post-2009 tax year, having three or more children, and age of the youngest child in the household, the intearction of post-2009 with three or more children, as well as the triple interaction of the three terms. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each panel-column represents a separate regression. Standard errors clustered at the state level. Total effect, measured as the sum of the two-way and three-way interaction, is presented for each age group below the regression estimates, with p-values associated with the F-statistic on the combined effect below.

Appendix Table 9: Effect of the EITC on maternal labor supply outcomes, variation by child's age, test of federal versus state variation

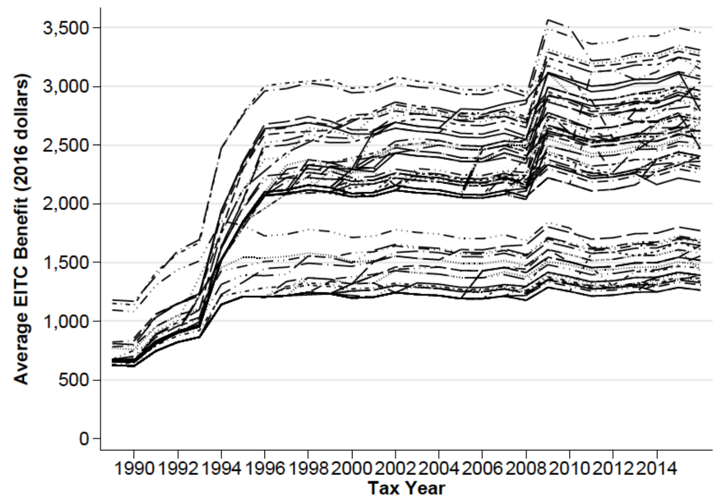
	Worked last week		Number of hours worked		Worked at least 35 hours		Pre-tax earnings ($1,000s of 2016$)		Above 100% of poverty *	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Federal	State	Federal	State	Federal	State	Federal	State	Federal	State
Simulated EITC	0.065	0.022	2.777	0.587	0.063	0.02	1.871	-0.22	0.033	-0.056
	(0.012)	(0.035)	(0.473)	(1.276)	(0.012)	(0.026)	(0.521)	(1.685)	(0.011)	(0.022)
Simulated EITC*aged 0-2	0.047	0.044	1.644	1.877	0.023	0.025	1.685	0.687	0.04	0.08
	(0.011)	(0.027)	(0.355)	(0.98)	(0.008)	(0.023)	(0.362)	(2.008)	(0.008)	(0.024)
Simulated EITC*aged 3-5	0.007	0.023	0.199	0.863	0.003	0.011	0.676	0.806	-0.004	0.074
	(0.011)	(0.018)	(0.422)	(1.026)	(0.011)	(0.033)	(0.435)	(1.672)	(0.01)	(0.023)
Simulated EITC*aged 6-12	-0.01	0.016	-0.63	0.556	-0.02	-0.008	-0.18	0.283	-0.008	0.053
	(0.009)	(0.013)	(0.374)	(0.65)	(0.009)	(0.018)	(0.332)	(1.516)	(0.008)	(0.018)
Simulated EITC*aged 13-17 (reference)										
Total, aged 0-2	0.112	0.066	4.421	2.464	0.086	0.045	3.556	0.467	0.073	0.024
Total, aged 3-5	0.072	0.045	2.976	1.450	0.066	0.031	2.547	0.586	0.029	0.018
Total, aged 6-12	0.055	0.038	2.147	1.143	0.043	0.012	1.691	0.063	0.025	-0.003
Total, aged 13-17	0.065	0.022	2.777	0.587	0.063	0.020	1.871	-0.220	0.033	-0.056
p(F-statistic), aged 0-2	0.000	0.013	0.000	0.020	0.000	0.056	0.000	0.581	0.000	0.133
p(F-statistic), aged 3-5	0.000	0.149	0.000	0.336	0.000	0.402	0.000	0.555	0.003	0.308
p(F-statistic), aged 6-12	0.000	0.224	0.000	0.299	0.000	0.564	0.000	0.946	0.002	0.830
p(F-statistic), aged 13-17	0.000	0.531	0.000	0.648	0.000	0.457	0.001	0.897	0.005	0.017
Number of Observations	150,691									

Notes: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Regressions of labor market characteristics on simulated EITC, measured in thousands of 2016$, interacted with indicators for the age of the youngest child in the household (categorized as 0-2, 3-5, 6-12 and 13-17 (reference) years old). Odd-numbered columns rely only on federal EITC to constructed simulated EITC, while even-numbered columns rely only on the state EITCs to construct the simulated EITC. All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Each column represents a separate regression. Standard errors clustered at the state level. Total effect, measured as the sum of the main effect of the simulated credit and the interaction term, is presented for each age group below the regression estimates, with p-values associated with the F-statistic on the combined effect below.

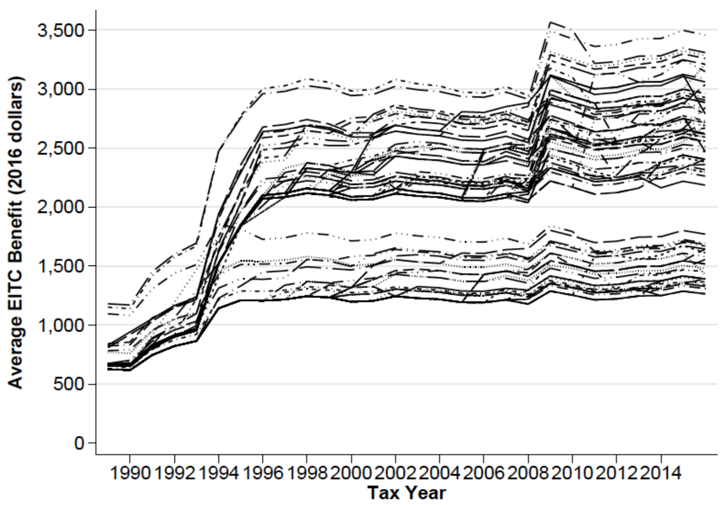
Appendix Figure 1. Variation in simulated EITC, by state, year, number of children, and age of the youngest child



A. Aged 0-2



B. Aged 3-5

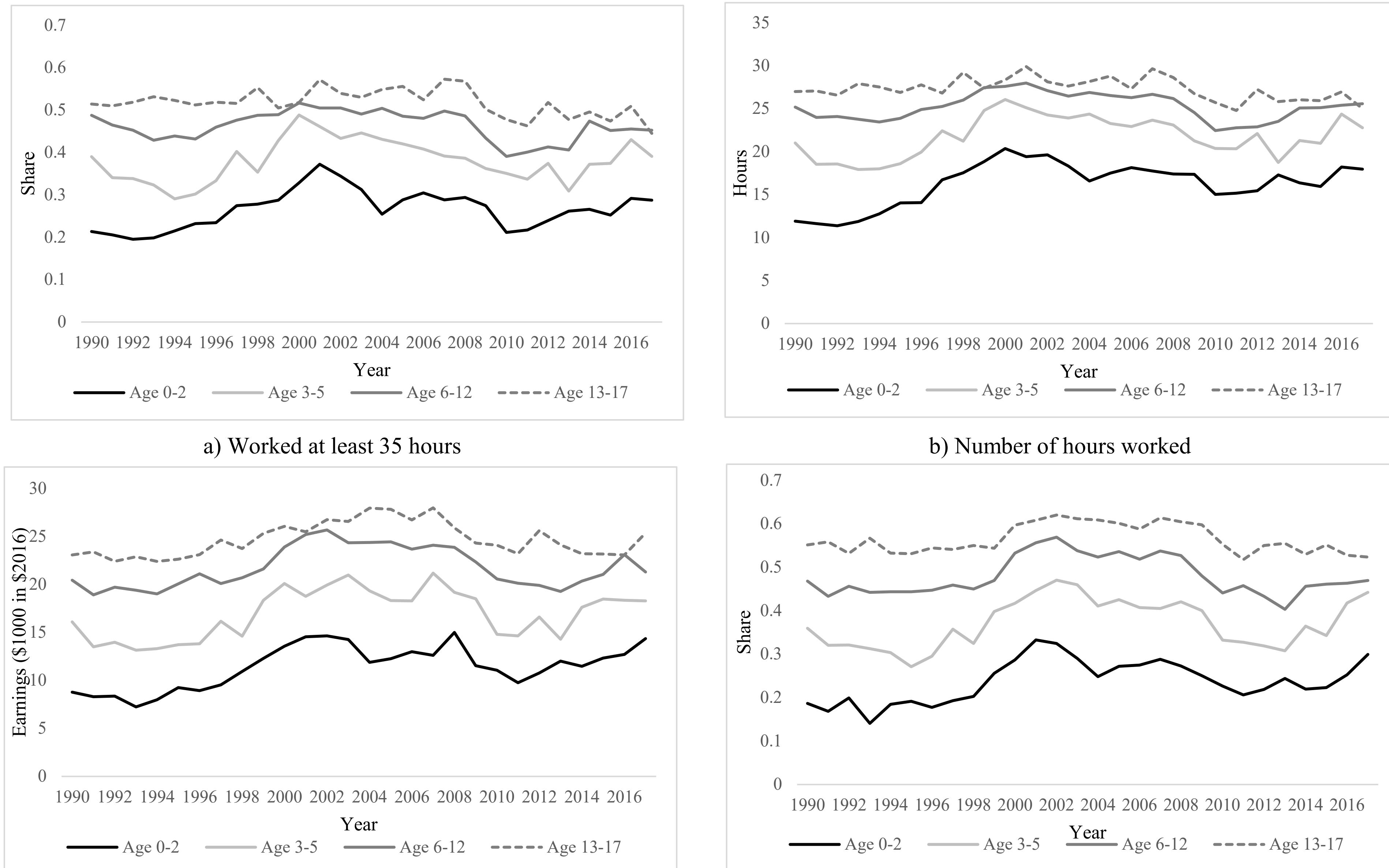


C. Aged 6-12

D. Aged 13-17

Notes: Survey of Income and Program Participation 1996 Survey and NBER's TAXSIM. Unmarried mothers aged 25-65 with at least one child under the age of 19 residing in the household. Average household state and federal EITC benefits from 1990-2015 in 2016$. Age refers to the age of the youngest child in the household. See description of simulated EITC in the text for more details.

Appendix Figure 2. Trends in labor force participation among umarried mothers 1990-2016, by age of the youngest child



a) Worked at least 35 hours

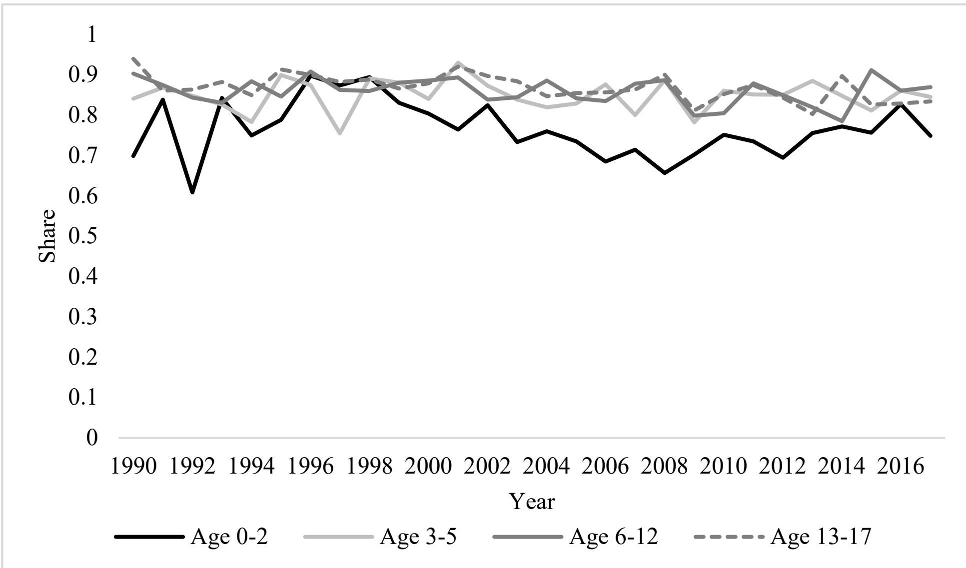
b) Number of hours worked

c) Pre-tax earnings

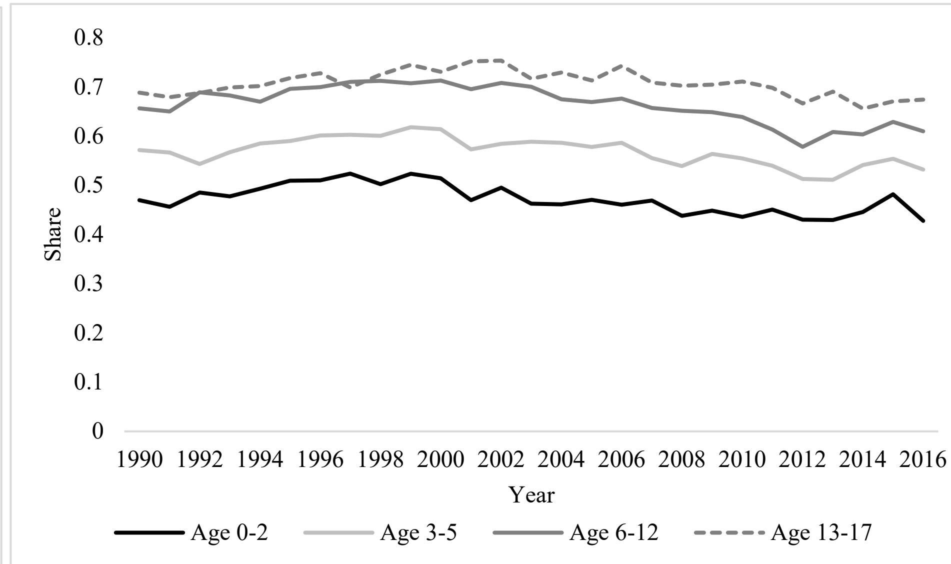
d) Above 100% of poverty

Notes: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household.

Appendix Figure 3. Trends in employment among college-educated unmarried mothers (a) and married mothers (b) between 1990 and 2016, by age of the youngest child



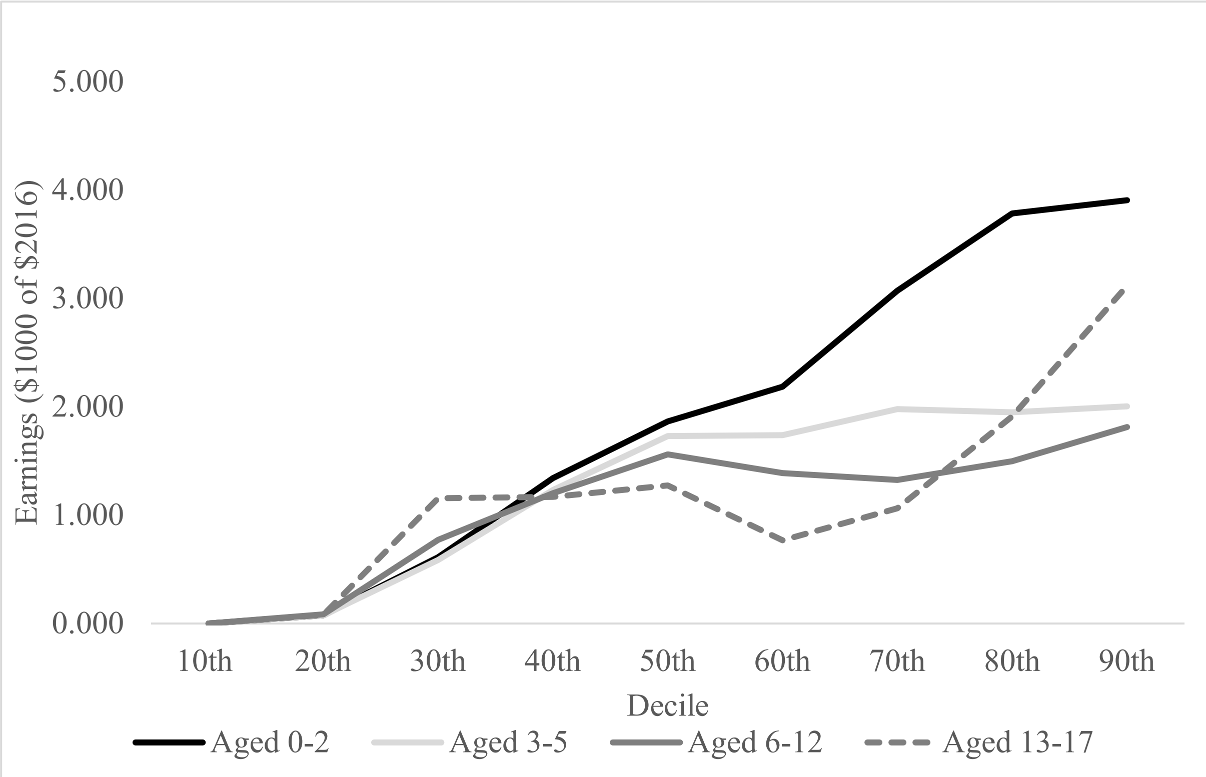
a) College-educated unmarried mothers



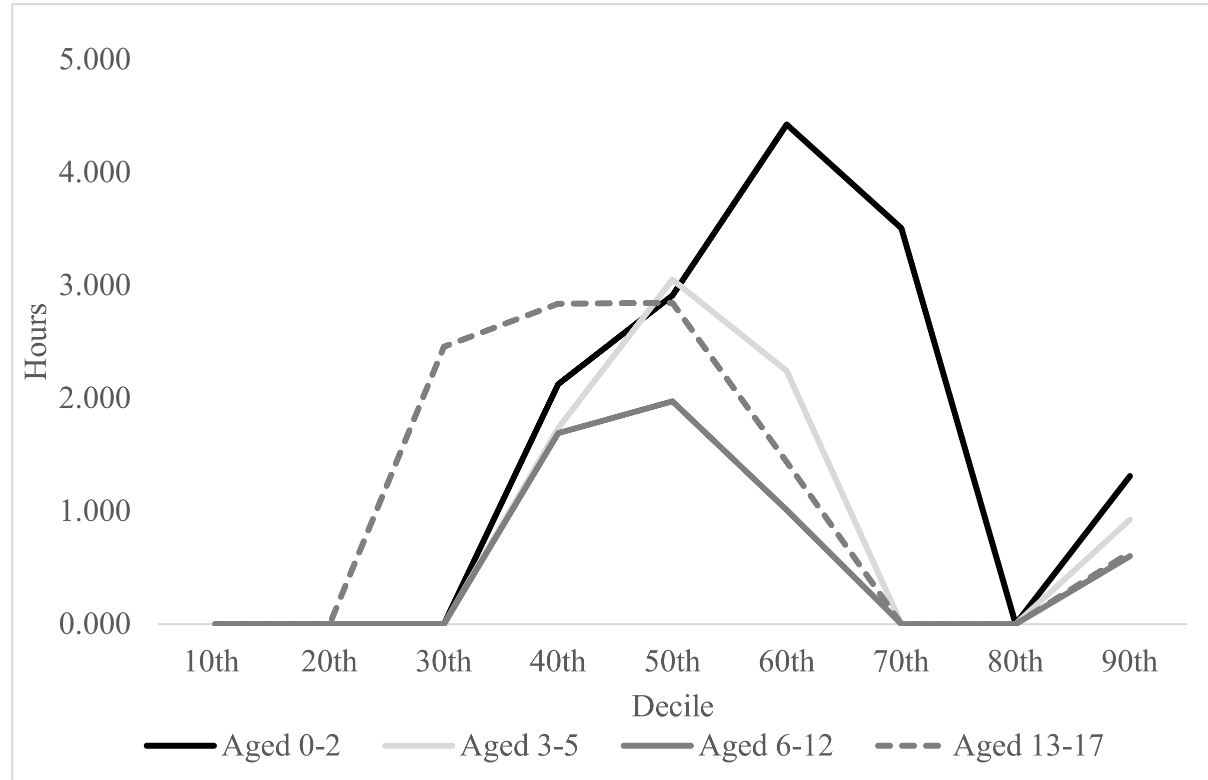
b) Married mothers

Notes: Current Population Survey (ASEC) 1990-2016. Sample is restricted to unmarried mothers over the age of 18 with a college degree (a) or married mothers (b). For both figures, sample is restricted to women who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household.

Appendix Figure 4. Quantile regressions of the effect of the EITC on pre-tax earnings (2016$) and hours worked, by age of the youngest child



a. Pre-tax earnings



b. Number of hours worked

Note: Current Population Survey (ASEC)1990-2016. Sample is restricted to unmarried mothers over the age of 18 without a college degree who have at least one child under the age of 18 in the household. All ages refer to the age of the youngest child in the household. Quantile regressions of labor market characteristics on simulated combined federal and state EITC, measured in thousands of 2016$, interacted with indicators for the age of the youngest child in the household (categorized as 0-2, 3-5, 6-12 and 13-17 (reference) years old). All regressions include demographic (parental age, educational attainment, race, indicators for presence of children aged 0-2,3-5,6-12, 13-17) and state-year characteristics (whether state had welfare waiver, welfare generosity, food stamp generosity, minimum wage, unemployment rate, GDP), as well as state, year, and number of child fixed effects. Separate regressions estimated for each decile between 10th and 90th percentile. Standard errors clustered at the state level. Simulated credits in thousands of 2016$. Coefficients plotted are the total effect of the simulated EITC on the outcome of interest for each age category. For age categories 0-2, 3-5, and 6-12 this is calculated based on summing the main effect of the EITC and the interaction term. For age category 13-17, this is represented by the main effect of the EITC on the outcome of interest.