Employment Effects of the Earned Income Tax Credit: Taking the Long View

Diane Whitmore Schanzenbach
Northwestern University and NBER

Michael R. Strain
American Enterprise Institute and IZA

Draft: September 16, 2020

The Earned Income Tax Credit (EITC) is the cornerstone U.S. anti-poverty program, typically lifting over 5 million children out of poverty each year. Targeted to low-income households with children, and only available to those who work, the EITC includes strong incentives for non-workers to become employed. Most of the existing economics literature focuses on federal EITC expansions in the 1980s and 1990s. This paper takes a longer view, studying all federal expansions since the program's inception in 1975. We find robust evidence that EITC expansions increase the extensive margin of labor supply.

The authors thank Jacob Bastian, Jeffrey Clemens, Bob Greenstein, Hilary Hoynes, Jonathan Meer, Bruce Meyer, Jesse Rothstein, Daniel Shoag, and Stan Veuger for helpful discussions. We thank Abigail Pitts and Sachin Shukla, and especially Duncan Hobbs, for excellent research assistance. All errors are our own.

The Earned Income Tax Credit (EITC) has been widely hailed as one of the most successful anti-poverty programs in the United States. The EITC provides a financial benefit to low-income, working households, raising their annual incomes through a refundable tax credit that varies based on total labor market earnings and household size. In addition, by raising the financial returns to paid employment, the EITC provides an incentive to low-income individuals who are not working to participate in the labor market.

Whether this incentive leads to an increase in labor supply among the EITC's target population has been studied by economists, primarily by investigating individual credit expansions (e.g., Bastian, 2020, and Eissa and Leibman, 1996) or groups of selected expansions together (e.g., Meyer and Rosenbaum, 2001). Most of the literature has focused on the expansions of the 1980s and 1990s.

This paper takes a longer view, studying all federal EITC expansions together, with a unified empirical framework, using modern econometric methods. This approach has several advantages. It allows for a reexamination of the expansions of the 1980s and 1990s using difference-in-differences and event-study techniques, including studying the dynamic effect of the EITC on the extensive margin of labor supply. By using the same sample definitions and methods, it allows readers to compare how different expansions have affected employment. It also allows us to study all five federal expansions in the same specifications.

We find broad support for the hypothesis that the EITC's labor supply incentives increase employment. We first study all five EITC expansions separately. Our preferred specification allows for business cycle effects to vary by the presence of children in the household. It is clearly important to control for the business cycle, and particularly important to allow for business cycle effects to vary by household composition, since EITC expansions increase employment incentives for some households with children relative to household without children. As a result, EITC effects are identified here (and in the literature) by comparing employment outcomes across years and between households with children and those without children. We find evidence that four of the five EITC expansions — the program's introduction in 1975, and the 1986, 1990, and 1993 expansions — increased the share of low-education women who reported working in the previous year. This conclusion is based both on difference-in-differences analyses and on an event-study approach.

We then examine the 1993 expansion more closely. The credit expansion in 1993 was large, and it occurred during a period in which many states were experimenting with changes to their welfare policies that were designed to increase employment. For example, implementing time limits on the receipt of cash welfare.[1] Because these policy changes happened concurrently, estimates of the 1993 EITC expansion's employment effect could be confounded by the effects of state-level welfare reform policies on employment. We use a straightforward method to study whether the 1993 ETIC expansion increased employment independent of changes to state welfare policies: We estimate the credit expansion's effect only in states that did not enact welfare reforms. We find strong EITC impacts on employment in these states, building confidence that the 1993 EITC expansion increased employment separate and apart from any employment effects from state welfare reform policies.

We then attempt to estimate "the" EITC-employment effect by pooling all expansions together in one difference-in-difference model. The purpose of this exercise is to study whether the program as a whole — apart from individual expansions — affects labor supply, and to quantify the magnitude of the effect. We use variation over time and states in the size of the maximum EITC credit to estimate the employment response and find robust evidence of an extensive-margin effect. When studying all federal expansions together, we find that a $1,000 increase in the size of the maximum credit is associated with a 3.2 to 3.7 percentage point increase in employment among unmarried mothers with low levels of education. When examining both federal and state expansions together, we find a 2.9 to 3.3 percentage point increase in employment.

These magnitudes are reasonable. For example, for unmarried mothers with two children, the maximum credit increased by $2,045 following the 1993 expansion, and employment rates among this group increased by 11 percentage points relative to childless unmarried women by 1996. Applying our estimates suggests that the EITC expansion explains 59 percent of the increase in employment rates among the targeted population during this period.

Finally, we study the dynamic effect of all five federal expansions simultaneously in an event-study framework. We find strong evidence that the EITC increased employment, as a whole and when pooling all federal expansions. The dynamic effect of the EITC in the pre-

[1] Meyer and Rosenbaum (2000) offer a comprehensive summary and analysis of the social-policy changes of the 1990s.

expansion period suggests that the treatment and control groups were evolving similarly and supports a causal interpretation of the post-period estimates. On average, we find the EITC increased employment among low-education unmarried mothers with children by around 2.9 percentage points, with the magnitude of the effect growing to around 4 percentage points in the fifth year after the expansion occurred.

To our knowledge, the only other paper to look comprehensively at all five federal EITC expansions is Kleven (2019), a working paper. Kleven notes that the large increase in employment among unmarried mothers in the 1990s occurred concurrently with both the EITC expansion and many states' implementation of cash welfare reforms aimed at reducing welfare rolls. He attempts to separate the impacts of state welfare reforms from the EITC expansion and concludes that the EITC benefit increase did not cause the employment increase. Kleven also finds that no other federal EITC expansion is associated with employment increases among the targeted population.

We are able to reconcile our results by adopting his methodological choices. Specifically, by omitting business cycle and individual demographic controls, and by defining the outcome variable as whether single mothers reported working in the previous week as opposed to the previous year. We argue that our empirical approach is preferable because the business cycle likely affects single mothers with children differently than those without children, and because it is preferable to investigate the impact of the EITC on individuals with low levels of education, as the credit's target population is low-income households. Including individuals with high education levels, who generally earn too much to be eligible for the EITC, attenuates the true policy effect. Studying whether the EITC affects labor supply over the year helps to ensure that the outcome variable is more representative of actual labor supply behavior than studying whether the respondent worked in the week prior to the survey. In addition, the EITC is a policy that operates on an annual frequency, and studying whether it affects employment at any point in the year, rather than in the week prior to the survey week, better aligns the outcome variable with the structure of the policy. Regarding the 1993 expansion specifically, Kleven (2019) relies upon a three-way fixed effect controlling for whether a state had welfare waivers interacted by year interacted by whether children are present in the household. We argue that this tight control absorbs much of the employment effect of the EITC, which is identified by comparing households with and without children before and after credit expansions.

The paper proceeds as follows. In section 1, we provide background on the EITC and a brief review of the prior literature. Section 2 provides an overview of the data we use. Section 3 studies the impacts of individual EITC expansions separately, using difference-in-differences and event study approaches. We then study the 1993 expansion in more detail and attempt to reconcile our findings with other recent work. Section 4 considers all five EITC reforms together, and section 5 concludes.

1. Background on the EITC

The EITC lifts millions of people, including several million children, out of poverty each year — more than any other policy (Renwick and Fox 2016, Bitler, Hoynes and Kuka 2017, Meyer and Wu 2018).[2] About 1 in 6 tax returns (17.6 percent) claimed the EITC in 2017, receiving a total of $66.4 billion in tax credits. The calculation of the credit depends on a household's earnings, their filing status (married or unmarried), and the number of eligible children in the household. In 2020, the maximum tax credit ranges from $3,584 for those with 1 child to $6,660 for those with 3 children and can make up as much as 45 percent of a family's pre-tax income. The average credit received for unmarried parents is about $2,400 for those with 1 child, $3,850 with 2 children, and $4,250 for a single parent with 3 children (Crandall-Hollick & Falk, 2020).

The EITC is structured with three ranges of payments, with a payment schedule that is shaped like a trapezoid (see Appendix Figure 1). The incentives and impacts of the EITC on workers vary across these ranges. In the phase-in range, the tax credit increases with every additional dollar of earnings — meaning that for every additional hour worked, a recipient's income will increase by more than their hourly wage. Currently the phase-in range extends to annual earnings of just over $10,000 for a single parent with 1 child (and just below $15,000 for those with 2 or more children). Over the next range of earnings, the tax credit remains constant—unchanged at the maximum payment level regardless of additional earnings. From a recipient's perspective, having earnings in this range of the EITC payment schedule means that every additional hour worked increases a recipient's income by the hourly wage amount, but a

[2] For example, the 2013 EITC lifted 4.7 million children out of poverty, purely as an income transfer (Bitler, Hoynes & Kuka 2017). The Current Population Survey under-states the anti-poverty impacts of the EITC because too few survey respondents accurately report receiving the credit (Meyer, 2010).

worker's total income is increased quite substantially by the EITC payment – 31 to 39 percent for a single worker with 2 children, depending on where in the range they fall. Once earnings pass $19,330 ($25,220 for married couples with children), the worker moves into the phase-out range in which the tax credit is slowly reduced with each additional dollar earned. From the worker's perspective, this means that each additional hour worked results in a total income increase that is less than the wage amount, because the EITC payment is reduced as earnings rise. Those earning in excess of $43,000 to $56,000 (depending on marital status and number of children) are no longer eligible for the EITC.

For unmarried potential low-earning workers who are not currently employed, the incentives are clear: by raising the payoff to working, the EITC increases incentives to become employed. Since EITC payments are calculated based on annual earnings, economic theory predicts that low-income workers will be more likely to be employed over the course of the year but there is no prediction about how earnings will be spread throughout the year. (For example, a worker may get to 1000 hours of work through full-year part-time work or partial-year full-time work.) The EITC likely has a much larger impact on the labor supply decisions of individuals with low levels of education, as those individuals are more likely to be heading low-income households.

EITC payment levels have increased over time in response to discrete policy changes, including substantial expansions as part of the tax acts of 1975, 1986, 1990, 1993, and 2009, as shown in Figure 1. Some expansions have been large — for example, over 3 years the 1993 reform more than doubled the maximum EITC payment for those with 2 or more children — while others have been more modest. In some cases (1993 and 2009), expansions increased the EITC disproportionately for families with different numbers of children. In addition, 29 states plus the District of Columbia have adopted supplemental state EITC programs. Together, these policy changes have provided ample variation for researchers to isolate the impact of the EITC on employment, income, and a wide range of other outcomes.

Of course, it is worth noting that families do not receive the EITC until the following calendar year, after they file their taxes. To the extent that there is learning about EITC parameters, it may take multiple years because of the delay in timing between work effort (in calendar year t) and payment receipt (in calendar year $t+1$). Recent results from a randomized-controlled trial of the Paycheck Plus program in New York City, similar in structure to the EITC

but available to those without children, finds that the program's impacts on employment rates are zero the first year, but positive in years two and three, suggesting there may be a delay between policy implementation and behavioral response on the extensive margin (Miller et al. 2018). We examine timing of employment effects in our event-study analyses below.

There have been many papers studying the EITC and a number of comprehensive reviews of the literature (Hotz & Scholz 2003; Eissa & Hoynes 2006; Nichols & Rothstein 2015; Hoynes & Rothstein 2017). Researchers have utilized variation across tax years and family sizes, generally comparing outcomes among low-educated unmarried women with and without children. As shown in Figure 2, in the 1970s and 1980s, unmarried childless women with a high school diploma or less education on average were 15 percentage points more likely to be employed than those with children, with the gap narrowing and expanding at various points. Starting around 1988, the difference in employment rates began to sharply close so that by 1999 and continuing through 2018 unmarried mothers with low education levels were more likely to be employed than childless women.

Using a range of data sources and approaches, studies nearly universally find substantial positive impacts of the EITC on employment among single mothers with low levels of education. Notably, Eissa and Liebman (1996) find that the 1986 EITC expansion increased employment among single women with children by 2.8 percentage points compared to those without children. Meyer and Rosenbaum (2001) find that the 1986, 1990 and 1993 EITC expansions increased employment among unmarried mothers relative to unmarried childless women by 7.2 percentage points. Hoynes and Patel (2018) estimate that the 1993 expansion increased employment by 6.1 percentage points among unmarried mothers with some college or less compared with childless women with the same education, with larger impacts for single mothers with 2 or more children. Bastian (2020) investigates the 1975 introduction of the EITC, finding that maternal employment increased by 6 percent relative to childless women. Bastian and Jones (2000) find weakly positive impacts of the 2009 federal expansion on women with 3 or more children (including married and unmarried, and all education levels), in comparison to women without children as well as mothers with 1 or 2 children. Similarly, Bastian and Lochner (2020) use the American Time Use Survey to examine the 2009 federal expansion and find that maternal employment time increases among unmarried mothers. Gelber and Mitchell (2012) find in the Panel Study of Income Dynamics that unmarried women were more likely to participate in the labor force in

response to changes in the EITC that increased the average net-of-tax share of income kept. Importantly, their results are robust to the inclusion of individual fixed effects. Instead of relying on federal variation over time, Neumark and Wascher (2002) use variation in state-level EITC payments, comparing low-income families with children across states with different state-EITC payments, and find it increases employment and raises families out of poverty. The finding that the EITC increases employment, especially among unmarried mothers with low education levels, is robust across different time periods, and different research approaches.

The EITC's impact has also been widely studied along other dimensions, including its (small) effects on marriage and fertility (Dickert-Conlin & Houser 2002; Holtzblatt & Rebelein 2000; Michelmore 2014; Baughman & Dickert-Conlin 2009), its ability to improve health outcomes among infants as well as mothers (Evans & Garthwaite 2014; Baughman & Duchovny 2016; Hoynes, Miller & Simon 2015), and its positive impacts on children's school test scores and educational attainment (Dahl & Lochner 2012; Chetty, Friedman & Rockoff 2011), as well as college enrollment (Bastian & Michelmore 2018; Manoli & Turner 2018). It has also been shown to have only a small impact on hours worked among those already employed (Saez 2010), but instead most of the impact on labor supply comes through moving individuals from not working to working. The prior literature has found no impacts of the EITC on employment rates of married fathers (who have employment rates in excess of 95 percent) and either small negative or no impact on employment among married mothers (Eissa & Hoynes, 2004).

2. Data

We use data from the Current Population Survey Annual Social and Economic Supplement (ASEC) for the years 1971-2014 for our primary analysis, a time period that spans five years prior to the first EITC expansion through five years after the most recent one. These data include information on annual employment as well as demographic characteristics (marital status, presence of children, education level) required to determine likely EITC eligibility. Following Kleven (2019), we supplement this analysis with information on whether the respondent worked in the prior week, drawn from both the ASEC and CPS monthly files from 1989-2014.[3] Recall that the CPS ASEC asks about whether a respondent worked in the prior

[3] Although CPS monthly files are available starting in 1976, it is not possible to accurately identify the presence and number of own children in the household (which is necessary for determining the relevant EITC parameters) for

year, so data on employment in year *t* come from the ASEC survey in year *t+1*. Our primary analysis sample includes unmarried women ages 20-50 with a high school diploma or less education, as this is the group most impacted by the EITC. We drop observations with missing weights, state (or state group prior to 1977) identifiers, or educational attainment. Summary statistics are presented in Appendix Table 1.

Data on federal EITC parameters come from the Tax Policy Center and are graphed in Appendix Figure 1. We code the expansions enacted in 1975, 1987 and 2009 with binary indicators. Since the EITC expansions passed in the tax acts of 1990 and 1993 were phased in over multiple-year periods, we assign treatment in proportion to the phase-in amount. In particular, for those with 1 child, the 1993 expansion was phased in over 2 years, with 92 percent of the eventual increase implemented in 1994 and the expansion complete in 1995; we code the EITC expansion variable to be 0.92 in 1994 and 1 in 1995. For those with 2 or more children, the 1993 expansion was phased in over 3 years, with 50 percent of the eventual total implemented in 1994, 78 percent by 1995, and full implementation by 1996; we code those expansions 0.5, 0.78, and 1 for years 1994, 1995 and 1996, respectively. Similarly, the 1990 expansion was phased in with 50 percent of the eventual increase by 1991 and full implementation by 1992 for those with 2 or more children. For those with 1 child, the phase-in of the EITC increase was 64 percent in 1991 and 100 percent by 1992. We also include information on state EITC parameters over time, drawn from the Tax Policy Center and the National Bureau of Economic Research, compiled in Kleven (2019), and presented in Appendix Table 2. We also include data on whether a state had an Aid to Families with Dependent Children (AFDC) welfare waiver approved prior to the 1996 welfare reform law, drawn from the Department of Health and Human Services. Thirty-six states had a welfare waiver, as shown in Appendix Table 3. Unemployment rates by state and year are calculated from the CPS.

3. Examining the Effects of Individual EITC Expansions

In this section, we estimate the effects of individual federal EITC expansions on employment, first using difference-in-differences approaches and then studying the dynamic

years prior to 1989. We link children to parents using household ID and mother location to determine if a woman is living with any children eligible for the EITC, which includes own children in the household under age 19, or under 24 and a full-time student. Throughout, we use "children" to refer to EITC-eligible children, and we drop the small fraction of single women who have EITC-ineligible children living at home.

effect of each individual expansion using event studies. Then, we more closely examine the 1993 reform, attempting to disentangle the EITC's impact on employment from that of states' experiments with welfare reform prior to the 1996 federal welfare reform legislation. We attempt to reconcile our results with Kleven (2019), which finds that the only EITC expansion which might have increased employment was 1993, and that employment increases in the mid-1990s are better explained by state welfare waivers than by the credit expansion. We find the opposite. Specifically, we find evidence that multiple credit expansions, not just 1993, are associated with employment increases, and we find that the 1993 EITC expansion had a significant effect on employment, independent from welfare reform experiments.

a. Difference in differences estimates

We first examine the employment effects of each of the federal EITC expansions adopted, respectively, by the tax acts of 1975, 1986, 1990, 1993, and 2009. We examine each expansion in separate regressions, limiting the sample to five years before and after the EITC expansion took effect. In each case, we compare employment rates of unmarried mothers to those of unmarried childless women, before vs. after the EITC expansion. This natural experiment was first used by Eissa and Liebman (1996). We adopt a standard and transparent difference-in-differences framework for this analysis:

$$E_{ist} = \beta EITC_{it} + \gamma kids_i + \boldsymbol{X_i}\phi + \eta u_{st} + \theta(u_{st} * kids_i) + \lambda_s + \tau_t + v_{ist}. \quad (1)$$

The outcome, E_{ist}, is an indicator for whether individual *i* living in state *s* is employed in year *t*. Explanatory variables include an indicator variable ($kids_i$) for the presence of EITC-eligible children living at home, the vector $\boldsymbol{X_i}$ includes individual characteristics including the woman's age (dummied out into 5-year age groups, plus 45-50), their education level (less than high school, high school only, some college, college degree or higher), and the age of their youngest child (0-1, 2-3, 4-6, 7-9, 10-13, 14-17, 18-23). We include state and year fixed effects (λ_s and τ_t) to account for time-invariant differences across states, and annual shocks that are common across states. In most specifications we add controls for the annual average state unemployment rate u_{st} to account for general economic and labor market conditions, and further augment it with the state unemployment rate interacted with the presence of children ($u_{st} *$

$kids_i$) to account for potential differential business cycle effects on those with and without children.

The coefficient of interest is on the indicator variable equal to one for the five years after the EITC expansion and equal to zero otherwise.[4] Recall *EITC* is a binary variable for the expansions passed in 1975, 1986 and 2009, and phases in with the 1990 and 1993 expansions. Where appropriate, the EITC variable differs by number of children in the household.

Results are displayed in Table 1. Panel A limits the sample to women with low levels of education, defined as having completed high school or less. This is the most appropriate of the two samples we use, since the EITC is targeted to those with low levels of earnings — although still of course EITC takeup is far from universal. Columns (1) through (3) present the most appropriate outcome measure of the two we study, which equals one if the individual was employed during the year and zero if not. This outcome variable, as opposed to the outcome variable measuring whether the respondent was employed in the week prior to the survey, is likely the more representative of labor supply patterns throughout the year, and because the frequency of the EITC is annual, studying annual employment is the better analytical choice. The first column omits controls for unemployment rates, while column (2) includes the annual state unemployment rate, and column (3) interacts state unemployment rate with the presence of children and is our preferred specification.

As shown in column (3), our preferred difference-in-differences estimate finds that the 1975 introduction of the EITC increased single mothers' annual employment rates by 6.5 percentage points.[5] The 1986 expansion increased single mothers' annual employment by 3.1 percentage points. Next, we consider the 1990 EITC expansion, which as described above was phased in over a 2-year period (1991-92). The difference-in-differences estimate indicates that the EITC expansion increased single mothers' annual employment by 6.9 percentage points.[6]

The 1993 EITC expansion was larger than prior boosts, especially for mothers with 2 or more children. Employment among unmarried mothers increased by 10.2 percentage points in the post-expansion period, after accounting for state unemployment rates and allowing their

[4] We tested and found that shortening the post-EITC expansion window to 4 years for the 1986 and 1990 expansions so the post-periods would not overlap with a subsequent expansion does not meaningfully change the results.
[5] From 1968-1972, 32 states cannot be separately identified and from 1973-1976, 38 states cannot be separately identified in the CPS. We calculate unemployment rates for all identified state-groups.
[6] Both the 1986 and 1990 expansion 5-year post-periods run up against the next EITC expansion. Results are qualitatively similar if we limit the analysis to 4 years after the expansions.

impacts to differ for women with and without children in the home. Each of these individual EITC expansions (1975, 1986, 1990 and 1993) show positive, statistically significant effects on mothers' annual employment.

The exception to this pattern is the 2009 EITC expansion. In this case, the EITC was expanded among unmarried women only for those with three or more children, leaving the control group to include both childless women and those with two or fewer children.[7] We do not find that this expansion has a significant impact on treated women's employment rates, although other recent papers employing different research designs do find weakly positive employment effects (Bastian & Jones, 2020; Bastian & Lochner, 2020). It is worth noting that this expansion occurred during a period of high unemployment and a subsequent slow jobs recovery, and it is plausible that some women who wanted to work could not find employment.

Because the EITC is based on annual earnings, we concur with the prior literature and conclude that annual employment rates are the most appropriate outcome measure. However, to address concerns raised by Kleven (2019), we augment these results with data from the CPS monthly files on whether an individual was employed in the prior week. We find that this alternative outcome variable does not change the general conclusion from using annual employment. The general patterns shown for annual employment persist when we examine weekly employment in columns (4)-(6). The 1975, 1990 and 1993 expansions continue to have a positive, significant impact on mothers' employment, but the 1986 EITC expansion no longer has a statistically significant impact once state unemployment rates are interacted with presence of children.

Panel B expands the analysis to all single women, regardless of education levels. Fewer women with higher levels of education have earnings in the range that would make them eligible for EITC payments, so we would not expect them to have strong responses to EITC incentives. By including these women in the treatment group, we expect the estimates to be attenuated relative to Panel A. Moreover, the presence of higher-educated women in the control group also muddles the comparison between treatment and control groups.

[7] The 2009 expansion also extended the range over which married filers receive the maximum EITC. Meyer (2010) finds that trends in employment between unmarried women who are childless, and have 1, 2 or 3 children are not different from 1999-2007, indicating the parallel pre-trend assumption holds in 2009.

Even so, using this approach, the 1975, 1990 and 1993 expansions are individually statistically significant for annual employment. The 1986 expansion is no longer statistically significant once the impact of state unemployment rates is allowed to vary by presence of children. For prior week's employment (columns 4 through 6), in the overall sample, the 1990 expansion also loses statistical significance while the 1975 and 1993 expansions remain individually statistically significant.

b. Event-Study Estimates

Figure 3 displays event-study estimates using our preferred set of control variables and sample. Specifically, they present estimates of the dynamic effect of individual EITC expansions on the annual employment of women with low levels of education, controlling for state unemployment rate interacted with an indicator variable for the presence of children in the household (*i.e.*, Table 1, Panel A, Column 3). In particular, we graph estimates of δ_j from the following equation, estimated over years -5 to 4 (where year 0 is the first year in which the EITC reform is implemented):

$$E_{ist} = \sum_{j \neq -1} \left(\delta_j Year_{j=t} * kids_i\right) + \gamma kids_i + \boldsymbol{X_i}\phi + \eta u_{st} + \theta(u_{st} * kids_i) + \lambda_s + \tau_t + v_{ist}. \qquad (2)$$

Panel A displays results from the 1975 EITC expansion. Notice that the estimates of event-time prior to the expansion are all zero and display no trend. The EITC expansion increases unmarried mothers' employment rates. In each post-expansion year, the yearly coefficient is individually statistically significant. Panel B shows results from the 1986 expansion. Again, there are no pre-trends, and strong increases in employment in the post period, with the exception of the first post-expansion year which is small and not individually significant.

Panel C displays results from the 1990 expansion, which was phased in so that in 1991, 64 percent of the eventual expansion was available to those with one child and 50 percent was available to those with two or more children. The full credit was available in 1992. Note here that unmarried mothers' relative employment was increasing during the pre-expansion period, in

keeping with the effects of the 1986 expansion shown in Panel B, but that the 1990-expansion pre-period increase had leveled out by 3 years prior to the 1990 expansion. The post period shows a discrete increase in employment, with each of the 5 post-years individually significant except year 3.

Panel D repeats the analysis for the 1993 expansion, which was also phased in. For those with one child, 92 percent of the eventual expansion was available in 1994 and it was fully expanded in 1995. For those with two or more children, 50 percent was available in 1994, 78 percent in 1995 and it was fully available in 1996. Here, too, there are pre-trends occurring, in keeping with the effects found for the 1990 expansion. But there is also a discrete increase in the yearly event-study coefficients when the expansion's phase-in began. Each post-expansion year is individually statistically significant, including those implemented prior to the PRWORA federal welfare reform law's passage. We explore the potential confounding role for welfare reform in the next section.[8]

Panel E shows the impact of the 2009 EITC expansion, which only affected those with 3 or more children. As in Table 1, we compare employment rates among unmarried women with 3 or more to those of a control group including those with only 2 children. There is no statistically significant impact of the 2009 EITC expansion in any year. We speculate that particularly weak labor demand during the period following the 2008 financial crisis and Great Recession may have swamped any EITC-driven labor supply effect.

When we examine the impacts on the group most likely to be impacted by the EITC (unmarried women with low levels of education) on the most relevant margin of interest (annual employment), we find strong, consistent, positive and statistically significant impacts on employment rates for each expansion, except the narrowly targeted expansion during the Great Recession. This pattern is evident in both the difference-in-differences results in Table 1, and the event study estimates in Figure 3. We turn to further analysis of the 1993 expansion below, which we examine in greater detail because of the potentially confounding effects of the mid-1990s welfare reform.

[8] For each expansion, we estimated models limiting the pre-period to three years, which is roughly where the pre-period trends in the 1986, 1990, and 1993 expansions level out. The difference-in-difference results using this specification are not materially different than those we present.

c. Is the 1993 Effect Driven by Welfare Reform?

The impacts of the 1993 phased-in EITC expansion were particularly strong. During that time period there were a number of factors that may have also contributed to increasing employment rates, making it difficult to disentangle the separate impact of the EITC. In particular, in the years leading up to the 1996 welfare reform law, many states were granted waivers to existing AFDC rules in order to experiment with reforms to limit access to cash welfare payments and encourage work.

A substantial literature evaluated the impact of state welfare waivers and subsequent transition at the federal level to the Temporary Assistance for Needy Families (TANF) on a variety of outcomes, including welfare participation and labor market outcomes. Many studies investigate hours and weeks worked, but fewer study the extensive margin of whether or not an individual is employed at all. A notable exception is Shoeni and Blank (2000), who find that unmarried women with dependent children who are high school dropouts increased their employment rates by 2.0 to 4.5 percentage points in waiver states relative to non-waiver states. They find no additional impact of TANF on employment for high school dropouts. They also find no impact of either welfare waivers or TANF on employment among unmarried mothers with a high school diploma, or with higher levels of education.

It is a generally accepted conclusion among economists that welfare reform increased employment, and decreased participation in welfare programs. In his 2003 review of the literature, Moffitt summarizes that welfare waivers had positive effects on most measures of labor supply, with the few random-assignment studies generally finding smaller impacts than the quasi-experimental ones. Ziliak, in his 2015 review, concludes that the literature as a whole finds that welfare reform had a positive impact on employment, but notes that the magnitude varies widely between studies. More recently, Mead (2018) argues that these state welfare policies, which he describes as changes authorizing caseworkers to provide a combination of "help and hassle" to move women from welfare to work, were the primary driver of increased employment rates in the mid-1990s. Similarly, Kleven (2019) argues that the increase in employment rates among unmarried mothers was likely due to welfare reform, and not the sizable 1993 EITC expansion.

We use a simple and intuitive approach to test whether welfare waivers are confounding estimates of the 1993 EITC expansion's effect on employment: we omit states from the analysis

sample that ever had a welfare reform waiver at any point in time, and estimate the effect of the 1993 EITC expansion only on the remaining states that did not have early changes to their cash welfare systems designed to encourage employment. In addition to controlling directly for the effect of waivers, these estimates help to hold constant hard-to-measure factors like state-level culture and attitudes towards low-income women and assistance programs that might drive both state-level safety net policy and labor market outcomes among unmarried women.

As shown in Table 2, we first estimate the impact of the 1993 EITC expansion on the full panel of states. In our preferred specification, reported in column (3), the EITC expansion is estimated to have increased employment rates among unmarried mothers with a high school diploma or less by 10.2 percentage points. Omitting the 36 states with any welfare waiver (including a handful of states with minor waivers not likely to impact overall employment rates), the EITC impact is essentially unchanged, with a statistically significant 11.0 percentage point increase in employment after the 1993 expansion.

As shown in columns (4)-(6), the same general patterns hold when we measure the EITC impact on weekly employment rates. Panel B, which includes unmarried women of all education levels (including many who would not be expected to respond to EITC or welfare incentives because their incomes would be too high), generally shows smaller point estimates that are about half as large as they are among the low-education sample, and are all statistically significant.

We conclude that the 1993 EITC expansion increased employment separate and apart from any employment effect due to pro-work changes to the cash welfare system. Our straightforward test of estimating the impact of the 1993 EITC expansion only on states that did not adopt early welfare reform policies shows that in states without early welfare reform, unmarried mothers' employment increased substantially when the EITC was expanded.

d. Reconciling our Findings with Recent Work

As shown in Tables 1 and 2 and Figure 3, we find strong and consistent evidence that EITC expansions from 1975 to 1993 increased employment among unmarried mothers, especially among those with a high school diploma or less education, and that the 1993 EITC expansion had an impact separate from welfare reform. Recent work by Kleven (2019) comes to a different conclusion, arguing (1) that only the 1993 expansion is associated with consistent employment increases, and (2) that employment increases following the 1993 expansion are

more likely driven by welfare reform than by the increased generosity of the EITC. To our knowledge, Kleven (2019) is the only other paper to look comprehensively at all five federal EITC expansions, so it is important that we reconcile these disparate findings. In Table 3, we attempt to reconcile our findings on the first point. In Table 4, we attempt to reconcile our findings on the second point.

Table 3, Panel A, Column (1) reproduces our preferred specification from Table 1, measuring the difference-in-differences estimate of each EITC expansion on annual employment among a sample of women with a high school diploma or less, in the 5 years before and after the expansion. The specification includes state and year fixed effects, demographic characteristics including age and education level, state unemployment rates and the interaction between the unemployment rate and the presence of children in the household. As before, specification of the 1990 and 1993 expansions accounts for their phase-in period. Each EITC expansion, with the exception of 2009, results in a statistically significant increase in employment.

Following Kleven, column (2) limits the time period considered to a one-year pre period and a three-year post period. The point estimates move around somewhat — becoming larger for the 1975 and 1986 expansions, and smaller for the 1990 and 1993 ones — but are still positive, statistically significant, and of significant magnitudes. In column (3) we further reconcile our approach with Kleven's by dropping the interaction between the state unemployment rate and the presence of children in the household, which eliminates the statistical significance of the 1975 expansion. In column (4) we drop state and year fixed effects, state unemployment rates, demographic characteristics and replace the phase-in for the 1990 and 1993 expansions with a binary indicator, in a specification similar to the ones Kleven employs. Even without these controls for the labor market factors, the 1986 and 1993 expansions remain statistically significant.

Columns (5) through (8) repeat the exercise with an alternate dependent variable, an indicator variable for whether the respondent worked in the prior week. This is the employment outcome variable used by Kleven. In this case, in our preferred specification presented in column (5), the 1975, 1990 and 1993 expansions are statistically significant, right signed, and of sizeable magnitude. The coefficient on the 1986 expansion is not precisely estimated. As before, results are qualitatively similar when the sample period is narrowed in column (6), and when we omit controls for state unemployment interacted with the presence of children in column (7).

Column (8) removes additional controls and specifies the phased-in EITC with a binary indicator, finding that when other factors are left uncontrolled and employment is measured weekly, only the 1993 EITC expansion is statistically significant. These coefficients precisely replicate the coefficient estimates for low-education unmarried mothers in Table 2, Column (1) of Kleven (2019).[9]

Panel B expands the analysis to include all unmarried women, including those with higher levels of education who are unlikely to be eligible for the EITC. Consistent with Kleven (2019), we find that only 1993 remains statistically significant once appropriate controls for the business cycle and other demographic characteristics are dropped. Column (8) precisely replicates the results for unmarried mothers of all education levels in Table 2, Column (1) of Kleven (2019).

Table 4 more closely examines the 1993 EITC expansion, using specifications in line with Kleven's (2019) approach. In the most restrictive specification, Kleven controls for the effect of state welfare waivers by allowing that effect to vary by year interacted with whether children are present in the household. This is a tight control, estimating the EITC's employment effect using variation within year by whether children are present in the household by whether the state implemented welfare waivers. Because it absorbs variation in year by the presence of children in the household, it is controlling in part for the effect of the EITC, as whether a household has children or not in the years following an EITC expansion is used to identify the credit expansion's employment effect. Of course, it is important to establish whether the 1993 credit expansion had an effect on employment independent of state experiments with welfare reform. We argue that the method we use for Table 2 — simply omitting states that ever had a welfare waiver from the estimation sample — is a cleaner and more intuitive test.

Table 4 produces difference-in-differences estimates of the 1993 expansion (which was phased in from 1994-1996), on data from 1993-1996, following the approach of Kleven to use one year of pre-period data and three years of post-period data. Column (1) employs a basic regression, with controls for unemployment rates that are allowed to differ by presence of children, state and year fixed effects, and individual characteristics. The impact of the EITC expansion is strong and consistent, with low-education mothers increasing their annual

[9] Our standard errors differ, because we cluster the standard errors by state, which gives us larger standard errors than clustering by individual in specifications using annual employment. Kleven (2019) clusters by individual.

employment by 5.5 percentage points (6.8 points for worked last week) and the overall sample increasing by 5.0 points (5.2 points for worked last week). Column (2) adds as further controls fixed effects for the interaction between the state having a welfare waiver in place at the time with presence of children, and welfare waivers times year. The estimates on the EITC's effect remain quite robust and are largely unchanged by these additional controls. This is evidence that the 1993 EITC expansion had an independent and significant effect on employment, separate and apart from the effect of state experiments with pro-work welfare reforms.

Column (3) adds fixed effects for the interaction between year and presence of children. Recall that the fundamental identification approach in studying the EITC is the interaction of year and whether a household had children present, so the inclusion of these fixed effects absorbs most of the variation in the EITC, leaving only the differences across family sizes for those with children to identify the effects. When these controls are added, the EITC's impact on annual employment is no longer significant in either the low-education sample or among all observations, though the impact on worked last week is still significant in this specification. Following Kleven, column (4) adds a three-way fixed effect, interacting presence of waivers with presence of children with year. Once this additional control is added, coefficients on the EITC variable lose statistical significance in all four specifications. It is unsurprising that these fixed effects that absorb most of the variation used to identify the EITC's impact also absorb its impact on employment.

Instead of employing a differences-in-differences approach, Kleven (2019) estimates an event study which allows the coefficient on indicators for presence of welfare waivers (which vary at the state and year level) to vary by children-times-year. We exactly replicate his findings (column 3 of Table 6) in Appendix Table 4. Kleven shows estimates on the year-3 and year-10 post-EITC expansion coefficients; we also include year 5. We present estimates separately for the low-education sample and the overall sample of unmarried women, and for annual employment as well as whether the respondent worked in the prior week. When waivers*children*year fixed effects are included, year 3 effects are small and not statistically significant, though those in years 5 and 10 are. When this three-way fixed effect is omitted, we find consistent, positive impacts of the EITC on employment.

4. Considering the EITC Holistically

Finally, we take a different approach and attempt to study the EITC holistically. We do this in two ways: by studying the employment effect all five federal EITC expansions utilizing one event study, and by exploiting continuous variation in the maximum size of the EITC benefit.

The methodology we use to estimate the event study is the same used for the individual EITC expansions that are presented in the other Panels A through E of Figure 3 and discussed in Section (3)(b) above, but in this case data from the 5 years before and after each expansion are stacked and event-time interacted with EITC eligibility are the coefficients of interest. Specifically, Panel F presents estimates of equation (2), the dynamic effect of all five EITC expansions, pooled together and using an event-study framework, on the annual employment of unmarried women with low levels of education, controlling for state unemployment rate interacted with the presence of children in the household.

Pooling all expansions, we see that by the second year after an expansion there is a positive, statistically significant increase in treated women's employment rates. This effect rises modestly, and by the final year of the post period EITC expansions are associated with around a 4 percent increase in employment. Event study graphs for the sample of all unmarried women are included as Appendix Figure 2 and show results that are consistent with those in Panel B of Table 1.

Finally, we use continuous variation in the size of the maximum EITC credit to estimate the credit's employment elasticity. We pool across all sample years (1971-2016) and estimate regressions of the following type:

$$E_{ist} = \beta Max_{EITC_{ist}} + \gamma(kids_i) + \boldsymbol{X_i}\phi + \eta u_{st} + \theta(u_{st} * kids_i) + \lambda_s + \tau_t + v_{ist}. \quad (3)$$

Equation (3) is similar to equation (1) except that the coefficient of interest is on the maximum EITC benefit available to a woman with children in each year. Household income and EITC receipt are endogenous with respect to the decision to work. In contrast, our *Max_EITC* variable represents exogenous variable in EITC policy. Specifically, it is defined as the

maximum credit available to households based on their marital status, the number of children in their household, the year, and their state of residence.

We present two sets of estimates: one considers only federal EITC payments, while the second includes federal and state EITC payments, taking advantage of an additional source of variation.

Results are presented in Table 5. Panel A limits the sample to unmarried women with a high school diploma or less education. Column (1) presents results based on maximum federal EITC payments across all years and finds that a $1,000 increase in the inflation-adjusted maximum EITC benefit increases annual employment rates by 3.2 percentage points. Column (2) repeats this approach, dropping from the sample states after they received approved welfare reform waivers in 1992-96. The results are largely unchanged, with an estimated coefficient of 3.2 percentage points. Column (3) includes all states but omits the years 1994-1999 in order to remove the 1993 EITC expansion and estimate the combined effects of the other 4 federal expansions. For every $1,000 increase in maximum EITC benefits, unmarried mothers' employment increases by 3.7 percentage points. The results are quite similar in magnitude and statistical significance across all columns. We conclude that the effect of EITC benefits on employment is robust and is neither driven by the particularly large 1993 expansion nor by welfare reform.

Columns (4)-(6) add in state EITCs payments, which are available in 26 states plus the District of Columbia, and are generally calculated as a percentage of the federal credit. Across the three specifications, the estimates are consistent and robust, indicating that a $1,000 increase in maximum EITC payments increase unmarried mothers' employment by 2.9 to 3.3 percentage points relative to childless women.

Panel B repeats the analysis on the full sample of women. As expected, the estimated impacts are smaller with the inclusion of women with higher levels of education who are not likely to be affected by EITC parameters. Using variation from the federal credit only, each $1,000 increase in maximum EITC benefits increases unmarried mothers' employment by 1.6 to 2.1 percentage points. When state credit variation is also included, the impacts range from 1.5 to 1.9 percentage points.

5. Discussion and Conclusions

In this paper, we examine the five federal expansions of the EITC, including its creation in 1975. We take a longer view than the existing literature, studying all five expansions together with a unified empirical framework using modern econometric methods. This approach allows for a reexamination of the credit expansions of the 1980s and 1990s using difference-in-differences and event-study techniques, including studying the dynamic effect of the EITC on employment. By using the same sample definitions and methods to study all five credit expansions, it allows for more direct comparisons across credit expansions.

We find robust evidence that four of the five credit expansions increase employment among unmarried mothers. The exception is the 2009 expansion, which was targeted on households of a specific size and occurred during a period of historically weak labor demand following the 2008 financial crisis and Great Recession. We also look more closely at the 1993 expansion and conclude that this generous credit expansion increased the extensive margin of labor supply separate and apart from any pro-work reforms to state welfare systems that occurred at the same time. Finally, we study the EITC holistically, pooling all five expansions into one event-study framework and using continuous variation in the size of the maximum EITC benefit to estimate its employment elasticity.

To our knowledge, the only other paper to look comprehensively at all five federal EITC expansions is Kleven (2019), which comes to different conclusions. Specifically, Kleven finds little evidence for an EITC extensive margin effect. We find the opposite, reconcile our findings with Kleven, and argue that our analytic approach is most appropriate.

The Earned Income Tax Credit (EITC) is the cornerstone anti-poverty policy in the United States. Designed to fight poverty by encouraging and rewarding work, decades of research on the EITC has found that the program meets its goals by increasing employment among targeted women, and by successfully raising their annual incomes, lifting millions of families out of poverty. This paper confirms and extends that consensus.

References

Bastian, J., 2020. The rise of working mothers and the 1975 earned income tax credit. *American Economic Journal: Economic Policy*, *12*(3), pp.44-75.

Bastian, J. and Jones, M.R., 2020. Do EITC Expansions Pay for Themselves? Effects on Tax Revenue and Public Assistance Spending. Rutgers University Working Paper.

Bastian, J. and Lochner, L., 2020. The EITC and Maternal Time Use: More Time Working and Less Time with Kids? NBER Working Paper 27717.

Bastian, J. and Michelmore, K., 2018. The long-term impact of the earned income tax credit on children's education and employment outcomes. *Journal of Labor Economics*, *36*(4), pp.1127-1163.

Baughman, R. and Dickert-Conlin, S., 2009. The earned income tax credit and fertility. *Journal of Population Economics*, *22*(3), pp.537-563.

Baughman, R.A. and Duchovny, N., 2016. State earned income tax credits and the production of child health: Insurance coverage, utilization, and health status. *National Tax Journal*, *69*(1), p.103.

Bitler, M., Hoynes, H.W. and Kuka, E. 2017. Do in-work tax credits serve as a safety net? *Journal of Human Resources* 36(2): 358-89.

Chetty, R., Friedman, J.N. and Rockoff, J., 2011. New evidence on the long-term impacts of tax credits. *IRS Statistics of Income White Paper*.

Crandall-Hollick, M. and Falk, G., 2020. The Earned Income Tax Credit (EITC): How It Works and Who Receives It. [online] Washington, D.C.: Congressional Research Service. Available at: <https://fas.org/sgp/crs/misc/R43805.pdf>

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

Dickert-Conlin, S. and Houser, S., 2002. EITC and Marriage. *National Tax Journal*, pp.25-40.

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

Eissa, N. and Hoynes, H.W., 2006. Behavioral responses to taxes: Lessons from the EITC and labor supply. *Tax Policy and the Economy*, *20*, pp.73-110.

Eissa, N. and Liebman, J.B., 1996. Labor supply response to the earned income tax credit. *The Quarterly Journal of Economics*, *111*(2), pp.605-637.

Evans, W.N. and Garthwaite, C.L., 2014. Giving mom a break: The impact of higher EITC payments on maternal health. *American Economic Journal: Economic Policy*, *6*(2), pp.258-90.

Flood, Sarah, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 7.0 [dataset]. Minneapolis, MN: IPUMS, 2020. https://doi.org/10.18128/D030.V7.0

Gelber, Alexander M., and Joshua W. Mitchell. "Taxes and time allocation: Evidence from single women and men." *The Review of Economic Studies* 79, no. 3 (2012): 863-897.

Holtzblatt, J. and Rebelein, R., 2000. Measuring the Effect of the EITC on Marriage Penalties and Bonuses. *National Tax Journal*, pp.1107-1133.
Hotz, V.J. and Scholz, J.K. 2003. The earned income tax credit. In *Means-Tested Transfer Programs in the United States* (pp. 141-198). University of Chicago press.

Hoynes, H., Miller, D. and Simon, D., 2015. Income, the earned income tax credit, and infant health. *American Economic Journal: Economic Policy*, *7*(1), pp.172-211.

Hoynes, H.W. and Patel, A.J., 2018. Effective policy for reducing poverty and inequality? The Earned Income Tax Credit and the distribution of income. *Journal of Human Resources*, *53*(4), pp.859-890.

Hoynes, H. and Rothstein, J., 2017. Tax Policy Toward Low Income Families. *The Economics of Tax Policy*, p.2.

Kleven, H., 2019. *The EITC and the Extensive Margin: A Reappraisal* (No. w26405). National Bureau of Economic Research.

Manoli, D. and Turner, N., 2018. Cash-on-hand and college enrollment: Evidence from population tax data and the earned income tax credit. *American Economic Journal: Economic Policy*, *10*(2), pp.242-71.

Mead, L.M., 2018. Can Benefits and Incentives Promote Work? *Journal of Policy Analysis and Management*, *37*(4), pp.897-903.

Meyer, B.D. and Rosenbaum, D.T., 2000. "Making Single Mothers Work: Recent Tax and Welfare Policy and its Effects." *National Tax Journal* 53, no. 4 (2000): 1,027-1,061.

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

Meyer, Bruce D. "The effects of the Earned Income Tax Credit and recent reforms." *Tax Policy and the Economy* 24, no. 1 (2010): 153-180.

Meyer, Bruce D., and Derek Wu. "The poverty reduction of social security and means-tested transfers." *ILR Review* 71, no. 5 (2018): 1106-1153.

Michelmore, K., 2014, January. EITC and Union Formation. In *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association* (Vol. 107, pp. 1-32). National Tax Association.

Miller, Cynthia, Lawrence F. Katz, Gilda Azurdia, Adam Isen, Caroline B. Schultz, and Kali Aloisi. "Boosting the Earned Income Tax Credit for Singles: Final Impact Findings from the Paycheck Plus Demonstration in New York City." *New York: MDRC* (2018).

Moffitt, R.A., 2003. The Temporary Assistance for Needy Families program. In *Means-Tested Transfer Programs in the United States* (pp. 291-364). University of Chicago Press.

Neumark, D. and Wascher, W, 2002. State-Level Estimates of Minimum Wage Effects: New Evidence And Interpretations From Disequilibrium Methods. *Journal of Human Resources*, v37(1, Winter), 35-62.

Nichols, A. and Rothstein, J., 2015. The Earned Income Tax Credit. In *Means-Tested Transfer Programs in the United States, Volume 1* (pp. 137-218). University of Chicago Press.

Renwick, T. and Fox, L., 2016. The supplemental poverty measure: 2015. *Current Population Reports*, pp.1-23.

Saez, E., 2010. Do taxpayers bunch at kink points? *American Economic Journal: Economic Policy*, *2*(3), pp.180-212.

Schoeni, R.F. and Blank, R.M., 2000. *What has welfare reform accomplished? Impacts on welfare participation, employment, income, poverty, and family structure* (No. w7627). National Bureau of Economic Research.

Ziliak, J.P., 2015. Temporary assistance for needy families. In *Economics of Means-Tested Transfer Programs in the United States, Volume 1* (pp. 303-393). University of Chicago Press.

Table 1. Effects of Federal EITC Reforms on Employment of Unmarried Mothers

Panel A: Low Education Sample

	Worked in year			Worked prior week		
	(1)	(2)	(3)	(4)	(5)	(6)
1975 expansion	0.029	0.034	6.458***	1.575	1.562	6.620***
	(1.011)	(1.016)	(1.875)	(1.074)	(1.089)	(1.817)
N	51,667	51,667	51,667	48,691	48,691	48,691
1986 expansion	4.010***	4.026***	3.109***	2.222***	2.240***	1.410
	(0.705)	(0.689)	(1.158)	(0.795)	(0.803)	(1.409)
N	70,216	70,216	70,216	70,678	70,678	70,678
1990 expansion	6.999***	6.897***	6.926***	6.620***	6.460***	6.481***
	(1.065)	(1.072)	(1.106)	(1.134)	(1.120)	(1.150)
N	65,031	65,031	65,031	66,882	66,882	66,882
1993 expansion	10.592***	10.580***	10.186***	10.868***	10.835***	10.567***
	(0.957)	(0.946)	(0.980)	(0.630)	(0.628)	(0.668)
N	59,798	59,798	59,798	676,828	676,828	676,828
2009 expansion	-0.551	-0.551	0.246	-0.909	-0.908	-1.082
	(2.059)	(2.060)	(2.676)	(1.152)	(1.154)	(1.513)
N	21,494	21,494	21,494	155,987	155,987	155,987
State UR	No	Yes	Yes	No	Yes	Yes
State UR x Has Children	No	No	Yes	No	No	Yes

Table 1, Continued

Panel B: All observations

	Worked in year			Worked last week		
	(1)	(2)	(3)	(4)	(5)	(6)
1975 expansion	-0.398	-0.384	4.811**	-0.145	-0.117	4.050**
	(0.824)	(0.822)	(1.734)	(0.825)	(0.830)	(1.644)
N	83,547	83,547	83,547	77,304	77,304	77,304
1986 expansion	2.080**	2.085***	0.470	1.929**	1.920**	0.517
	(0.787)	(0.778)	(1.017)	(0.760)	(0.760)	(1.209)
N	130,572	130,572	130,572	128,950	128,950	128,950
1990 expansion	2.018**	1.893**	1.969**	1.048	0.880	0.960
	(0.853)	(0.857)	(0.963)	(0.841)	(0.819)	(0.826)
N	131,115	131,115	131,115	132,405	132,405	132,405
1993 expansion	7.110***	7.102***	5.757***	6.277***	6.246***	5.003***
	(0.590)	(0.588)	(0.621)	(0.493)	(0.487)	(0.499)
N	128,429	128,429	128,429	1,457,816	1,457,816	1,457,816
2009 expansion	-1.013	-1.013	-0.462	-1.057	-1.063	-1.710
	(1.018)	(1.018)	(1.353)	(0.864)	(0.874)	(1.156)
N	41,029	41,029	41,029	294,094	294,094	294,094
State UR	No	Yes	Yes	No	Yes	Yes
State UR x Has Children	No	No	Yes	No	No	Yes

Notes: Each regression includes data on unmarried women ages 20-50, for the 5 years before and after the federal EITC expansion. The 1975, 1986, and 1990 expansions use CPS ASEC data; the 1993 and 2009 expansions include CPS monthly files in the specifications based on worked last week. Panel A limits to women with a high school diploma or less. All columns include indicators for woman's education and age, and age bin of youngest child, plus state and year fixed effects. The coefficient of interest is the interaction of post-EITC expansion and whether the woman has EITC-eligible children. The 1990 and 1993 EITC expansions are phased in over time, and we code the phase-in years to be the share of the expansion implemented by that year with full phase-in equal to 1 as described in text. The 2009 control group is unmarried women with 2 children. Not all individual states are identified in the CPS prior to 1977, so following Bastian (2020) we control for consistently defined state-group fixed effects and unemployment rates from 1970-79 around the 1975 expansion. Standard errors are clustered at the state level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2. Effects of the 1993 EITC Expansion, Overall and for Non-Waiver States

Panel A: Low Education Sample						
	Worked in year			Worked last week		
	(1)	(2)	(3)	(4)	(5)	(6)
All states	10.592***	10.580***	10.186***	10.868***	10.835***	10.567***
	(0.957)	(0.946)	(0.980)	(0.630)	(0.628)	(0.668)
	59,798	59,798	59,798	676,828	676,828	676,828
States without waivers	10.233***	10.240***	10.992***	10.936***	10.924***	11.501***
	(1.582)	(1.590)	(1.774)	(0.733)	(0.746)	(1.217)
	16,973	16,973	16,973	192,141	192,141	192,141
State Unemployment	No	Yes	Yes	No	Yes	Yes
State Unemployment x Has Children	No	No	Yes	No	No	Yes
Panel B: Overall sample						
	Worked in year			Worked last week		
All states	7.110***	7.102***	5.757***	6.277***	6.246***	5.003***
	(0.590)	(0.588)	(0.621)	(0.493)	(0.487)	(0.499)
	128,429	128,429	128,429	1,457,816	1,457,816	1,457,816
States without waivers	5.384***	5.386***	4.495***	5.639***	5.594***	4.853***
	(0.844)	(0.849)	(0.882)	(0.638)	(0.650)	(1.051)
	36,565	36,565	36,565	413,556	413,556	413,556
State Unemployment	No	Yes	Yes	No	Yes	Yes
State Unemployment x Has Children	No	No	Yes	No	No	Yes

Notes: Each regression includes CPS ASEC data on unmarried women ages 20-50, for the 5 years before and after the 1993 federal EITC expansion. Panel A limits to women with a high school diploma or less. All columns include indicators for woman's education and age, and age bin of youngest child, plus state and year fixed effects. The coefficient of interest is the interaction of post-EITC expansion and whether the woman has EITC-eligible children. The 1993 EITC expansion was phased in over time and varied by number of children; as described in the text we code the phase-in years to be the share of the expansion implemented by that year with full phase-in equal to 1. Non-waiver states include AL, AK, CO, DC, KS, LA, MN, NV, NM, NY, ND, OK, PA, RI, WY. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.

Table 3: Effects of Federal EITC Reforms on Employment of Unmarried Mothers: Alternate Specifications

Panel A: Low Education Sample Dependent Variable	Worked in year				Worked last week			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1975 expansion	6.458***	7.327**	-1.309	-1.417	6.620***	7.968**	-0.398	-0.118
	(1.875)	(2.676)	(1.508)	(1.461)	(1.817)	(3.349)	(1.784)	(1.867)
N	51,667	20,897	20,897	20,897	48,691	19,272	19,272	19,272
1986 expansion	3.109***	4.268***	3.683***	3.135***	1.410	0.842	0.522	-0.411
	(1.158)	(1.223)	(0.966)	(1.103)	(1.409)	(1.654)	(1.212)	(1.229)
N	70,216	27,734	27,734	27,734	70,678	27,688	27,688	27,688
1990 expansion	6.926***	4.210**	3.966**	1.188	6.481***	4.172*	3.981**	-0.170
	(1.106)	(2.019)	(1.767)	(1.172)	(1.150)	(2.119)	(1.754)	(1.244)
N	65,031	26,236	26,236	26,236	66,882	27,331	27,331	27,331
1993 expansion	10.186***	5.539***	6.878***	4.866***	10.567***	6.839***	7.148***	3.538***
	(0.980)	(1.837)	(1.517)	(1.455)	(0.668)	(1.044)	(0.992)	(1.132)
N	59,798	22,314	22,314	22,314	676,828	254,912	254,912	254,912
2009 expansion	0.246	-0.086	-0.086	-2.574	-1.082	-4.941**	-3.642**	-2.170
	(2.676)	(3.232)	(3.232)	(2.114)	(1.650)	(2.249)	(1.554)	(1.486)
N	21,494	8,593	8,593	16,507	155,987	61,660	61,660	140,032
Pre and post period	5 & 5	1 & 3	1 & 3	1 & 3	5 & 5	1 & 3	1 & 3	1 & 3
State UR * has Children	Yes	Yes	No	No	Yes	Yes	No	No
State and Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
State UR	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Phase-in 1990, 1993	Yes	Yes	Yes	No	Yes	Yes	Yes	No
2009 control group	2 kids	2 kids	2 kids	0 kids	2 kids	2 kids	2 kids	0 kids
Individual Controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No

Table 3, Continued

Panel B: All observations

	Worked in year				Worked last week			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1975 expansion	4.811**	6.570**	6.763***	-0.421	4.050**	6.773**	-0.695	-0.713
	(1.734)	(3.257)	(2.251)	(1.032)	(1.644)	(2.870)	(1.288)	(1.372)
N	83,547	34,134	34,134	34,134	77,304	31,106	31,106	31,106
1986 expansion	0.470	1.755	1.658*	1.501	0.517	-0.442	-0.121	-1.028
	(1.017)	(1.084)	(0.868)	(0.948)	(1.209)	(1.410)	(1.052)	(1.165)
N	130,572	51,538	51,538	51,538	128,950	51,038	51,038	51,038
1990 expansion	1.969**	-1.054	-2.468*	0.003	0.960	-0.958	-2.400**	-0.347
	(0.963)	(1.638)	(1.286)	(0.985)	(0.826)	(1.658)	(1.042)	(1.015)
N	131,115	54,769	54,769	54,769	132,405	54,857	54,857	54,857
1993 expansion	5.757***	4.965***	6.072***	4.388***	5.003***	5.241***	5.863***	3.060***
	(0.621)	(1.013)	(0.946)	(0.935)	(0.499)	(0.749)	(0.575)	(0.604)
N	128,429	50,039	50,039	50,039	1,457,816	581,511	581,511	581,511
2009 expansion	-0.462	-1.514	-2.200	-1.251	-1.710	-6.46***	-4.05***	-3.55***
	(1.353)	(2.693)	(1.547)	(1.522)	(1.156)	(1.828)	(1.292)	(0.996)
N	41,029	16,567	16,567	48,252	294,094	117,527	117,527	426,414
Pre and post period	5 & 5	1 & 3	1 & 3	1 & 3	5 & 5	1 & 3	1 & 3	1 & 3
State UR * has Children	Yes	Yes	No	No	Yes	Yes	No	No
State and Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
State UR	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Phase-in 1990, 1993	Yes	Yes	Yes	No	Yes	Yes	Yes	No
2009 control group	2 kids	2 kids	2 kids	0 kids	2 kids	2 kids	2 kids	0 kids
Individual Controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No

Notes: Each regression includes data on unmarried women ages 20-50, for the 5 years before and after the federal EITC expansion. The 1975, 1986, and 1990 expansions use CPS ASEC data; the 1993 and 2009 expansions also include CPS monthly files (worked last week). Panel A limits to women with a high school

diploma or less. Columns (1) and (5) reproduce columns (3) and (6) of Table 1. Demographic controls, where included, are for a woman's education and age, and age bin of youngest child. The coefficient of interest is the interaction of post-EITC expansion and whether the woman has EITC-eligible children. The 1990 and 1993 EITC expansions are phased in over time unless otherwise noted. The 2009 treatment group is unmarried women with 3 children, with control group either unmarried women with 2 children or unmarried women without children, as indicated. Not all individual states are identified in the CPS before 1977, so following Bastian (2020) we control for consistently defined state-group fixed effects and unemployment rates from1970-79 around the 1975 expansion. Standard errors are clustered at the state level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4. Effects of the 1993 EITC Expansion on Employment of Unmarried Mothers: Alternate Specifications

Panel A: Low Education Sample				
	(1)	(2)	(3)	(4)
Worked in year	5.539***	5.664**	3.794	-1.256
	(1.837)	(2.480)	(3.312)	(3.867)
N	22,314	22,314	22,314	22,314
Worked last week	6.839***	6.851***	4.571***	1.403
	(1.044)	(1.233)	(1.468)	(1.860)
N	254,912	254,912	254,912	254,912
Welfare Waivers X Has Children	No	Yes	Yes	Yes
Welfare Waiver X Year	No	Yes	Yes	Yes
Has Children X Year	No	No	Yes	Yes
Welfare Waivers X Has Children X Year	No	No	No	Yes
Panel B: All observations				
	(1)	(2)	(3)	(4)
Worked in year	4.965***	4.776***	2.887	-0.735
	(1.013)	(1.401)	(1.767)	(1.789)
N	50,039	50,039	50,039	50,039
Worked last week	5.241***	5.513***	3.597***	1.150
	(0.749)	(1.015)	(1.244)	(1.146)
N	581,511	581,511	581,511	581,511
Welfare Waivers X Has Children	No	Yes	Yes	Yes
Welfare Waiver X Year	No	Yes	Yes	Yes
Has Children X Year	No	No	Yes	Yes
Welfare Waivers X Has Children X Year	No	No	No	Yes

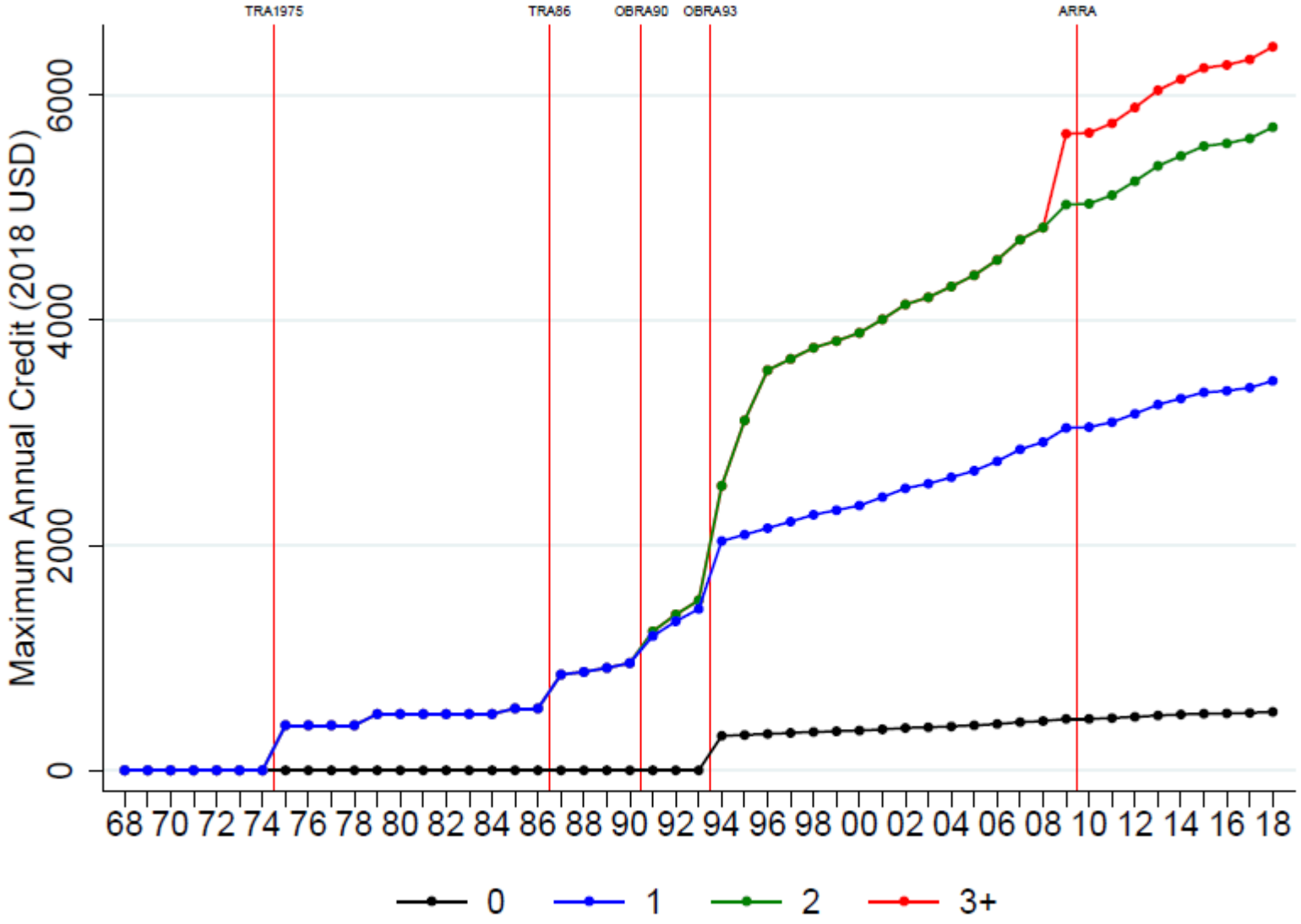
Notes: Each regression includes CPS ASEC data on unmarried women ages 20-50, for 1993-1996. Panel A limits to women with a high school diploma or less. All columns include indicators for woman's education and age, and age bin of youngest child, plus state and year fixed effects, state unemployment rate, and the unemployment rate interacted with whether the woman has EITC-eligible children. The 1993 EITC expansion was phased in over time and varied by number of children; as described in the text we code the phase-in years to be the share of the expansion implemented by that year with full phase-in equal to 1. Welfare waivers coded by state and year for all years following the first approval, as shown in Appendix Table 3. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

Table 5. Effects of Pooled EITC Reforms on Annual Employment of Unmarried Mothers

Panel A: Low Education Sample						
	Federal Credit Only			Federal + State Credit		
	(1)	(2)	(3)	(4)	(5)	(6)
Maximum EITC Credit (Thousands)	0.032***	0.032***	0.037***	0.029***	0.029***	0.033***
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Observations	297,800	189,954	266,260	297,800	189,954	266,260
Drop Welfare Waiver States	No	Yes	No	No	Yes	No
Drop Years 1994 - 1999	No	No	Yes	No	No	Yes
Panel B: Overall sample						
	Federal Credit Only			Federal + State Credit		
Maximum EITC Credit (Thousands)	0.016***	0.019***	0.021***	0.015***	0.018***	0.019***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)
Observations	633,869	368,175	561,861	633,869	368,175	561,861
Drop Welfare Waiver States	No	Yes	No	No	Yes	No
Drop Years 1994 - 1999	No	No	Yes	No	No	Yes

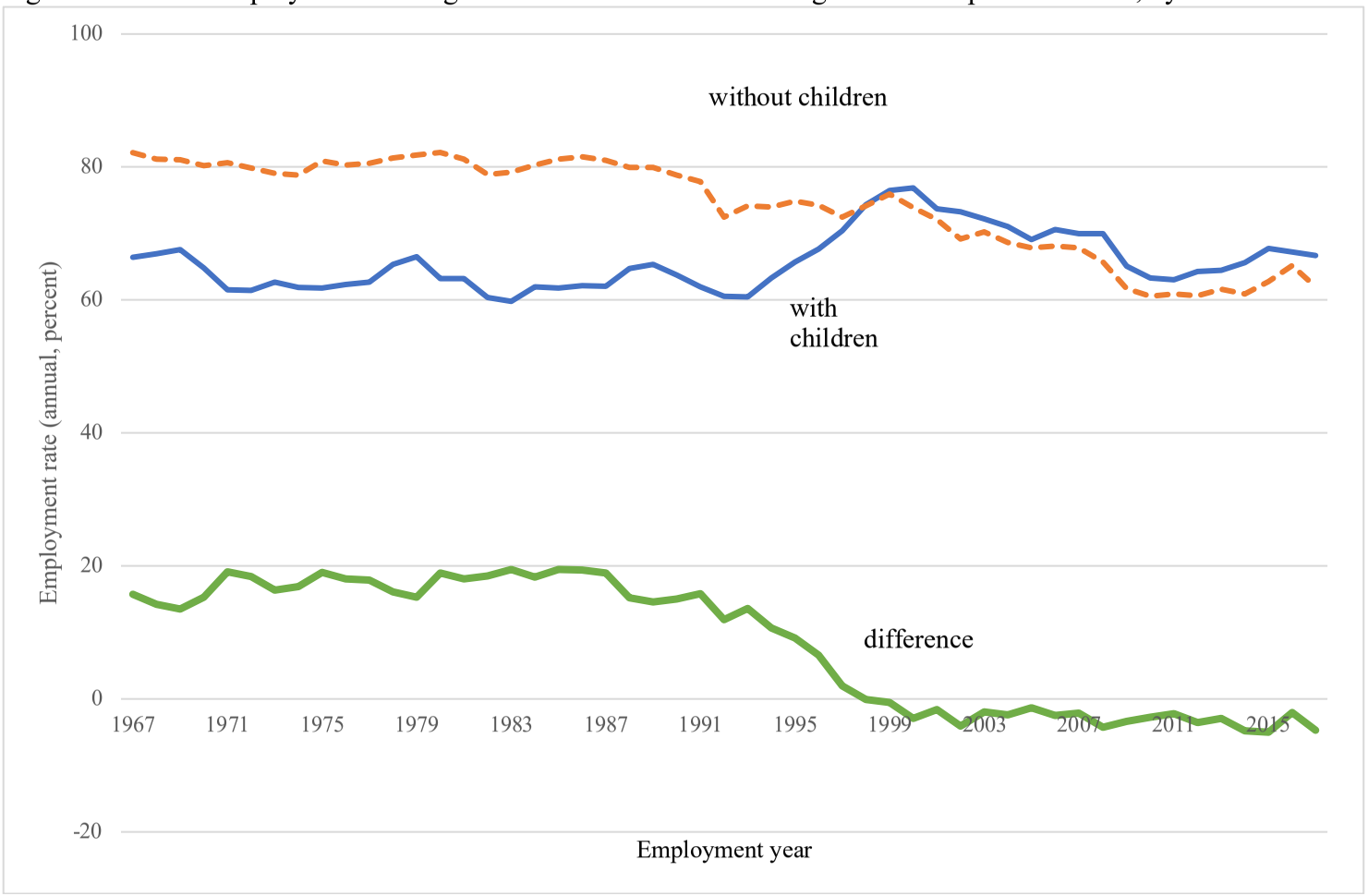
Notes: This table displays estimates of the employment effects of EITC expansions using the maximum EITC value allowed defined by number of children, state, and year, and measured in thousands of dollars, inflation-adjusted using PCEPI. The coefficients report the marginal effect of an additional thousand dollars of maximum EITC benefits on the probability of annual employment. Sample includes unmarried women ages 20-50, from the ASEC with and without EITC-eligible children, 1970-2015. Low education defined as high school diploma or less. All columns include demographic controls, state, year, and controls for , state annual unemployment rates, and state unemployment rates interacted with presence of EITC-eligible children. State-group fixed effects are included for years 1970-79 when individual states are not disclosed in the data. In columns 2 and 5 we drop states from the sample after they first approve a welfare waiver as indicated in Appendix Table 3. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

Figure 1. Maximum Federal Earned Income Tax Credit for Single Adults, by Number of Eligible Children (1968-2018)



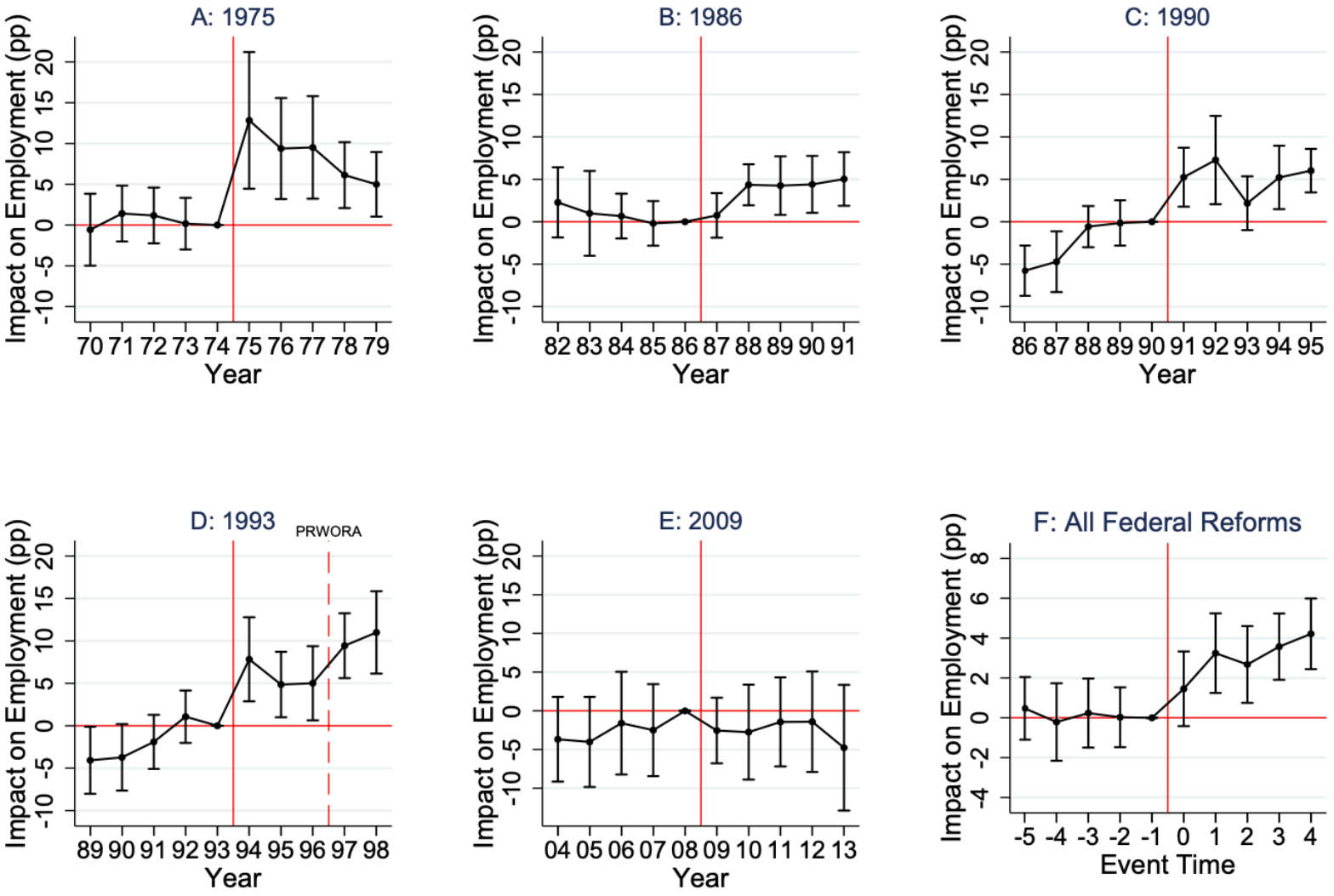
Notes: Federal EITC parameters come from the Urban Institute-Brookings Institution Tax Policy Center.

Figure 2. Annual Employment Among Unmarried Women with a High School Diploma or Less, by Presence of Children



Notes: Authors' calculation of annual employment rates from CPS ASEC 1968-2018 data.

Figure 3. Event Studies: EITC Impact on Annual Employment of Unmarried Mothers with Low Education Levels



Notes: Each panel includes data on unmarried women with a high school diploma or less, ages 20-50, for the 5 years before and after the federal EITC expansion, using CPS ASEC data on annual employment status. All event studies include controls for woman's education and age, age bin of youngest child, state and year fixed effects, state unemployment rate and (except panel E) unemployment rate interacted with presence of children. The 1990 and 1993 EITC expansions are phased in over time, and we code the phase-in years to be the share of the expansion implemented by that year with full phase-in equal to 1 as described in text. The 2009 expansion only impacted unmarried women with 3 children, and we use unmarried women with 2 children as the control group. States are grouped in the CPS prior to 1977, so state-group fixed effects are included for those years and the weighted average unemployment rate is included as a control variable. Figures present estimates of an indicator variable for the 5 years before and after the EITC expansion, with the year prior to expansion omitted. Standard errors are clustered at the state level, and 95 percent confidence intervals are displayed.

Table A1: Sample Summary Statistics: CPS and Supplemental Data for Samples Around Each Federal EITC Expansion

	(1)	(2)	(3)	(4)	(5)
Expansion	1975	1986	1990	1993	2009
Years	1970-1979	1982-1991	1986-1995	1989-1998	2004-2013
Annual Employment, All Unmarried Mothers	66.58	66.37	68.54	72.54	74.35
	(47.17)	(47.24)	(46.44)	(44.63)	(43.67)
Annual Employment, Unmarried Mothers with High School Diploma or less	63.21	60.99	62.98	65.38	66.87
	(48.22)	(48.78)	(48.29)	(47.58)	(47.07)
Annual Employment, All Unmarried Childless Women	84.41	84.70	86.62	83.90	75.58
	(36.27)	(36.00)	(34.05)	(36.75)	(42.96)
Annual Employment, Unmarried Childless Women with High School Diploma or less	80.43	79.95	80.82	75.44	64.12
	(39.67)	(40.04)	(39.37)	(43.05)	(47.97)
Average Federal EITC Benefit (Dollars)	106.7	189.6	322.7	947.7	1754.3
	(189.4)	(252.9)	(433.0)	(1137.5)	(1864.5)
Average Federal and State EITC Benefit (Dollars)	106.7	190.2	327.5	970.1	1860.2
	(189.4)	(254.0)	(441.6)	(1172.3)	(1989.1)
Observations	83,547	51,330	170,510	1,445,101	1,537,541

Notes: This table reports summary statistics for our regression samples using 10-year windows around each federal EITC expansion. Column 1 reports averages and standard deviations (in parentheses) for years around the 1975 expansion. Column 2 reports averages and standard deviations (in parentheses) for years around the 1986 expansion. Column 3 reports averages and standard deviations (in parentheses) for years around the 1990 expansion. Column 4 reports averages and standard deviations (in parentheses) for years around the 1993 expansion. Column 5 reports averages and standard deviations (in parentheses for years around the 2009 expansion. Entries for annual employment come from the March CPS files and data on federal and state EITC benefits come from the Tax Policy Center and NBER.

Table A2: Year First State EITC Supplements Approved

States with EITC Supplements	Year First Approved
California	2015
Colorado	1999
Connecticut	2011
Delaware	1995
District of Columbia	2000
Hawaii	2018
Idaho	1996
Indiana	1999
Illinois	2000
Iowa	1990
Kansas	1998
Louisiana	2008
Maine	2000
Maryland	1987
Massachusetts	1997
Michigan	2008
Nebraska	2006
New Mexico	2007
New York	1994
North Carolina	2008
Ohio	2013
Oregon	1997
Rhode Island	2001
South Carolina	2018
Vermont	1993
Virginia	2006
Wisconsin	1984

Notes: Data on state EITC supplements from NBER and Kleven (2019). The year reported is the year the first state EITC supplement was approved.

Table A3: List of States with Approved Welfare Waivers During the 1990s

States Approving Welfare Waivers	Year First Approved
Arizona	1995
Arkansas	1994
California	1992
Connecticut	1994
Delaware	1995
Florida	1994
Georgia	1993
Hawaii	1994
Idaho	1996
Indiana	1993
Illinois	1994
Iowa	1993
Maine	1996
Maryland	1995
Massachusetts	1995
Michigan	1992
Mississippi	1995
Missouri	1995
Montana	1995
Nebraska	1995
New Hampshire	1996
New Jersey	1992
North Carolina	1996
North Dakota	1996
Ohio	1996
Oregon	1992
South Carolina	1996
South Dakota	1994
Tennessee	1996
Texas	1996
Utah	1992
Vermont	1993
Virginia	1995
Washington	1995
West Virginia	1995
Wisconsin	1994

Notes: Data on welfare waivers from Kleven (2019) table A.III. The year reported is the year the first welfare waiver was approved. Data originally sourced from: Department of Health and Human Services, Assistant Secretary for Planning and Evaluation (1997). *Setting the Baseline: A Report on State Welfare Waivers.*

Table A4. Event-Study Coefficients for 1993 EITC Expansion, with and without Waiver*Kids*Year Fixed Effects

Panel A: Low Education Sample

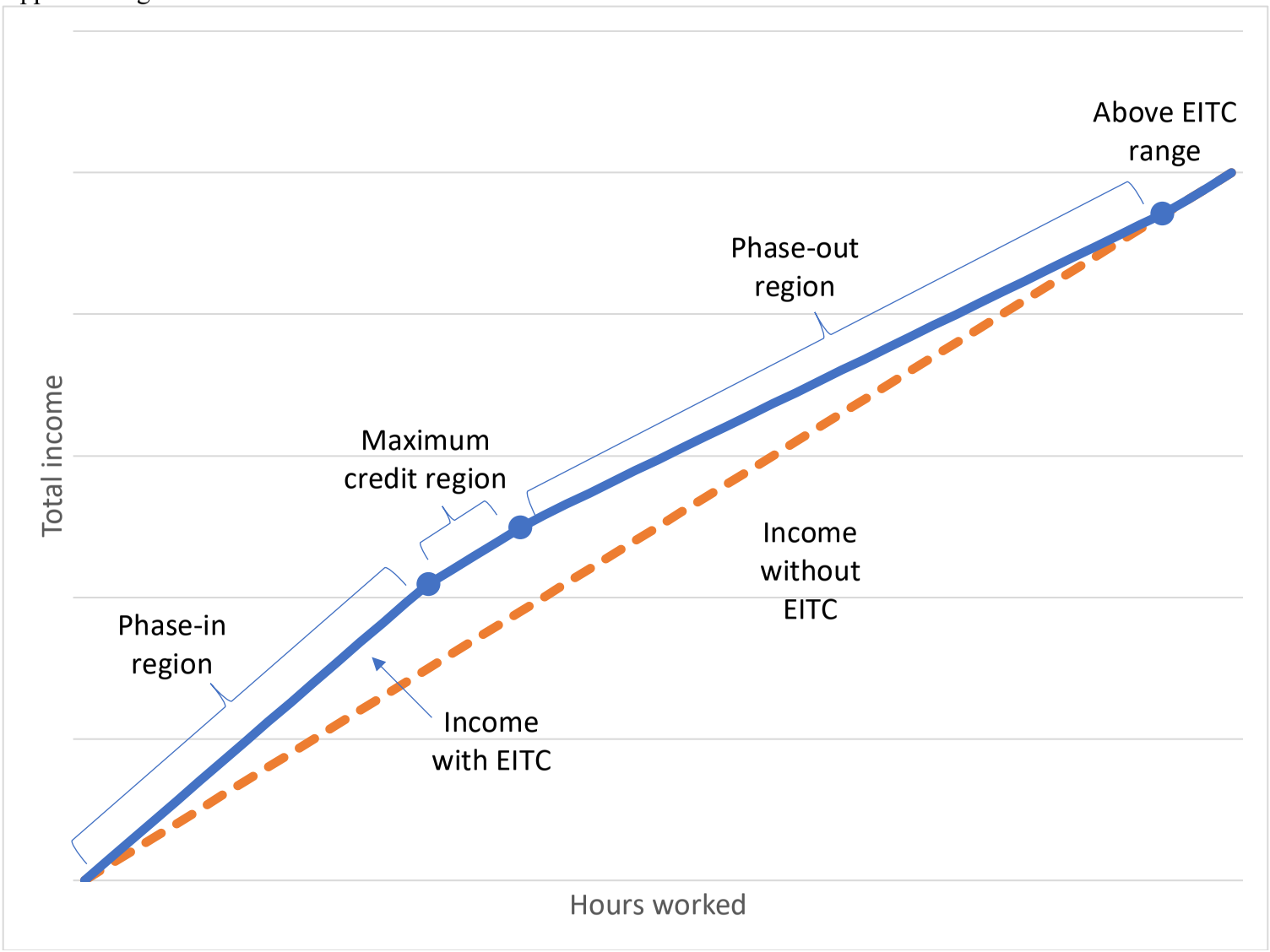
	Worked in Year		Worked last week	
	(1)	(2)	(3)	(4)
Year 3	-0.349	4.581**	1.060	4.061***
	(2.976)	(1.968)	(1.511)	(1.019)
Year 5	8.798***	10.605***	7.656***	8.509***
	(3.129)	(2.078)	(1.575)	(1.080)
Year 10	9.705***	12.840***	12.021***	13.669***
	(2.753)	(1.830)	(1.563)	(1.001)
Waivers*Children*Year	Yes	No	Yes	No

Panel B: Overall Sample

	Worked in Year		Worked last week	
	(1)	(2)	(3)	(4)
Year 3	-0.287	3.601***	0.836	2.986***
	(1.865)	(1.227)	(0.996)	(0.668)
Year 5	6.128***	8.853***	5.715***	6.806***
	(1.923)	(1.282)	(1.008)	(0.699)
Year 10	9.163***	10.284***	9.017***	10.311***
	(1.651)	(1.119)	(0.982)	(0.640)
Waivers*Children*Year	Yes	No	Yes	No

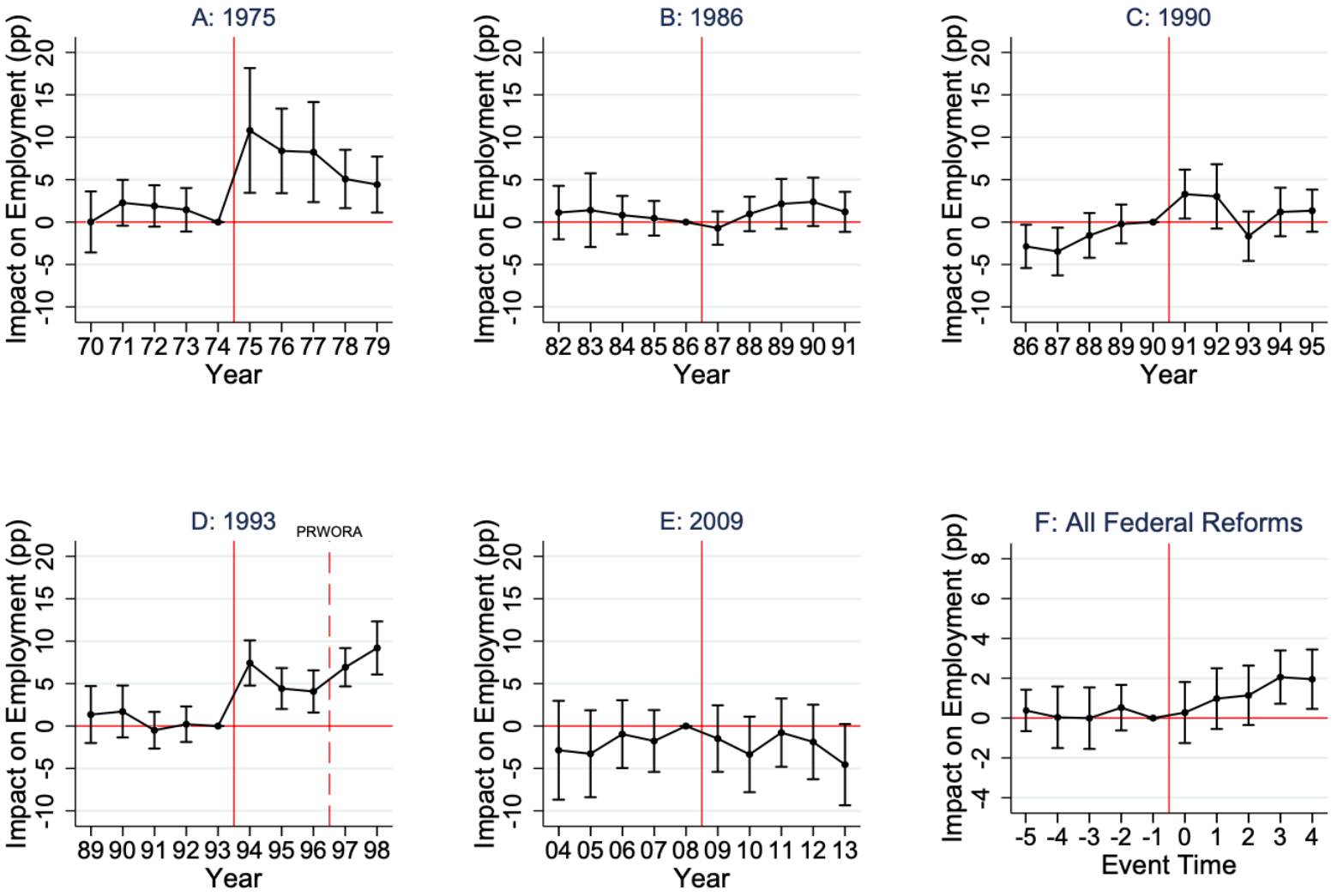
Notes: This table shows estimates of the effects of the 1993 EITC expansion in years 3, 5, and 10 years after the implementation began. The estimates are based on comparing single women with children to those without children. All specifications include demographic controls and state fixed effects. The columns show results for employment with different controls, Panel A shows results for women with a high school diploma or less, while Panel B includes all unmarried women ages 20-50. Column (3), estimates for years 3 and 10 replicate results from column 3 table 6 in Kleven (2020). Data from CPS-ASEC and basic monthly CPS files. Standard errors are clustered at the individual level. *** p<0.01, ** p<0.05, * p<0.1

Appendix Figure 1. Income with and without EITC



Notes: Income with EITC based on 2020 parameters for unmarried filer with two children.

Appendix Figure 2. Event Studies: EITC Impact on Annual Employment of All Unmarried Mothers



Notes: Each panel includes data on unmarried women, ages 20-50, for the 5 years before and after the federal EITC expansion, using CPS ASEC data on annual employment status. All event studies include controls for woman's education and age, age bin of youngest child, state and year fixed effects, state unemployment rate and (except panel E) unemployment rate interacted with presence of children. The 1990 and 1993 EITC expansions are phased in over time, and we code the

phase-in years to be the share of the expansion implemented by that year with full phase-in equal to 1 as described in text. The 2009 expansion only impacted unmarried women with 3 children, and we use unmarried women with 2 children as the control group. States are grouped in the CPS prior to 1977, so state-group fixed effects are included for those years and the weighted average unemployment rate is included as a control variable. Figures present estimates of an indicator variable for the 5 years before and after the EITC expansion, with the year prior to expansion omitted. Standard errors are clustered at the state level, and 95 percent confidence intervals are displayed.