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ABSTRACT

In recent years, many states and some local governments implemented or expanded their own supplemental Earned Income Tax Credits (EITCs). The expansion of state EITCs may have stemmed in large part from wanting to provide a more generous program than the federal program, because state EITCs increase transfer payments to low-income recipients who qualify. However, state and local governments can also benefit from maximizing participation of their constituents in the federal EITC, and there are several reasons why state or local EITCs could increase participation in the federal EITC program. We find some evidence suggesting that state EITCs may increase federal EITC program participation among low-skilled single filers with children.

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I. Introduction

The Earned Income Tax Credit (EITC) is a federal program that provides refundable tax credits for working people with low to moderate incomes. The EITC has become the largest federal cash transfer program in the United States, with about 26 million families receiving over $65 billion in cash assistance in tax year 2015 (Internal Revenue Service 2016). The EITC is designed primarily to benefit low-income families with children; there is only a small credit available to qualifying workers without children. In recent years, many states and some local governments implemented or expanded their own, supplemental EITCs.

Existing research has generally found that the EITC boosts employment and earnings for single mothers (e.g., Eissa and Liebman 1996; Meyer and Rosenbaum 2001) and reduces the share of families in poverty (Neumark and Wascher 2001; Hoynes and Patel 2018). Other work has suggested that the EITC has positive effects on consumption (Goodman-Bacon and McGranahan 2008), and has some longer-term positive impacts on child and maternal health (Evans and Garthwaite 2014; Hoynes et al. 2015; Averett and Wang 2018), child achievement (Dahl and Lochner 2012), and education (Manoli and Turner 2018; Bastian and Michelmore 2018). Nonetheless, not all eligible recipients claim their benefits, with the overall take-up rate estimated to be around 75 percent (Scholz 1994; Plueger 2009; Jones 2014). This take-up rate is relatively high compared to other social programs such as food stamps or Temporary Assistance for Needy Families, but nevertheless, improving program participation could have positive welfare effects for additional qualified working families (Currie 2006).

The expansion of state EITCs may have stemmed in large part from states simply wanting to provide a more generous program than the federal program, because state EITCs increase transfer payments to the low-income recipients who qualify (and increase work). However, state and local governments can also benefit from maximizing participation of their constituents in the federal EITC. First, because the EITC effectively increases incomes of poor and low-income families – especially those with children – increased participation in the federal program can improve the economic circumstances of low-income families and children in their jurisdictions. Second, state and local economies can potentially

benefit from increased federal tax dollars flowing into the jurisdiction (to EITC recipients). Even if forward-looking governments account for higher federal tax payments, there is no reason to think the local burden of federal taxes will reflect local participation in the EITC.[1] And third, if this EITC participation is accompanied by increased employment due to behavioral responses to the federal EITC, the higher participation can reduce the burden on state-provided income (and other) supports to these families. A positive effect of state EITCs on participation in the federal EITC can arise for a number of reasons, including: increased information about the EITC; changes induced by tax return filing requirements; and labor supply effects. In light of the reasons why states would want to boost federal EITC participation, and why state EITCs might have this effect, in this paper we evaluate evidence on whether supplemental state EITCs encourage federal EITC participation.

State EITC policy variation has been used in prior studies to examine the effect of the EITC on contemporaneous employment (Meyer and Rosenbaum 2001; Neumark and Wascher 2011), poverty (Neumark and Wascher 2001), marriage (Dickert-Conlin and Houser 2002), education and employment in the longer run (Bastian and Michelmore 2018), and fertility (Baughman and Dickert-Conlin 2009). These studies do not focus on the effect of state EITCs explicitly or as the key policy instrument, but instead – in some cases – exploit the state EITC variation to strengthen the identification of the overall EITC effect. The question we ask in this paper – whether these supplemental EITCs encourage federal EITC participation – is different and has not yet been addressed.

Our empirical strategy for estimating the effects of state EITCs on federal EITC participation hews closely to the prior literature on estimating employment effects of the EITC. We identify groups more likely to be affected by the EITC (e.g., single mothers with children), and mainly estimate triple-difference specifications, using a combination of Statistics of Income (SOI) and Current Population Survey (CPS) data, to identify the effect of state EITCs from relative changes for those more likely to be affected by state EITCs. To identify a causal effect, our key assumption is that, conditional on state and year effects and economic and demographic controls, the timing of the introduction and expansions of state EITCs is not correlated with other omitted factors that may affect the federal EITC filing share

among more- versus less-affected groups. More specifically, the main identifying assumption is that more- and less-affected groups (e.g., those with children vs. without children, or the lower skilled vs. the higher skilled, among those with children) experience similar shocks related to EITC variation that could affect filing for the federal EITC. Our triple-difference strategy requires a weaker assumption than what would be required for a simpler difference-in-differences analysis that focuses only on more-affected workers – the parallel trends assumption – because the less-affected workers provide controls for influences common to both groups that might differ in the states that do and do not adopt state EITCs (or change them differently). However, we also do many other analyses to assess a causal interpretation of our evidence, including: exploring differences in effects on EITC participation for groups for which predicted effects vary; examining other sources of predicted variation in the strength of the effect of state EITCs on federal EITC participation; and assessing the robustness of the findings to including leading effects of the EITC and other variations in the specification.

Overall, our estimates provide some evidence suggesting that state EITCs may increase federal EITC program participation. The effects we estimate are consistent with positive effects of state EITC generosity on labor supply, although the estimates suggest that most of the participation effect is not explained by labor supply responses. The evidence on the effect of state EITCs on federal program participation is not always statistically significant, especially in some of the more demanding specifications or analyses that we report. And it emerges more for single filers with one child than two or more children. Still, the effects tend to arise for those who are likely to have low incomes and high EITC benefits – i.e., single mothers, and are stronger in states with a larger share of the population likely to be affected by state EITC policies because of lower skills. And the estimates from a number of robustness analyses generally point in a consistent direction. Overall, our evidence should be viewed cautiously, with stronger conclusions requiring further research.

II. Federal and State Earned Income Tax Credits

The federal EITC is a refundable tax credit, administered through the federal tax system. Eligibility is based in part on earned income of a tax-filing unit, and qualifying income must be positive

and below the maximum allowable amount. The credit amount an eligible taxpayer receives depends on the taxpayer's positive earned income and the number of EITC qualifying children (and marital status). (See Hotz and Scholz 2003.)

II.A. EITC Parameters and Variation

Figure 1 illustrates the federal EITC structure for the year 2008, the last year in our sample period. The credit amount is displayed as a function of earnings for single filers with zero, one, and two or more EITC qualifying children. As shown in Figure 1, the EITC is far more generous for taxpayers with children. In 2008, the final year in our sample, the maximum credit amount available was $438 for childless taxpayers, $2,917 for EITC recipients with one child, and $4,824 for EITC recipients with two or more children.

The EITC structure is characterized by three main regions. The "phase-in" region is the range of income for which the credit amount increases, and is equal to earned income times the applicable credit rate. During the sample years 1997-2008, the phase-in federal credit rate was 40 percent for eligible families with two or more children, 34 percent for families with one child, and 7.65 percent for childless taxpayers. Next, the "plateau," or flat region, is the range of income for which the maximum credit amount is received. Finally, the "phase-out" region is the range of income for which the EITC credit amount declines with each additional dollar of Adjusted Gross Income (AGI, the sum of earned plus unearned income),[2] declining by 21.06 percent for families with two or more children, 15.98 percent for families with one child, and 7.65 percent for childless filers, until no credit is available.[3]

The first state EITC was offered in Rhode Island in 1986, and by 2015, the number of state EITC programs had increased to 26, including the District of Columbia (Internal Revenue Service, n.d.); our sample period ends in 2008, at which point 23 states (including the District of Columbia) had their own supplemental EITCs.[4] Most of the supplemental EITCs are refundable.[5] Generally, state EITCs are based on federal guidelines for eligibility and are structured as a percentage of the federal EITC credit.[6] The dashed line in Figure 1 shows how a 16 percent state supplemental EITC (the average supplement amount during our sample period) increases the total credit amount received by eligible taxpayers with

two or more children.

There was a wave of adoption of state EITCs during our 1997-2008 sample period, and considerable variation in supplement generosity. In 1997, only nine states offered an EITC, with supplements ranging from 5 percent to 50 percent of the federal credit. By 2008, 23 states did so, and supplements ranged from 3.5 percent to 40 percent of the federal credit.

Figure 2 displays information on average state supplements, expressed as a proportion of the federal credit, by year. For each year, the solid straight line shows the average supplement for all states, and the dashed line shows the average supplement for states that had a supplement in that year. The rising solid line reflects the increasing number of states adopting an EITC. The dashed line suggests that, for the most part, average generosity of the state EITCs adopted has been constant, at least since about 2001. Further detail is provided in Figure 3, which displays which states had an EITC, and information on the average supplement amount by state (in ranges), for various years during and bracketing the sample period (for the continental United States).

Figure 4 displays the number of federal EITC filers per potentially eligible population for the sample years 1997-2008 (from data discussed in more detail below), for states that did not have an EITC during the sample period, for states that had an EITC at some point during the sample period, and for the subset of states that adopted one during the sample period. All three series increase, but the series for the states that had or adopted an EITC during the sample period increase faster, with the series for the subset of adopters increasing the fastest.[7]

Figure 4 indicates that states with a state EITC tend to have a lower ratio of federal EITC filers to the potentially eligible population. This raises the possibility that state EITCs are endogenously adopted in response to a low federal EITC participation rate.[8] A number of features of our empirical analysis account for this possible endogeneity, including the inclusion of fixed state effects, and showing that there are not leading effects of state EITCs on EITC participation. Moreover, in some sense this is the question that drives the paper: are there states where implementing an EITC boosts participation in the federal

program? We would expect this to happen in states where participation is initially low, as suggested by Figure 4.

In Figure 5, we overlay the difference between the series for states that never had an EITC in the sample period and states that always had one or adopted one, on the number of states with an EITC in each year. This figure suggests that the relative increase in the share of federal EITC filers among states with EITCs roughly coincides with the growth in state EITCs. This evidence is broadly consistent with an increase in prevalence of state EITCs leading to increased participation in the federal EITC. Of course this evidence is suggestive at best; other factors could drive the increases in federal participation, and the time-series evidence can be misleading.[9] Among other problems, as our later analysis shows, the principal evidence suggesting that state EITCs may boost federal EITC program participation arises for the low-skilled, but we have no way to directly measure filing among the low-skilled in the SOI data and therefore cannot construct the corresponding time-series graph. And if we construct these figures for single filers with children – although these figures cannot break out effects for the less-skilled – the time-series evidence tends to point in the opposite direction for part of the sample period.

II.B. Potential Effects of State EITCs on Federal EITC Variation

There are several reasons why state or local EITCs could increase participation in the federal EITC program. Existing studies of the federal EITC have found that informational complexity and low program awareness contribute importantly to low EITC participation (Chetty et al. 2013; Bhargava and Manoli 2015; Manoli and Turner 2014).[10] To receive the federal EITC, eligible workers must file a federal tax return, even if their income is below the federal filing requirement.[11] Because the EITC targets low-income working families, many eligible workers may not be familiar with how to file a tax return, or even know what tax credits are available. To address these issues, in addition to the Internal Revenue Service (IRS), state and local governments have engaged in outreach efforts to promote both state and federal EITCs (Internal Revenue Service, n.d.), often in conjunction with passage of a state or local EITC.

For example, when California enacted its own EITC program in 2015, the state's Franchise Tax

Board partnered with community-based organizations, non-profits, and other government agencies to raise awareness of both the federal and state credits.[12] Efforts included a direct mailer campaign to California taxpayers with incomes below the state filing requirement, education outreach events, and marketing materials with information about the available credits. To help taxpayers who may not know how to file for the EITC, the state also collaborated with local partners to provide free tax assistance services. State or local governments that successfully promote their own EITCs should increase federal EITC participation, since in order to receive a state or local EITC, qualifying workers must file a state tax return and have already filed a federal tax return and completed the federal EITC application.

In some states, low-income individuals may be required to file a state income tax return when they do not have to file a federal tax return. For instance, a state may have a lower income filing requirement than the federal requirement. Low-income individuals who already file a state tax return may learn about the federal EITC if the state offers their own supplemental program through additional EITC qualifying questions asked on their state tax return. Moreover, both of these influences may have spillover effects, as information about the EITC spreads among low-income workers (as evidenced, for example, by the information spillovers among neighbors in Chetty et al., 2013).

Finally, because the state (or local) EITC supplement to the federal EITC increases the effective wage an eligible person (most notably, low-skilled single mothers) can earn, it has an unambiguously positive predicted effect on employment for these taxpayers, which will spur higher federal EITC participation. One effect that might be viewed less positively by state or local policymakers is that, because EITC eligibility is based on family income, a higher state EITC might create a disincentive to work among some individuals with family income past the range where the federal EITC phases out, lowering employment but increasing EITC participation.[13]

III. Changes in Participation via Labor Supply Effects

We study the effects of state EITCs on participation in the federal EITC (i.e., filing). As noted above, there is some focus in the literature on EITC take-up. The EITC take-up rate is typically defined in the literature as total EITC participants per eligible filer. The general approach to estimating a take-up

rate is to use administrative data to estimate the total number of participants and survey data to estimate those eligible. Eligibility is often simulated based on income and household characteristics in the survey data. However, in this paper, we are interested in changes in federal EITC participation, which could potentially be related to behavioral labor supply responses to increased state EITC generosity that affect eligibility. To avoid any endogenous income responses, we use an estimate of potentially eligible filers that does not depend on income; hence, we study what we call "EITC participation," rather than EITC take-up. States should be interested in the number of people who file for the EITC generally, as this increases the inflow of federal dollars. Take-up is important for other reasons, pertaining to the public policy goal of helping those deemed eligible for the program. But analyzing effects on take-up is a different kind of empirical exercise.

We already noted that increased publicity and outreach efforts related to state EITCs can increase federal EITC participation. However, a state EITC can also affect federal program participation through labor supply responses to the increased credit generosity. We discuss the predicted extensive margin labor supply effects for both single and married taxpayers and then relate the predicted labor supply responses to the predicted changes in federal EITC participation.[14]

In the standard labor-leisure choice model, an individual's labor supply decision is determined by their utility function and budget constraint. An individual receives utility from consumption of goods (M) and consumption of leisure (L); T is the total time endowment, and H is labor supply. In Figure 6, the solid line illustrates an individual's budget constraint without the EITC (labeled "No EITC"), showing consumption as a function of leisure hours. As leisure hours increase, hours worked decrease, and earned income decreases, until all time is spent on leisure and M equals unearned or non-labor income. Figure 6 also illustrates how a federal and a state EITC shift the budget constraint. Because state EITCs are based on federal income eligibility requirements and typically pay a percentage of the federal EITC, the budget line shares the same kink points (relative to the horizontal axis) as the budget line with the federal EITC. The state EITC steepens the budget line in the phase-in and phase-out regions and increases the maximum credit amount received.

Prior to the state EITC, some individuals choose not to work due to a high reservation wage (because of, for example, high non-labor income or a high value of home production owing to the presence of small children). A federal EITC may not increase their effective wage enough to exceed their reservation wage and induce labor market entry, but the additional state EITC supplement may raise their net wage enough to encourage labor market entry. Thus, for single earners initially not working, a state EITC is expected to have a positive effect on employment, because there is a positive substitution effect and no income effect. Consequently, federal EITC participation is also expected to increase as these individuals start working to qualify for the credit.

The predicted labor supply response for a married secondary earner can differ, because EITC eligibility depends on total family income. If neither the primary nor the secondary earner are initially working, then by the same argument as above we would expect a state EITC to sometimes draw at least one of them into the labor market, thus possibly increasing federal EITC participation. However, if the primary earner is already working, and the primary earner's income falls in the EITC eligible range, an increase in a state EITC can be viewed as an increase in non-labor income for the secondary earner, in which case the effect of a state EITC on the secondary earner's employment is ambiguous. The additional non-labor income effectively raises their reservation wage, creating a disincentive to work. However, the positive substitution effect could outweigh this, and increase employment. In any event, these kinds of responses are not expected to affect federal EITC participation for the tax filing unit.

For some individuals with pre-EITC income above the phase-out region of the credit, the altered budget set can induce them to reduce their hours so that their earned income falls in the EITC-eligible range. This effect can arise for single taxpayers or secondary earners. In the latter case, for example, if the family's combined income exceeds the EITC income eligibility requirements, but falls into the EITC income eligibility range without the secondary earner's income, the secondary earner may reduce their hours or stop working. If these individuals adjust their labor supply so that their family income falls within the EITC eligible range, EITC participation could increase.

Table 1 summarizes the predicted extensive labor supply responses and the effect on federal

EITC participation for single and married filers with children.[15] As the preceding discussion and Table 1 illustrate, the predicted effects of state EITCs on employment and federal EITC participation can depend on marital/filing status and where the individual's or family's income falls on the budget constraint.

An additional complication is that these predicted labor supply and hence EITC participation responses do not account for general equilibrium effects. In particular, childless workers may be adversely affected by the increased labor supply of EITC filers with children due to increased competition for jobs (e.g., Leigh 2010).[16] For this group, if there is a general equilibrium disemployment effect, EITC participation is expected to decrease due to childless EITC recipients losing eligibility. This implies that some of our triple-difference estimates could perhaps slightly overstate the effects of the EITC on those with children. However, when we estimated effects on EITC participation for childless filers only, we found no impact of state EITCs.

Finally, as explained in the Introduction, there is no reason to expect that labor supply responses to state EITCs are the most important influence on whether state EITCs boost federal EITC participation. Factors such as increased information and increased inducements to file a federal tax return can also be important. And these factors may be most important for the same group for whom extensive margin labor supply increases are most likely – low-skill single mothers – because of this group's low income and high EITC benefits.

IV. Data

We measure program participation using data on federal EITC recipients per potential filer. Data on federal EITC recipients come from the IRS' Statistics of Income (SOI) annual public-use samples of federal tax returns. Data on EITC tax filers come from the SOI public-use tax files, which are cross-sectional samples of nationally representative U.S. federal individual income tax returns. One issue regarding the public-use SOI files, however, is that they are not explicitly constructed to be representative at the state level. Our appendix discusses this potential limitation, and shows that our results do not appear to be sensitive to this issue.

The SOI data include information on EITC recipients and the credit amount received,

filing/marital status, the number of EITC qualifying children, and state of residence. Ideally, to examine the effect of state EITCs on federal EITC participation, we would need data on EITC filers, potentially eligible filers, and their location on the budget constraint. However, while rich in tax income information, the SOI data cannot be used to locate individuals on the budget constraint. The data do not include information on employment, hours, or wages, or on demographic information that might be useful for drawing some inferences about wage levels and hence eligibility, such as age, race, sex, or education. Furthermore, the SOI data are a sample of federal tax filers, so from these data we are unable to capture whether a state EITC affects filing a federal tax return (and hence presumably getting the EITC if eligible), since we do not have data on eligible units that did not file a federal tax return.[17]

Because the SOI data do not include detailed demographic or employment information, we use state-level demographic and labor force data from the CPS Annual Social and Economic Supplement (ASEC, or March) files to estimate the share of potentially eligible filers and the shares more likely to face different labor supply incentives.[18] Among working individuals, low-skilled workers are more likely to be on the phase-in region. As a proxy for low-skilled, we use data on individual's education from the CPS ASEC. We define low-skilled as having no more education than a high school degree.

We identify potentially eligible filers in the CPS ASEC based on EITC program qualifying rules unrelated to income, to avoid any endogenous income responses. Specifically, a household or individual was identified as potentially eligible if they had a qualifying child, defined as a child who was under the age of 19, under the age of 24 and a full-time student, or permanently disabled.[19] The CPS ASEC only includes information on children living at home, but that is appropriate since EITC eligibility is based on qualifying children living at home. Potentially eligible childless filers were identified as household heads between the ages of 25 and 65.

To combine the individual-level tax filer data with the CPS ASEC data, both datasets are aggregated to the state and year level.[20] Prior to aggregating the SOI data, we restrict the tax filer sample to exclude all high-income filers, for which there are no state identifiers due to confidentiality reasons. We exclude filers from Puerto Rico, Guam, and the Virgin Islands, and U.S. citizens and military

personnel living abroad, since these filers are all assigned the same geographic identifier. Finally, the tax filer sample excludes late filers.

Using the aggregated CPS ASEC and SOI data, for each state-year cell we construct estimates of EITC recipients per potentially eligible population for single filers and married filers, in each case with no children, one child, or two or more children.[21] Our models and the samples we study reflect the likelihood that EITC participation responses differ across these groups, with the sharpest predictions being that a state EITC increases federal EITC participation (and employment) for single filers with children, or with two or more children, given the higher phase-in rates, although their responses can also differ because of different income and benefit levels.

Additionally, the CPS ASEC data are used to construct state-year level estimates of employment and various demographic measures for each group, including the share of the population with low skills and the share of the population that is female, Hispanic, or black. We use the employment estimates to replicate some prior results in the literature – and results that underlie some of the predictions about EITC participation responses – and we use the other estimates as control variables in our specifications, and to test for stronger effects of the EITC where the share low-skilled is higher.

These data are combined with data on state unemployment rates, state and federal minimum wages,[22] and state maximum welfare benefits for a family size of three (which serve as controls),[23] as well as data on historical state EITC parameters, which is our key source of policy variation. The historical EITC parameters are taken from the Center on Budget and Policy Priorities and are expressed as a proportion of the federal credit. Additionally, existing research suggests that minimum wage effects may arise with a lag, so we use as our minimum wage control the average of the current and prior year's minimum wage (defined as the higher of the state or federal minimum wage).

The sample period covers the years 1997-2008, the years for which we have data on state EITC policies and for which the federal EITC structure was unchanged.[24] During these sample years, there was substantial state-level EITC policy variation – especially expansion in the number of state EITCs – but there were no major changes to the federal EITC structure.[25] Since the federal EITC structure remained

relatively stable during this period, we are able to focus on the state EITC policy variation in identifying how changes in state EITC generosity can affect federal EITC program participation.

Table 2 displays summary statistics for the distribution of federal tax filers, our measure of federal EITC participation (EITC Filers per Potentially Eligible Population), and our state EITC policy variables. The majority of the EITC recipients are single filers with children. In 2008, 59 percent of federal EITC filers were single with children, and they received 74 percent of all federal EITC expenditures. Childless filers only received about 3 percent of all federal EITC dollars – much less than proportionate to their share of filers (22 percent) because of the low EITC payments for this group.

V. Empirical Approach and Specifications

V.A. Examining the Effect of State EITCs on Employment

We first attempt to replicate earlier results from Neumark and Wascher (2011) evaluating the effects of state EITCs on employment, for the same sample period for which we analyze the effects of state EITCs on filing for the federal EITC. Our identification strategy for studying federal EITC participation is limited by the lack of detailed demographic information in the SOI tax filer data, and the aggregated nature of the SOI data. The SOI data are reported by marital status and number of children, but we do not have a low-skilled measure in the SOI, and hence use an estimate of the low-skilled share from the CPS data. However, in our analysis of employment with the CPS data, we collapse the data by state, year, number of children (using alternatively 0 vs. 1+ and 1 vs. 2+, as explained below), and low skill (at most a high school degree) vs. high skill. We estimate these models separately for single individuals and married individuals. We also report some of the employment results using the CPS for the low-skilled only, something we cannot do in the SOI data.

We estimate two different specifications:

$$Y_{stk} = \alpha + \beta_1 EITC_{st} + \beta_2 Kids_{stk} + \beta_3 EITC_{st} \cdot Kids_{stk} + X_{stk}\pi + \gamma_s + \lambda_t + \delta_{sk} + \rho_{tk} + \theta_{sl} + \vartheta_{tl} + \varepsilon_{stk} \quad (1)$$

and

$$Y_{stkl} = \alpha + \beta_1 EITC_{st} + \beta_2 Kids_{stkl} + \beta_3 Lowskilled_{stkl} + \beta_4 EITC_{st} \cdot Kids_{stkl}$$

$$+\beta_5 EITC_{st} \cdot Lowskilled_{stkl} + \beta_6 Kids_{stkl} \cdot Lowskilled_{stkl}$$

$$+ \beta_7 EITC_{st} \cdot Kids_{stkl} \cdot Lowskilled_{stkl} + X_{stkl}\pi + \gamma_s + \lambda_t$$

$$+ \delta_{sk} + \rho_{tk} + \theta_{sl} + \vartheta_{tl} + \delta'_{skl} + \rho'_{tkl} + \varepsilon_{stkl}.^{26} \quad (2)$$

In equation (1), Y_{stk} is the average employment rate for state *s* in year *t* for group *k* (based on number of children). In equation (2), an *l* subscript is added, indicating that Y is defined for the low-skilled and non-low-skilled group, and *Lowskilled* is a dummy variable indicating that the data are for the low-skilled. $EITC$ is the state EITC expressed as a proportion of the federal credit, and is equal to zero if the state did not have an EITC. $Kids$ is a dummy variable. In one specification of equations (1) and (2), it is equal to one if the number of children is greater than zero, and is zero otherwise (and we collapse the data that way). In a second specification, we consider only people with children, and *Kids* is equal to one if the number of children is two or more, and is zero if the number of children is equal to one; in the latter case, the data are collapsed correspondingly, leading to the same number of cells, but with the cell means constructed excluding people with no children. X_{stk} and X_{stkl} are matrices of state-year-kids or state-year-kids-skill group controls, including the share that is black, the share Hispanic, the share of the sample with young children, the share widowed/divorced/separated, and average age.

State fixed effects (γ_s) control for unobservable differences across states that may be correlated with EITC adoption. Year fixed effects (λ_t) control for other time-varying factors that are common to all states but may be correlated with state EITC policy changes, such as the national business cycle, or changes to other federal policies. Interactions between $Kids$ and the state and year dummy variables (captured in the fixed effects δ_{sk} and ρ_{tk}) control for changes over time in the relationship between the presence of children in the home and employment (and the federal EITC variation), as well as differences across states. And in equation (2), interactions between $Lowskilled$ and the state and year dummy variables (captured in the fixed effects θ_{sl} and ϑ_{tl}) control for changes over time and variation across states in the relationship between skill and employment. Also, equation (2) includes triple interactions between *Kids*, *Lowskilled*, and state or year fixed effects (captured in the fixed effects δ'_{skl} and ρ'_{tkl}), to

allow for differential changes over time or across states in employment based on number of children and skill.

Note that equation (1) is a difference-in-difference-in-differences equation. The effect of the EITC is identified from the difference between two difference-in-differences estimates: for the sample of single individuals, the effect of the EITC for single individuals with children (identified from the difference in the change in employment when the EITC becomes more generous vs. when it does not, for single individuals with children); and the effect of the EITC for single individuals without children (identified from the difference in the change in employment when the EITC becomes more generous vs. when it does not, for single individuals without children). This effect is captured in the parameter β_3. Equation (2) adds a second level of differencing, making it a quadruple-difference estimator; it is the difference between this triple-difference estimator for low-skilled vs. high-skilled individuals. This effect is captured in the parameter β_7. In addition, when we exclude those without children, the parameter β_5 captures the effect of the EITC on low-skilled single individuals with children, without regard to the number of children.

One might interpret the main effect of the EITC in equations (1) and (2) as the effect of the EITC on those without children, or the higher-skilled. However, in the difference-in-difference-in-differences framework, the main effects may reflect other shocks associated with EITC policy variation. Hence, the focus is instead on the relative effects of EITC variation based on number of children and skill.

To account for arbitrary patterns of serial correlation within states, and heteroscedasticity across states, standard errors are clustered at the state level. The employment regressions are weighted by the number of observations in each cell, as appropriate when using grouped data.

V.B. Federal EITC Participation

We then evaluate the effect of state EITCs on our main outcome variable. We estimate versions of equations (1) and (2), but the dependent variable becomes federal EITC filers per potentially eligible population.

We estimate these models separately for single filers and married filers, using the aggregations by

number of children available in the data. For the both the single and the married filers, we construct separate cells for people with no children and one or more children (corresponding to equation (1)), and for one kid and two or more children (corresponding to equation (2)). Since we are now using the SOI data, we switch from using the low-skilled indicator (which we have in the CPS data) to using the share low-skilled estimated from the CPS. However, the interpretation in terms of differencing estimators that we offered above, in relation to the equations for employment, still applies. The population control variables continue to come from the CPS. Estimates of our EITC participation regressions are weighted by the sample's population of potentially eligible filers for each state-year cell, again because the data are grouped.

In addition, we estimate a version of equation (1) where we interact the EITC variable with the share low-skilled rather than the indicator for having children:

$$Y_{stk} = \alpha + \beta_1 EITC_{st} + \beta_2 Lowskill_{stk} + \beta_3 EITC_{st} \cdot Lowskill_{stk} + X_{stk}\pi + \gamma_s + \lambda_t + \delta_{sk} + \rho_{tk} + \theta_{sl} + \vartheta_{tl} + \varepsilon_{stk} \quad (1')$$

The idea underlying equation (1') is that that the EITC should have a greater impact on low-skilled individuals, even without regard to whether or not they have children, as the low-skilled should be more affected by the EITC. This is a triple-difference estimator based on low-skilled vs. higher-skilled filers, rather than filers with and without children.

The main identifying assumption to identify a causal effect of state EITCs on federal EITC participation is that, conditional on state and year effects and economic and demographic controls, the timing of the introduction and expansions in state supplemental EITCs is not correlated with other omitted factors that may affect the federal EITC filing share among more- versus less-affected groups. Our difference-in-difference-in-differences strategy requires a weaker assumption than what would be required for a simpler difference-in-differences analysis that only focuses on the more-affected workers – the parallel trends assumption – because the less-affected workers provide a control for influences common to both groups. However, we also do many other things to assess a causal interpretation of our evidence, including: exploring differences in effects on EITC participation for groups for which predicted

effects vary; examining other sources of predicted variation in the strength of the effect of state EITCs on federal EITC participation (discussed later); and assessing the robustness of the findings to including leading effects of the EITC (in violation of the parallel trends assumption), and other variations in the specification and sample.

VI. Results

VI.A. Preliminary Results: Examining the Effects of State EITCs on Employment

Tables 3.A and 3.B report the estimates of the effects of state EITCs on the employment rate of single and married individuals with children. In the SOI data, we cannot distinguish by the sex of the filer and marital status, so we also look at the data without regard to sex in the CPS data. As we would expect, the results (available upon request) were very similar for single women compared with all single individuals, and were stronger – in the direction of negative employment effects – for married women than for married individuals.

We begin, in column 1-4 of Table 3.A, with estimates for single individuals, estimating the effects of the EITC from the difference between single individuals with and without children. In column 1, our difference-in-difference-in-differences estimator is the coefficient on the interaction between the state EITC and the indicator for having children (vs. no children). The estimated coefficient is positive and significant, with the magnitude implying that introducing a 10 percent state EITC supplement leads to 1.9 percentage point increase in the employment rate. In column 2, we restrict the sample to the low-skilled, and the implied effect is slightly higher (2.0 percentage points).[27] One might expect a larger difference, given that the EITC is more relevant to the low-skilled. But we have already restricted attention to single individuals, who are lower-skilled or lower earners. In column 3 we use the full sample, but introduce interactions with the low-skilled indicator (note that the sample is now twice as large, since we collapse the data by this indicator as well). We find a similar effect on the *EITC×kids* interaction, and no evidence that the EITC effect is higher for the low-skilled. In column 4, we saturate the model further, by adding kids-skill-state and kids-skill-year interactions. The estimated EITC effect (the EITC-kids interaction) shrinks by about half and is no longer statistically significant.

Columns 5-8 of Table 3.A turn to married individuals; the specifications and samples otherwise parallel columns 1-4. For married individuals, we would expect a negative effect on employment, and this is exactly what we see for the *EITC*×*kids* interaction, with the estimate significant in three out of four cases (with the evidence perhaps weaker when we restrict attention to the low-skilled because with lower incomes, it is possible that the EITC extensive margin effect dominates even for married individuals).[28]

Table 3.B estimates similar specifications. Here, though, we exclude individuals without children, and estimate effects from the relative differences between individuals with 2+ children and individuals with only one child. The estimates are generally quite similar to those in Table 3.A. One difference is weaker evidence of negative employment effects for married individuals, in columns 5 and 6. The other difference is in the specifications in columns 4 and 8, where we estimate separate effects for the low-skilled (and hence can interpret the estimates as quadruple-difference estimators), including the full set of interactions to saturate the model. In this case, for the single individuals we find a large (although imprecise) positive estimate on the employment of single individuals with 2+ children. We also find a positive interaction for married individuals, making the estimate less negative than for married individuals with 2+ children who are not low-skilled – again, because they may have lower family incomes, which can reduce the negative labor supply effect for some and strengthen the positive labor supply effect for others.

Taken together, the estimates in Tables 3.A and 3.B generally suggest that state EITCs have a positive effect on employment for single individuals with children, and there is also some evidence of negative effects for married individuals with children.[29] This is broadly consistent with past evidence.

VI.B. Main Results: Examining the Effect of State EITCs on Federal EITC Participation

Table 4.A reports the estimated effects of state EITCs on federal EITC participation for single filers, estimating the effect of the EITC from the difference between individuals with and without children. Across the columns, we report increasingly rich specifications that introduce interactions with the share low-skilled, and the corresponding interactions that further saturate the model to control for other sources of variation in the dependent variable associated with the number of children and with skill,

by year or across states.

Columns 1 and 2 report estimates of the effects of the EITC interaction with an indicator for whether individuals have children, and whether they are low-skilled, while column 3 adds the full set of interactions. The estimated specifications correspond to equations (1), (1'), and (2), respectively, although note that the versions of equations (1) and (2) we estimate for EITC program participation use the share low-skilled from the CPS data. Column 4 adds the full set of interactions between kids, skill, state, and year as controls. Hence, the key estimates, in our view, come from column 4. Here, we see a large positive effect of the State *EITC*×*Kids*×*Share* low-skilled interaction (5.01), although the estimate is not statistically significant so we cannot draw firm conclusions.[30] The estimated coefficient for *State EITC*×*Kids* is small and negative.

Paralleling what we did for employment, Table 4.B reports results only for single filers with children. Thus, the indicator for having children (*Kids*) from the earlier equations now becomes an indicator for having two or more children *2+ Kids*, and for the specifications that include this indicator, the effect of children is identified from individuals with two or more children, versus one child. In this case we do not find evidence of a positive effect from the parameter one might view, a priori, as most likely to capture the causal effect – the *EITC*×*2+ Kids*×*Share low-skilled* interaction. However, there is a significant positive effect of the *EITC*×*Share low-skilled* interaction in Table 4.B. This differs from what we found for employment, which was a positive effect of the EITC for individuals with children (or for individuals with more children). The result also differs qualitatively from the corresponding estimate in Table 4.A (5.01), which, while also positive, is statistically insignificant. But the difference in Table 4.B is that the sample only includes single filers with children, and we likely get the most reliable estimates for single filers with children, for all of the parameters in the model, when we include only them in the estimation sample. Thus, our evidence suggests that state EITCs boost federal EITC participation for low-skilled individuals among single filers with children.

Two issues arise in interpreting these effects. First, the estimated coefficient of the *EITC*×*2+ Kids*×*Share low-skilled* interaction in Table 4.B is rather large and negative, and could be viewed as

offsetting the large (and significant) positive effect for the *EITC×Share low-skilled* interaction, suggesting that the effect may principally arise for women with one child. There are a couple of potential explanations. One is that women with one child were less likely to have been aware of the EITC, so that the effects of the state EITC on federal program participation (through information, filing, or whatever the mechanism is) arise for them – especially for, but not limited to, new mothers. This is consistent with evidence from Shirley (forthcoming). A second explanation is that women with only one child are more likely to be working and hence eligible for the EITC – and, as discussed below, most of the EITC program participation effect does not appear to come from positive extensive margin employment effects making a woman eligible. Regardless, this nuance to our evidence is one that suggests we have to be cautious in drawing strong conclusions about the effects of state EITCs on federal EITC program participation.

Second, the combined evidence from Tables 4.A and 4.B indicates that the principal effect of the state EITC on federal program participation comes from the effect for low-skilled filers with children. This parallels the evidence that the large positive effects arise for the *EITC×Share low-skilled* interactions in Table 4.B (columns 2 and 4), and (although not significant) for the *EITC×Share low-skilled×Kids* interaction in Table 4.B (column 4). This evidence is consistent with eligibility of higher-skilled single mothers for the EITC being lower, although not consistent with the extensive margin employment effects of the EITC arising for women with children (or with more children). Again, this may reflect the EITC program participation effect not being driven primarily by the extensive margin employment effect. Indeed, the estimated magnitudes in columns 2 and 4 of Table 4.B seem large, in comparison to the estimated employment effects.

Tables 5.A and 5.B reports the estimates of the effect of state EITCs on federal EITC participation for married filers with children – again, first comparing those with and without children, and then comparing those with two or more children to only one child. We find no significant effects of a state EITC on federal EITC participation, and estimated magnitudes are much smaller than the large and significant estimates in Table 4.B. These estimates provide no indication of effects of state EITCs on the

participation of married filers in the federal EITC.[31]

The large positive estimated effects on EITC participation for single low-skilled filers with children, but the weaker evidence of positive employment effects, and no effects on EITC participation for married filers, suggest a strong effect on EITC participation for single filers, much of which is not driven by the employment response.[32] Recall, however, that the effect of state EITCs on federal EITC participation can stem from many factors other than labor supply effects. As discussed earlier, these other effects can stem from information and outreach about the EITC that accompanies state EITCs, and induced filing of federal tax returns. Since the single, low-skilled filers with children are likely to be the poorest and most disconnected from the labor market, perhaps with irregular and even some informal employment, stronger effects of state EITCs on federal EITC participation for them, stemming from information, outreach, etc., are plausible.

Another possibility is that changes in federal EITC participation come from changes in labor supply on the intensive margin, with tax filers cutting their earned income in order to become eligible for EITC on the phase-out region. However, this seems unlikely to be important because pushing one's earnings a bit below the maximum income at which one gets the EITC does not add much EITC payment. Put differently, at this point of the budget constraint the kink is convex, not concave, so we would not anticipate bunching at the kink. Similarly, there is some evidence (Chetty et al. 2013) of manipulation of reported earnings by the self-employed. However, this is driven by those on the phase-in range trying to maximize the EITC credit, not by manipulation that takes one from not qualifying for the EITC to qualifying.

VI.C. Supplemental Analyses

Next, we do more to assess the likelihood that our estimated effects of state EITC's on EITC participation are causal. First, we consider whether the estimates are more likely to be generated by underlying changes or trends that differ between more- and less-affected individuals in the treated and untreated (or treated more- versus less-intensively) states. We do this by including leading effects of the EITC in our specifications as a placebo test.[33] Evidence that the estimated leading "effects" do not

reproduce the effects reported thus far bolsters the credibility of a causal interpretation; in contrast, evidence that our effects are due to leading effects would suggest that state EITCs were increased where federal EITC participation of more-affected groups was rising. For this and other supplemental analyses reported in this subsection, we generally report estimates only for the single filer with children specifications (corresponding to columns 2 and 4 of Table 4.B), since the estimates for these specifications constitute our key evidence.[34]

These placebo test estimates are reported in columns 1-4 of Table 6, with both 1-year leads and then 2-year leads as well; the estimates should be compared with columns 2 and 4 of Table 4.B. The key result is that the qualitative evidence on the effect of the contemporaneous EITC variable interacted with the share low-skilled is robust (although typically less precise, as we would expect). And the leading effects are generally either small or imprecise, and in all cases statistically insignificant.

We also modify these key specifications by adding 1-year and 2-year lags instead, in columns 5-8, possibly capturing a period required for people to learn about and respond to the EITC,[35] and for general equilibrium effects to be realized (e.g., responding by increasing labor supply). For the fuller specification in columns 6 and 8 the result is again robust. The contemporaneous estimates again become quite imprecise, but they are qualitatively similar (with the exception of column 7). We do estimate a slight positive 2-year lag of the main EITC effect, but in general, as for leads, the lagged effects are small and insignificant.[36]

We did some other robustness analyses as well. First, we estimated the models in Tables 4.A-5.B for EITC expenditures, rather than EITC participation, and the results were qualitatively similar, with positive and significant effects for the *EITC×Share low-skilled* interaction in the equivalent of Table 4.B, columns 2 and 4, and much smaller (and insignificant) estimates in the equivalents of Tables 5.A and 5.B. Second, although in our view it is clear that one wants weighted estimates for the usual GLS reasons when using grouped data, we also estimated the models in Tables 4.A-5.B unweighted. The results were qualitatively similar, although less so, with considerably less precise estimates, in the more-saturated models; however, the positive and significant effect of the *EITC×Share low-skilled* effect in column 2 of

Table 4.B persisted. Third, we restricted the age range for the EITC participation equations to under 50 instead of under 64. The results were qualitatively similar. Fourth, we cut off the sample period in 2007 to avoid the onset of the Great Recession. Again the results were similar, with the model in column 2 of Table 4.B being particularly robust. Finally, results excluding the other policy controls were similar to those reported in Tables 4.A-5.B. The estimated effect of the *EITC×Share low-skilled* effect in column 2 of Table 4.B remained positive (with similar magnitude) and significant; and the estimate was column 4 is still large (7.05), but smaller than in Table 4.B and not significant.

To further gauge whether our estimated EITC effects are causal, we explore whether the estimated effects of state EITCs on federal EITC participation are larger in states for which the EITC is refundable. We might expect the effect of a state EITC to be larger in states where the EITC is fully refundable. Refundable credits are more valuable because if an eligible recipient's EITC credit exceeds their income tax liability, they can receive the difference. In addition, some states have different (i.e., lower) state filing requirements than the federal filing requirements. In these states, some low-income individuals may be required to file a state income tax return, but not a federal return, in which case a state EITC may have a larger impact on federal EITC participation due to individuals being exposed to more information about the EITC program, and having to file a federal return to get the state EITC.[37] We report estimates only for our final specification from the prior tables (corresponding to column 4 of Tables 4.A and 4.B).

We first compare the estimates in columns 1 and 3 of Table 7 to column 4 of Table 4.A, for the specification for children vs. no children. For the states with refundable credits, the evidence of an EITC participation effect is somewhat stronger; although still not significant, the estimated coefficients of *State EITC×Share low-skilled* and *State EITC×Kids×Share Low-skilled* are both larger in Table 7. For the states with different filing requirements, the difference is much more marked; in particular, the estimated coefficient of State *EITC×Kids×Share Low-skilled* is much larger. When we instead compare the estimates in columns 2 and 4 of Table 7 to column 4 of Table 4.B, for the specification for 2+ kids vs. 1 kid, the notable difference is for the states with different filing requirements. In Table 4.B, the sum of the

estimated *State EITC×Share low-skilled* and *State EITC×2+ Kids×Share Low-skilled* coefficients is close to zero, whereas in Table 7 the sum is about 7, consistent with a large EITC participation effect for low-skilled single filers with 2 or more children.[38]

Thus, the most consistent evidence is that in states with different (i.e., lower threshold) filing requirements, state EITCs have a larger participation effect among low-skilled single filers with children. To be clear, these estimates are often imprecise and not statistically different (which is not surprising since we have small numbers of state with different policies), and hence the evidence is only suggestive. Nonetheless, the differences are often consistent with expectations about when state EITCs will have larger effects on federal EITC participation. Moreover, the results for filing requirements (for single filers) are particularly interesting because the larger effects are not likely to arise from extensive margin labor supply effects, but rather – we might surmise – from increased information about the EITC stemming from state EITC programs, including encouraging filing of a federal return for those with earnings; and as noted earlier, our EITC participation results do not, for the most part, appear to reflect extensive margin labor supply effects.[39] Conversely, refundability is likely less important for those with earnings above very low levels.

VII. Conclusion

Existing research on the federal EITC has linked the program to many positive labor supply and welfare outcomes for low- to moderate-income families. At the state and local government level, supplemental EITCs have become increasingly popular. These supplemental EITCs enhance the federal credit by providing additional income support to lower-income working families. While individuals, families, and states can benefit from increased participation in the federal EITC through decreased poverty, economic benefits from increased spending of federal tax dollars, or other mechanisms, it has been previously unclear whether these state EITCs affect federal program participation.

In this paper, we explore whether state EITCs boost federal EITC participation. Our measure of EITC participation requires us to use data from two sources. Specifically, we use data on tax filers from the IRS's Statistics of Income and demographic and employment data (also used to estimate the

population of potentially eligible filers) from the Current Population Survey Annual Social and Economic Supplement. To combine these datasets, we aggregate individual-level data to the state-year level.

In our analysis of the effects of state EITCs on federal EITC recipients per potential filers, we find some evidence suggesting that state EITCs increase federal program participation primarily for single individuals with children. We find evidence that the effect of state EITCs depends on the state's population of low-skilled workers, a proxy for the share of the population that is likely to be affected by the state EITC. Our estimates imply that the effect of state EITCs on federal program participation is larger in states with greater shares of potentially affected populations. Moreover, much of this EITC participation effect appears to be independent of employment effects, as the estimated participation effect is considerably larger and sometimes appears for different groups. While the aggregated data may not provide a very precise estimate of the effect of state EITCs on federal program participation, our estimates point to positive increases in participation for single filers with children. That said, our evidence is not strong; it is not always statistically significant, and it emerges more for single filers with one child than two or more children – for which we have some potential explanations, which only further research can test.

There are potential limitations to the analysis we conduct, and it is possible that additional work that rectifies these could alter the conclusions. First, as we have emphasized, the Statistics of Income (SOI) data that we use do not include detailed individual-level demographic data, and are not weighted to be representative at the state level. We are able to address both of these limitations, but we cannot be certain that our results would be full replicated if both of these shortcomings could be directly overcome. Second, our evidence is, of course, only as reliable as the identification strategy. Our difference-in-difference-in-differences approach parallels what is used in most of the research literature on the EITC, but it still rests on an untestable assumption that more- and less-affected groups experience similar unmeasured shocks. Evidence on the effects of state EITCs on filing for the federal EITC from quite different identification strategies could clearly provide important complementary evidence.

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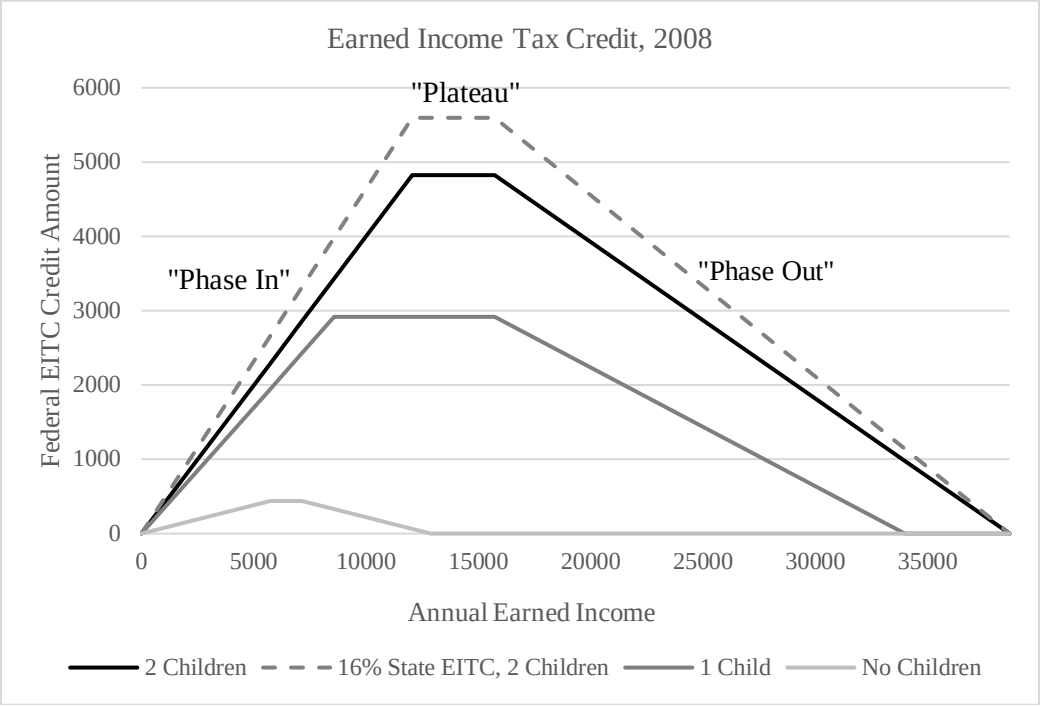
Figure 1: Federal and State EITC Parameters, 2008



Note: The EITC schedule is based on parameters for single filers from the year 2008.

Figure 2: Average EITC Supplement (Proportion of Federal EITC), 1997-2008

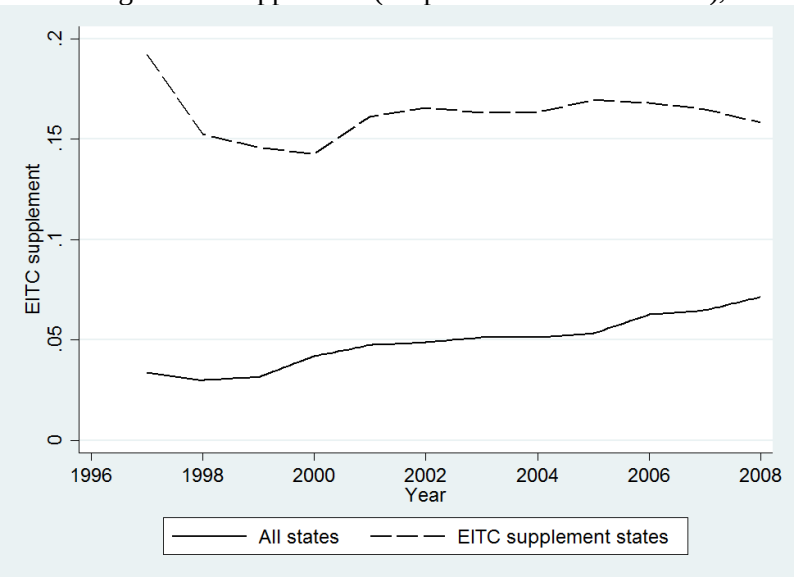
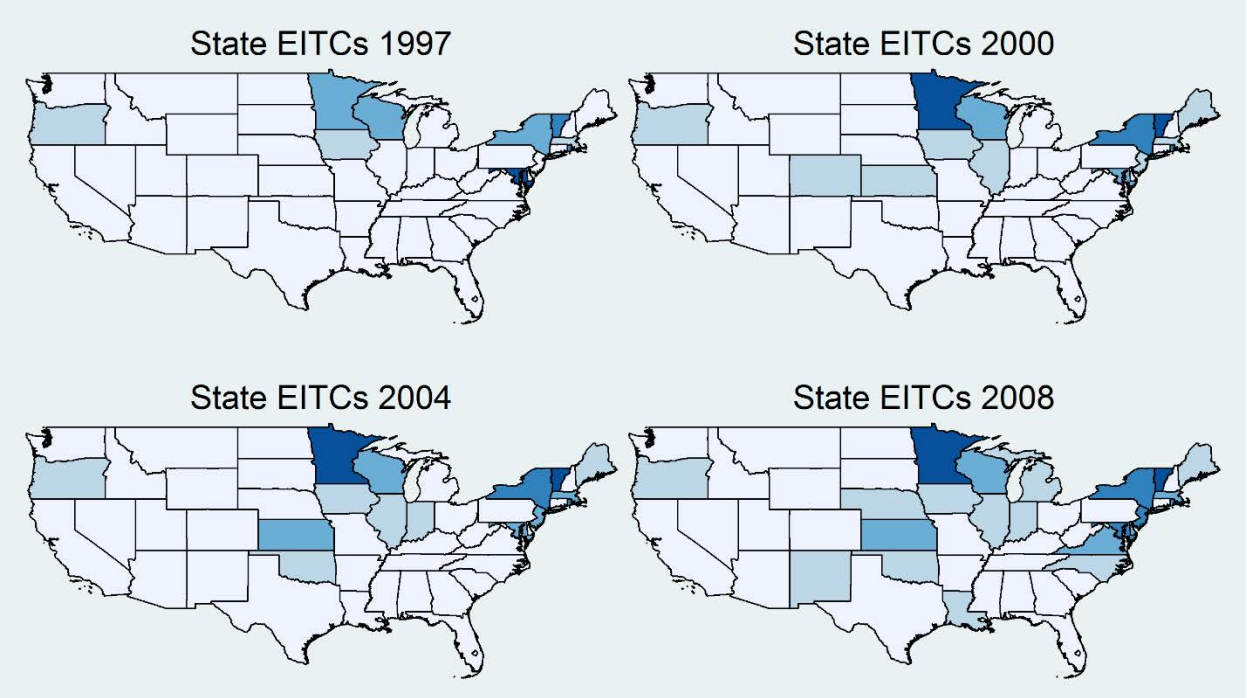


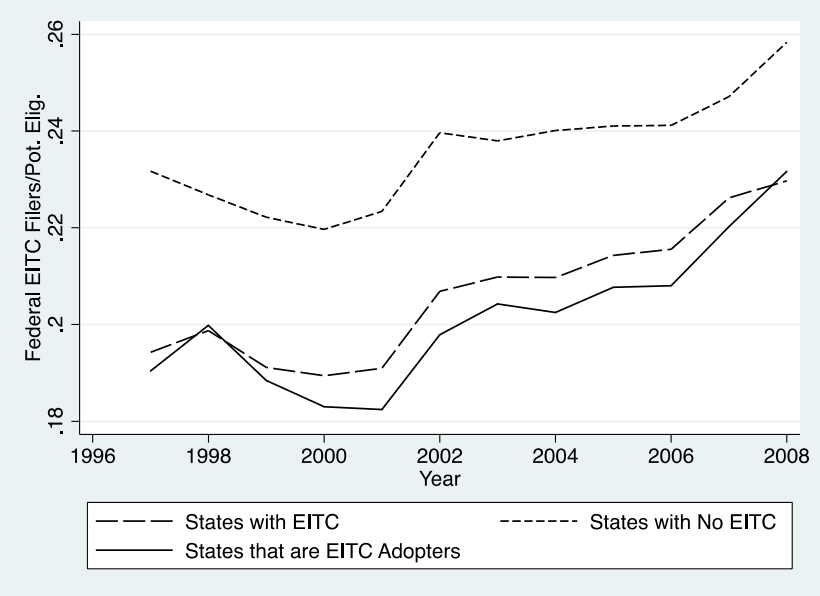
Figure 3: Average State EITC Supplement (Percentage of Federal Credit), by State and Year



Legend:

(30% +]
(20%, 30%]
(10%, 20%]
(0%, 10%]
[0%]

Figure 4: Federal EITC Filers per Potentially Eligible Population, by States with and without State EITCs, 1997-2008



Notes: The variable "Federal EITC Filers per Potentially Eligible Population" is our measure of federal EITC participation. This variable is constructed using data on federal EITC filers from the IRS SOI, and data on potentially eligible filers from the CPS ASEC. (Potentially eligible filers in this figure are household heads aged 25-64. For much of our analysis we focus on potentially eligible filers with children, defined as having a child who was under the age of 19, under the age of 24 and a full-time student, or permanently disabled.) States with or without EITC refers to whether a state ever had an EITC in the sample period. "States that are EITC Adopters" refers to states that adopted an EITC during the sample period.

Figure 5: Difference between EITC Filing Rates, by States with and without EITCs, and Number of States with EITC, 1997-2008

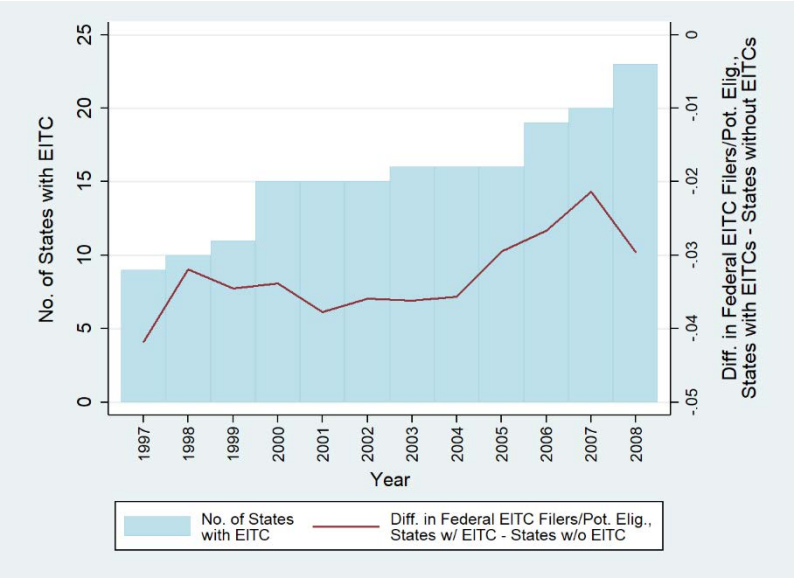


Figure 6: Federal and State EITCs and the Budget Line

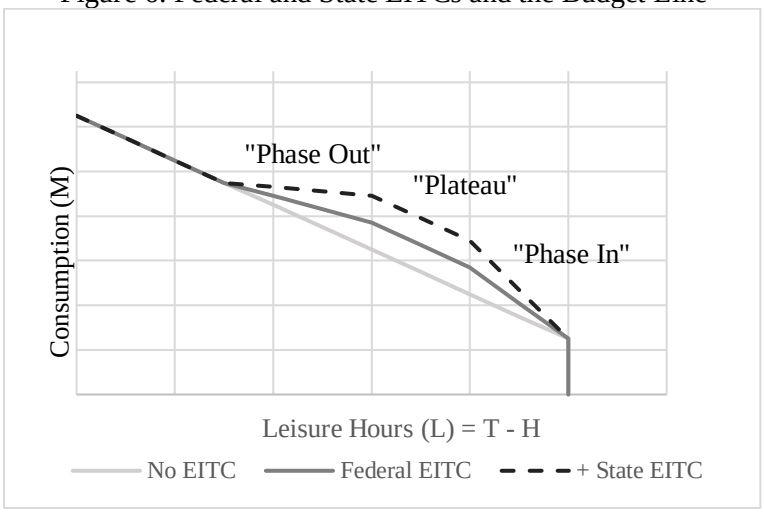


Table 1: Predicted Effects of State EITCs on Labor Supply and Federal EITC Participation

Group		*Predicted Extensive Labor Supply Response*	*Predicted Federal EITC Participation Response*
Single Filers with Children	Not Working Pre-State EITC	Increase in employment	Increase
	Pre-State EITC Income Above EITC Phase-Out Range	Decrease in hours	Increase
Married Filers with Children (Secondary Earner Responses)*	Not Working Pre-State EITC	1. Increase in employment if primary and secondary earners both not working pre-EITC. 2. Ambiguous effect on employment for the secondary earner if only the primary worker is working and the family already receives the EITC	1. Increase 2. No change (family already receives the federal EITC)
	Pre-State EITC Family Income Above EITC Phase-Out Range	Decrease in hours and/or employment.	Increase

*The predicted effects for primary earners in married households are the same as for single filers.

Table 2: Summary Statistics, 1997-2008

Tax Filers, Statistics of Income, 2008	2008
Total EITC Recipients (Millions)	24.4
Total Tax Filers (Millions)	131.4
Total EITC Expenditures (Billions)	$50.50

Share of Federal EITC Recipients, by Group	2008
Single with Children	0.59
Married with Children	0.19
No Children	0.22

Share of Federal EITC Expenditures, by Group	2008
Single with Children	0.74
Married with Children	0.23
No Children	0.03

Federal EITC Filers per Potentially Eligible Population	Mean	Obs.
Full Sample	0.23	3635
Single Individuals		
No Children	0.11	612
1 Child	1.02	611
2+ Children	1.03	609
Married with Children		
No Child	0.02	612
1 Child	0.15	586
2+ Children	0.16	605

State Policy Variables

State EITC % Supplement	Mean	Min	Max
All States	0.048	0	0.5
EITC States	0.164	0.035	0.5

Notes: Data on tax filers and EITC recipients come from the SOI, 1997-2008. Data on the population of potentially eligible filers come from the CPS ASEC, 1997-2008. Statistics are weighted to either represent the population of tax filers (see Appendix A for more details) or the population of potentially eligible filers for each cell. Potentially eligible filers in this table are household heads aged 25-64. We also use presence of children, defined as having a child who was under the age of 19, under the age of 24 and a full-time student, or permanently disabled, as well as marital status to identify potentially eligible filers.

Table 3.A: Estimated State EITC Effects on Employment: *Kids v. No Kids, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Single Individuals, Aged 21-44				Married Individuals, Aged 21-44			
State EITC	-0.03	-0.02	-0.05	-0.03	0.07	0.07	0.05	0.06
	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)	(0.07)	(0.06)	(0.05)
Kids	0.06*	0.02	0.03	0.03	0.04	0.10***	0.01	-0.01
	(0.03)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.01)	(0.03)
Low-skilled	0.03		-0.09***	-0.09***	0.05		-0.13***	-0.08***
	(0.06)		(0.01)	(0.01)	(0.06)		(0.02)	(0.01)
State EITC×Kids	0.19***	0.20***	0.19**	0.09	-0.15***	-0.11	-0.16***	-0.17***
	(0.06)	(0.07)	(0.09)	(0.07)	(0.06)	(0.11)	(0.05)	(0.06)
State EITC×Low-skilled			0.05	0.02			0.04	0.02
			(0.06)	(0.07)			(0.05)	(0.08)
Kids×Low-skilled			-0.01	-0.00			0.012**	-0.03
			(0.01)	(0.02)			(0.006)	(0.05)
State EITC×Kids×Low-skilled			-0.03	0.10			0.03	0.06
			(0.05)	(0.09)			(0.04)	(0.14)
State minimum wage	0.00	0.03	0.02	0.02	0.00	0.01	-0.00	-0.00
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Real maximum welfare benefit/$1000, family size = 3	-0.51*	-0.69**	-0.37	-0.37	-0.16	-0.33	-0.38**	-0.39**
	(0.28)	(0.31)	(0.26)	(0.26)	(0.17)	(0.25)	(0.16)	(0.17)
State unemployment rate	-0.61**	-0.82***	-0.72***	-0.71***	0.08	-0.23	-0.04	-0.03
	(0.24)	(0.26)	(0.21)	(0.22)	(0.16)	(0.16)	(0.15)	(0.15)
Sample Restricted to Low-skilled Individuals		Y				Y		
Fixed Effects								
State and Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y		Y	Y	Y		Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y				Y
Observations	1,224	1,224	2,448	2,448	1,224	1,224	2,448	2,448
R-squared	0.80	0.74	0.83	0.83	0.84	0.74	0.80	0.81

Notes: Standard errors are clustered at the state level and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Columns 1, 2, 5, and 6 use the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (0 or 1+). Columns 3, 4, 7, and 8 use the CPS ASEC data on individuals, aggregated to cells that vary by state, year, kids (0 or 1+), and skill level (no more than a high school degree). Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of observations in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Table 3.B: Estimated State EITC Effects on Employment: *2+ Kids vs. 1 Kid, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Single Individuals with Children, Aged 21-44				Married Individuals with Children, Aged 21-44			
State EITC	0.10	0.09	0.00	0.12	-0.01	0.01	-0.03	0.02
	(0.07)	(0.07)	(0.10)	(0.12)	(0.04)	(0.04)	(0.06)	(0.06)
2+ Kids	-0.05	-0.036	-0.04	-0.01	0.00	0.016	-0.00	-0.01
	(0.03)	(0.024)	(0.03)	(0.02)	(0.03)	(0.014)	(0.02)	(0.02)
Low-skilled	-0.04		-0.11***	-0.03	0.05		-0.08***	-0.05**
	(0.07)		(0.02)	(0.02)	(0.06)		(0.02)	(0.02)
State EITC×2+ Kids	0.14	0.20*	0.18*	-0.12	-0.09	-0.05	-0.12**	-0.19**
	(0.10)	(0.10)	(0.11)	(0.19)	(0.06)	(0.05)	(0.06)	(0.07)
State EITC×Low-skilled			0.12	-0.03			0.08	-0.01
			(0.10)	(0.14)			(0.07)	(0.07)
2+ Kids×Low-skilled			-0.02	-0.06***			0.00	0.01
			(0.01)	(0.02)			(0.01)	(0.02)
State EITC×2+ Kids×Low-skilled			-0.06	0.32			0.01	0.13**
			(0.08)	(0.21)			(0.02)	(0.06)
State minimum wage	0.03	0.04	0.04	0.04	-0.00	0.00	-0.00	-0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
Real maximum welfare benefit/$1000, family size = 3	-0.61	-0.83	-0.77	-0.74	-0.15	-0.11	-0.25	-0.26
	(0.65)	(0.80)	(0.63)	(0.64)	(0.20)	(0.26)	(0.20)	(0.21)
State unemployment rate	-0.73*	-0.73*	-0.80**	-0.80**	0.11	-0.21	-0.03	-0.03
	(0.43)	(0.43)	(0.39)	(0.40)	(0.15)	(0.16)	(0.15)	(0.15)
Sample Restricted to Low-skilled Individuals		Y				Y		
Fixed Effects								
State and Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y		Y	Y	Y		Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y				Y
Observations	1,224	1,224	2,445	2,445	1,224	1,224	2,448	2,448
R-squared	0.60	0.55	0.59	0.60	0.83	0.75	0.77	0.78

Notes: Standard errors are clustered at the state level and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Columns 1, 2, 5, and 6 use the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (1 or 2+). Columns 3, 4, 7 and 8 use the CPS ASEC data on individuals, aggregated to cells that vary by state, year, kids (1 or 2+), and skill level (no more than a high school degree). Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of observations in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Table 4.A: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer: *Single Filers, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)
	Y = EITC Filers/Potentially Eligible Population *Single Individuals, Aged 21-64*			
State EITC	0.02	0.00	0.03	0.04
	(0.05)	(0.05)	(0.06)	(0.05)
Kids	0.57***	0.57***	0.56***	1.97***
	(0.09)	(0.09)	(0.09)	(0.50)
Share low-skilled	0.46***	0.64***	0.58***	-0.12
	(0.16)	(0.14)	(0.17)	(0.12)
State EITC×Kids	-0.07		-0.21	-0.61
	(0.22)		(0.27)	(0.45)
State EITC×Share low-skilled		-0.15	0.25	0.26
		(0.87)	(0.74)	(0.64)
Kids×Share low-skilled			0.22	2.26***
			(0.17)	(0.82)
State EITC×Kids×Share low-skilled			1.59	5.01
			(1.52)	(4.18)
State minimum wage	-0.02	-0.02	-0.03	-0.02
	(0.05)	(0.05)	(0.05)	(0.05)
Real maximum welfare benefit/$1000, family size = 3	-0.00	-0.00	0.00	-0.04
	(0.09)	(0.09)	(0.09)	(0.09)
State unemployment rate	0.06	0.06	0.06	0.20
	(0.46)	(0.45)	(0.45)	(0.47)
Fixed Effects				
State and Year FE	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y
Observations	1,224	1,224	1,224	1,224
R-squared	0.98	0.98	0.98	0.99

Notes: Standard errors are clustered at the state level and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Regressions use the SOI data on tax filers and the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (0 or 1+). Columns 2 - 4 include interactions with contemporaneous share low-skilled. In specifications with *EITC×share low-skilled* interactions, the EITC and share variables are demeaned, so the main EITC effect represents the state EITC effect evaluated at sample means of the low-skilled shares. Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of potential filers in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Table 4.B: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer: *Single Filers with Children, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)
	Y = EITC Filers/Potentially Eligible Population *Single Individuals with Children, Aged 21-64*			
State EITC	-0.27	0.07	-0.07	0.29
	(0.25)	(0.18)	(0.30)	(0.43)
2+ Kids	0.04	0.04	0.06	-0.74
	(0.07)	(0.07)	(0.07)	(1.06)
Share low-skilled	1.29***	1.46***	1.35***	2.40***
	(0.42)	(0.40)	(0.42)	(0.80)
State EITC×2+ Kids	0.63		0.27	0.08
	(0.40)		(0.54)	(0.57)
State EITC×Share low-skilled		6.89***	5.41	15.08**
		(2.30)	(3.38)	(6.91)
2+ Kids×Share low-skilled			0.11	-1.82*
			(0.24)	(1.05)
State EITC×2+ Kids×Share low-skilled			0.02	-14.37
			(1.73)	(8.92)
State minimum wage	-0.24	-0.26	-0.25	-0.26
	(0.19)	(0.19)	(0.19)	(0.20)
Real maximum welfare benefit/$1000, family size = 3	-0.09	-0.08	-0.08	-0.10
	(0.37)	(0.35)	(0.36)	(0.37)
State unemployment rate	-1.11	-1.12	-1.12	-1.02
	(1.45)	(1.41)	(1.42)	(1.40)
Fixed Effects				
State and Year FE	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y
Observations	1,220	1,220	1,220	1,220
R-squared	0.75	0.75	0.75	0.77

Notes: Standard errors are clustered at the state level, and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Regressions use the SOI data on tax filers and the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (1 or 2+). Columns 2 - 4 include interactions with contemporaneous share low-skilled. In specifications with *EITC×share low-skilled* interactions, the EITC and share variables are demeaned, so the main EITC effect represents the state EITC effect evaluated at sample means of the low-skilled shares. Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of potential filers in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Table 5.A: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer: *Married Filers, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)
	Y = EITC Filers/Potentially Eligible Population *Married Individuals, Aged 21-64*			
State EITC	-0.03	-0.03	-0.02	0.01
	(0.03)	(0.03)	(0.03)	(0.02)
Kids	0.12***	0.12***	0.12***	0.07
	(0.02)	(0.02)	(0.02)	(0.07)
Share low-skilled	-0.44***	-0.32***	-0.33***	0.27***
	(0.05)	(0.05)	(0.05)	(0.06)
State EITC×Kids	-0.04		-0.02	-0.07
	(0.05)		(0.07)	(0.10)
State EITC×Share low-skilled		0.45	0.33	0.30
		(0.42)	(0.42)	(0.36)
Kids×Share low-skilled			0.01	-0.07
			(0.06)	(0.12)
State EITC×Kids×Share Low-skilled			0.02	0.18
			(0.37)	(1.12)
State minimum wage	0.02	0.02	0.02	0.031**
	(0.02)	(0.02)	(0.02)	(0.015)
Real maximum welfare benefit/$1000, family size = 3	-0.04*	-0.04*	-0.04*	-0.05**
	(0.02)	(0.02)	(0.02)	(0.02)
State unemployment rate	0.49***	0.49***	0.49***	0.47**
	(0.18)	(0.17)	(0.18)	(0.18)
Fixed Effects				
State and Year FE	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y
Observations	1,222	1,222	1,222	1,222
R-squared	0.95	0.95	0.95	0.96

Notes: Standard errors are clustered at the state level and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Regressions use the SOI data on tax filers and the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (0 or 1+). Columns 2 - 4 include interactions with contemporaneous share low-skilled. In specifications with *EITC×share low-skilled* interactions, the EITC and share variables are demeaned, so the main EITC effect represents the state EITC effect evaluated at sample means of the low-skilled shares. Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of potential filers in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Table 5.B: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer: *Married Filers with Children, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)
	Y = EITC Filers/Potentially Eligible Population *Married Individuals with Children, Aged 21-64*			
State EITC	-0.07	-0.06	-0.05	-0.01
	(0.05)	(0.06)	(0.06)	(0.08)
2+ Kids	0.26***	0.25***	0.26***	-0.37
	(0.03)	(0.02)	(0.03)	(0.35)
Share low-skilled	0.57***	-0.36***	-0.40***	0.19
	(0.08)	(0.09)	(0.12)	(0.16)
State EITC×2+ Kids	-0.03		-0.01	-0.05
	(0.08)		(0.12)	(0.18)
State EITC×Share low-skilled		0.51	0.53	1.75
		(0.66)	(0.80)	(1.52)
2+ Kids×Share low-skilled			0.05	-0.47
			(0.08)	(0.29)
State EITC×2+ Kids×Share low-skilled			-0.05	-1.60
			(0.53)	(1.83)
State minimum wage	0.03	0.03	0.03	0.04
	(0.03)	(0.03)	(0.03)	(0.03)
Real maximum welfare benefit/$1000, family size = 3	-0.04	-0.04	-0.04	-0.03
	(0.04)	(0.04)	(0.04)	(0.04)
State unemployment rate	0.96***	0.96***	0.97***	0.95***
	(0.32)	(0.32)	(0.31)	(0.34)
Fixed Effects				
State and Year FE	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y
Observations	1,191	1,191	1,191	1,191
R-squared	0.77	0.77	0.77	0.79

Notes: Standard errors are clustered at the state level and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Regressions use the SOI data on tax filers and the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (1 or 2+). Columns 2 - 4 include interactions with contemporaneous share low-skilled. In specifications with *EITC×share low-skilled* interactions, the EITC and share variables are demeaned, so the main EITC effect represents the state EITC effect evaluated at sample means of the low-skilled shares. Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of potential filers in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Table 6: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer: *Single Filers with Children, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Leads (columns 1-4)				Lags (columns 5-8)			
State EITC	0.16	0.06	0.07	0.02	-0.46	-0.04	0.15	0.34
	(0.18)	(0.57)	(0.15)	(0.52)	(0.49)	(0.86)	(0.32)	(0.84)
2+ Kids	-0.02	-0.04	-0.01	-0.04	0.02	0.06	-0.01	-0.02
	(0.07)	(0.07)	(0.07)	(0.08)	(0.06)	(0.07)	(0.06)	(0.06)
Share low-skilled	0.13	1.19**	0.28	1.19**	0.34	0.73	0.25	0.47
	(0.34)	(0.53)	(0.33)	(0.55)	(0.39)	(0.78)	(0.40)	(0.51)
2+ Kids×Share low-skilled		-2.20**		-2.10*		-1.01		-0.69
		(1.03)		(1.11)		(0.92)		(0.87)
State EITC×2+ Kids		0.52		0.40		-0.24		0.36
		(0.70)		(0.68)		(1.16)		(0.95)
State EITC×Share low-skilled	5.45	6.39	7.24*	10.79	1.37	10.93	3.47	16.00
	(3.58)	(14.09)	(3.93)	(14.96)	(5.66)	(13.96)	(5.79)	(16.45)
State EITC×2+ Kids×Share Low-skilled		-5.63		-7.17		-10.84		-24.31
		(14.14)		(13.07)		(16.87)		(18.37)
State EITC 1-year lead/lag	0.02	0.07	-0.42	-0.50	0.41	0.36	-0.60	-0.75
	(0.31)	(0.65)	(0.42)	(1.03)	(0.45)	(0.66)	(0.49)	(0.73)
State EITC 1-year lead/lag×2+ Kids		-0.04		0.08		0.21		-0.12
		(0.84)		(1.12)		(1.04)		(0.87)
State EITC 1-year lead/lag×Share low-skilled	1.74	3.24	-2.11	-4.88	4.32	7.62	-1.39	-7.52
	(4.92)	(13.11)	(5.47)	(13.00)	(6.06)	(11.46)	(6.13)	(11.78)
State EITC 1-year lead/lag×2+ Kids×Share low-skilled		-1.09		-2.32		-16.77		0.34
		(15.79)		(18.35)		(13.45)		(15.08)
State EITC 2-year lead/lag			0.58	0.56			0.44	1.38**
			(0.49)	(1.22)			(0.33)	(0.66)
State EITC 2-year lead/lag×2+ Kids				0.13				-1.51**
				(1.23)				(0.73)
State EITC 2-year lead/lag×Share low-skilled			1.18	0.39			-0.71	11.35
			(5.45)	(14.67)			(3.41)	(8.25)
State EITC 2-year lead/lag×2+ Kids×Share low-skilled				7.83				-6.08
				(18.51)				(12.93)
Fixed Effects								
State and Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE		Y		Y		Y		Y
Observations	1,119	1,119	1,017	1,017	1,118	1,118	1,016	1,016
R-squared	0.77	0.79	0.79	0.81	0.75	0.77	0.76	0.78

Notes: Standard errors are clustered at the state level, and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Regressions use the SOI data on tax filers and the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (0, 1, 1+, or 2+). In specifications with *EITC×share low-skilled* interactions, the EITC and share variables are demeaned, so the main EITC effect represents the state EITC effect evaluated at sample means of the low-skilled shares. Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of potential filers in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Table 7: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer: *Single Filers and Single Filers with Children, 1997-2008, Refundable EITCs and Different State Filing Requirements*

	(1)	(2)	(3)	(4)
	Y = EITC Filers/Potentially Eligible Population			
	Single Individuals, Aged 21-64			
	Refundable EITCs		Different State Filing Requirements	
VARIABLES	Single filers Kids vs. no Kids	Single filers with children 2+Kids vs. 1 Kid	Single filers Kids vs. no Kids	Single filers with children 2+Kids vs. 1 Kid
State EITC	0.08	0.48	0.03	0.55
	(0.09)	(0.62)	(0.06)	(0.59)
Kids/2+Kids	0.01	-0.77	0.49	-0.82
	(0.47)	(0.61)	(0.55)	(0.77)
Share low-skilled	0.32	0.83	-0.07	0.15
	(0.21)	(1.00)	(0.12)	(0.79)
State EITC×Kids/2+Kids	-0.74	-0.32	-1.52	-0.73
	(0.76)	(0.93)	(1.03)	(0.82)
State EITC×Share low-skilled	0.82	12.02	-0.08	16.33
	(0.69)	(8.81)	(0.93)	(10.51)
Kids/2+Kids×Share low-skilled	1.06*	-0.79	1.54**	-0.75
	(0.60)	(0.80)	(0.63)	(1.17)
State EITC×Kids/2+Kids×Share Low-skilled	5.97	-12.93	12.50	-9.15
	(6.00)	(12.10)	(9.39)	(15.28)
State minimum wage	-0.05	-0.42**	-0.02	-0.30
	(0.05)	(0.20)	(0.05)	(0.21)
Real maximum welfare benefit/$1000, family size = 3	-0.04	-0.02	-0.13*	-0.31
	(0.09)	(0.37)	(0.08)	(0.38)
State unemployment rate	0.27	-0.91	-0.22	-2.07
	(0.51)	(1.46)	(0.41)	(1.23)
Fixed Effects				
State and Year FE	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y
Kids-by-Low-skilled-by-State FE and Kids-by-Low-skilled-by-Year FE	Y	Y	Y	Y
Observations	1,008	1,004	1,080	1,078
R-squared	0.99	0.78	0.99	0.79

Notes: Standard errors are clustered at the state level, and reported in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Regressions use the SOI data on tax filers and the CPS ASEC data on individuals, aggregated to cells that vary by state, year, and kids (0, 1, 1+, or 2+). Columns 1 - 4 include interactions with contemporaneous share low-skilled. In specifications with *EITC×share low-skilled* interactions, the EITC and share variables are demeaned, so the main EITC effect represents the state EITC effect evaluated at sample means of the low-skilled shares. Regressions control for: cell demographic measures including share black, Hispanic, with different numbers of children, children under the age of six, and share divorced/widowed/separated (in single specifications); and average age. Estimates are weighted by the number of potential filers in each cell. State EITC is measured as the state EITC percentage supplement, scaled from zero to one.

Appendix

Potential Biases from Non-Representativeness of the Public-Use SOI Data

We use the SOI public-use files created by the IRS to measure EITC take-up. A potential issue is that these files are not constructed to be representative at the state level, but rather, with the sample weights, to be representative at the federal level. In this appendix, we document this issue, and explore whether our results are sensitive to this non-representativeness.

There are a couple of reasons this non-representativeness may not be a first-order problem for our regression estimates. First, a lack of representativeness need not bias regression estimates, if there is not heterogeneity of parameters across subgroups whose representation differs from the sampling universe. (This is essentially the same question that underlies the importance of weighting in regression estimates; see Solon et al., 2015). Thus, the critical question is how the regression estimates are affected by the sampling issue. Second, sampling errors in the public-use data are more common and larger for small states. But the estimates we report in the paper are weighted by the number of filers in the states, because we used grouped data, suggesting that any sampling errors will play a small role.

We first present some evidence on differences between the data sources, and then show that the results are insensitive to a number of ways to address the discrepancies. Note that we were not able to access the full confidential microdata, so that we cannot generate estimates avoiding the public-use SOI data, or estimate discrepancies by filing status.[40] However, we can study differences in the numbers of filers implied by the two data sources, and assess the sensitivity of the results to either trying to correct for the sampling error in the public-use SOI data, or dropping the states with large errors.

Appendix Figures A1 and A2 give some evidence on the sampling errors. In particular, for our first and last sample years (1997 and 2008) we plot the number of filers, by state, implied by the public-use SOI data, and in the full IRS data. (The plots are similar for all other years.) These figures clearly show some errors. And indeed if we zoom in on the smaller states to see more detail near the lower-left-hand corner, we see that these errors are larger in smaller states, which we show here just for the first year (Appendix Figure A3).

We take two different approaches to assessing whether the regression results are sensitive to these sampling errors. First, we simply drop states with large and persistent errors in the SOI public-use data. In particular, we drop states with 9 or more years of absolute errors in the SOI public-use data that exceed 10% (Delaware, the District of Columbia, Hawaii, Vermont, West Virginia, and Wyoming). Appendix Figure A4 shows these average absolute errors for each state, and the six states we drop based on this criterion (marked with x's). Appendix Table A1 shows the results in which we drop these states. In this analysis, we focus on the results for single filers with children, for the specification for 1 vs. 2+ kids. (Results for other runs were similar, as were results with different cutoffs for the states excluded, such as 5% and 20%.) The results in Appendix Table A1 are qualitatively similar to those in Table 4.B.

The second approach we take is to adjust the total number of filers implied by the SOI data for the percentage error implied by the difference between the public-use SOI and the full confidential SOI data. Note, again, that we do not have this error by filing status. The results again are very similar. (See Appendix Table A2.)

Overall, between these findings, and the fact the sampling errors are large for the small states that are downweighted, we conclude that our results are not materially influenced by the non-representative sampling in the public-use SOI data.

Figure A1: Total EITC filers: SOI vs IRS, 1997

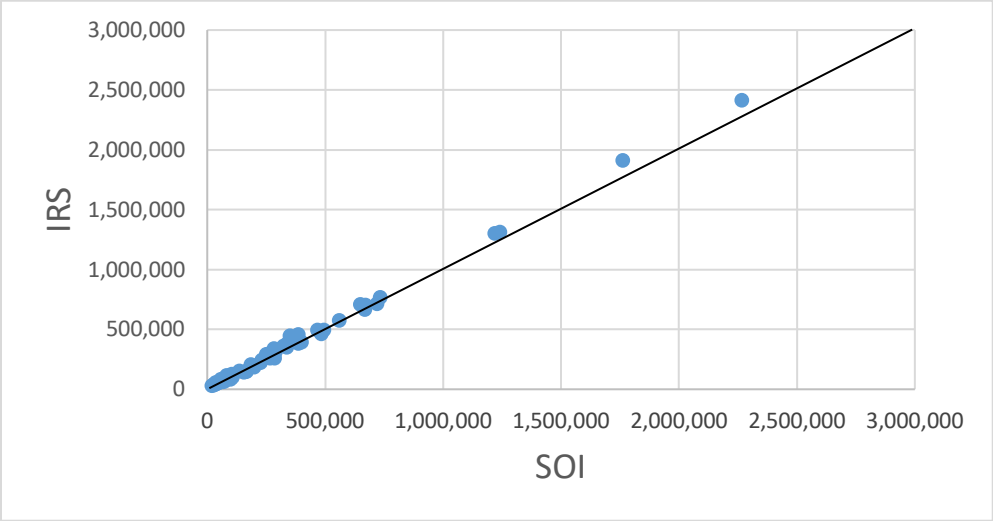


Figure A2: Total EITC filers: SOI vs IRS, 2008

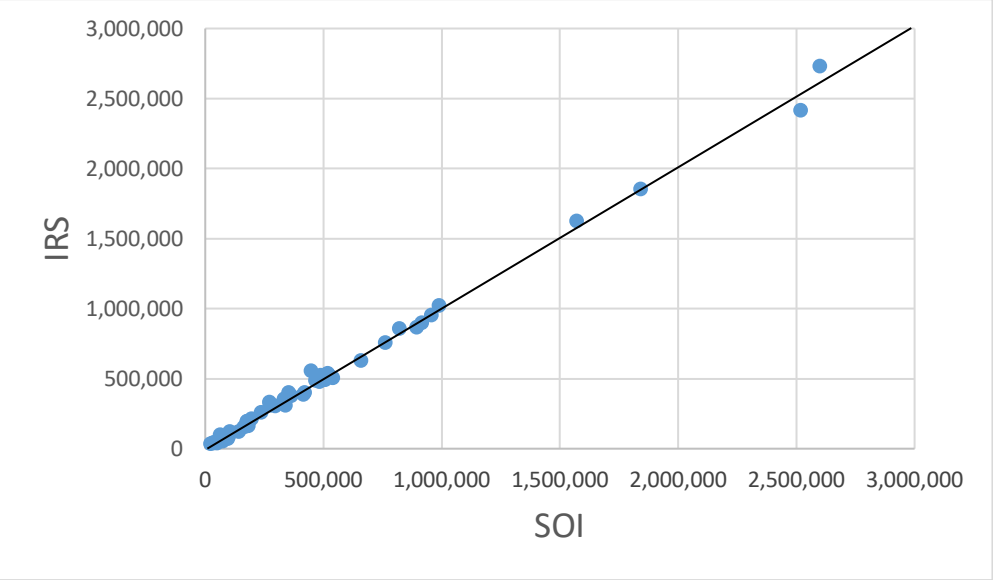


Figure A3: Total EITC filers: SOI vs IRS, 1997 (States with < 1 million filers)

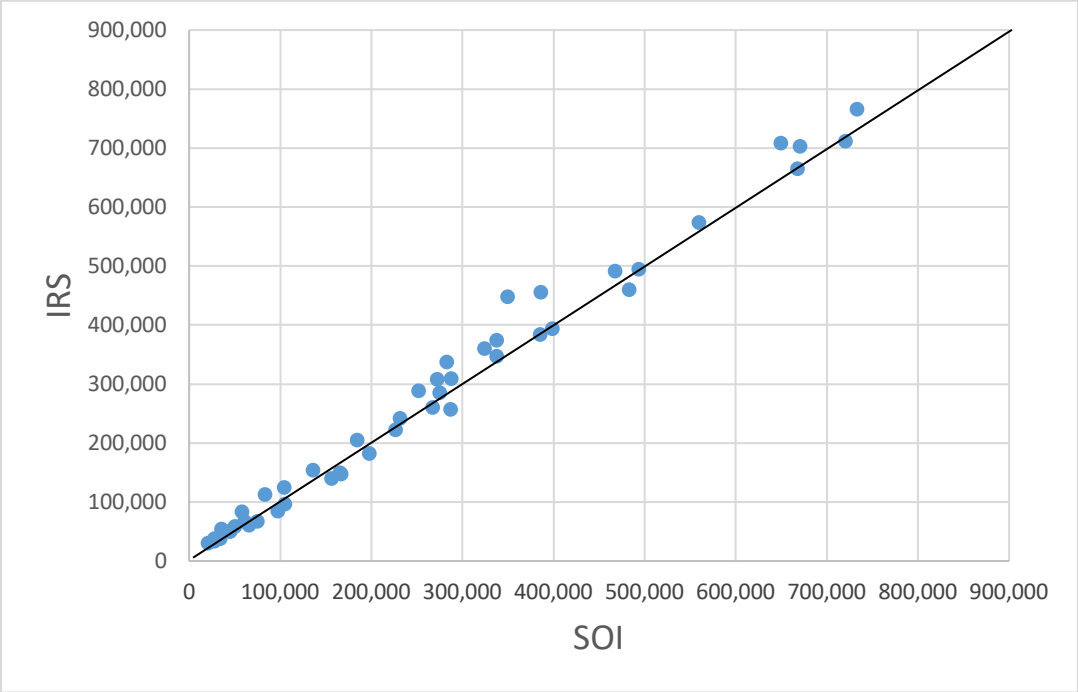
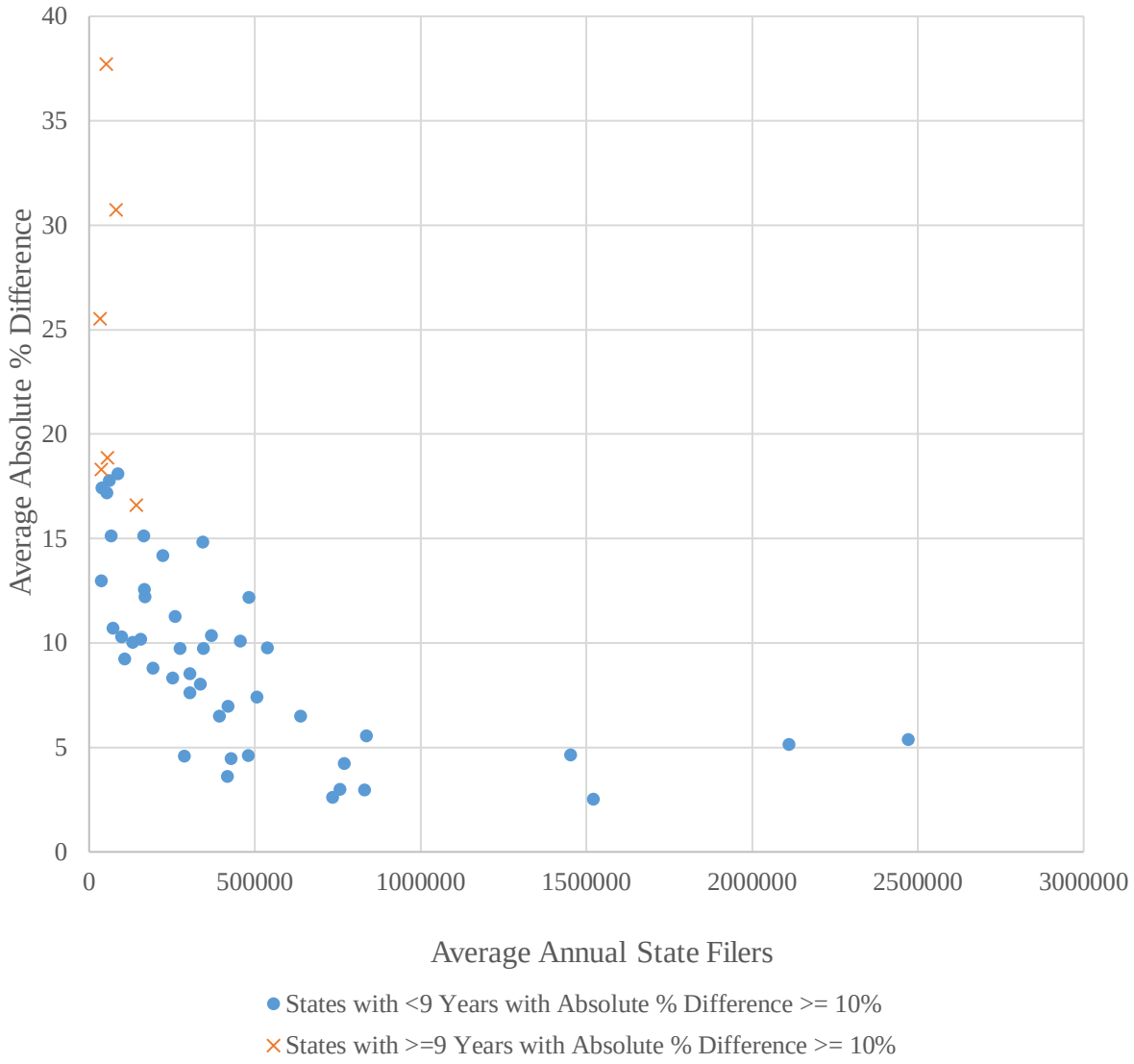


Figure A4: Average Absolute Percent Difference Between Public-Use SOI and Confidential IRS SOI EITC State Filers



Appendix Table A1: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer, Dropping States with Persistently Large Errors (DE, DC, HI, VT, WV, and WY): *Single Filers with Children, 2+ Kids vs. 1 Kid, 1997-2008*

VARIABLES	(1)	(2)	(3)	(4)
	Y = EITC Filers/Potentially Eligible Population *Single Individuals with Children, Aged 21-64*			
State EITC	-0.25	0.08	-0.08	0.26
	(0.25)	(0.17)	(0.30)	(0.43)
2+ Kids	0.04	0.05	0.06	-0.68
	(0.07)	(0.06)	(0.07)	(1.04)
Share low-skilled	1.21***	1.39***	1.28***	2.26***
	(0.40)	(0.39)	(0.40)	(0.78)
State EITC×2+ Kids	0.63		0.33	0.14
	(0.40)		(0.53)	(0.57)
State EITC×Share low-skilled		6.53***	4.72	13.88**
		(2.33)	(3.28)	(6.88)
2+ Kids×Share low-skilled			0.09	-1.73
			(0.24)	(1.04)
State EITC×2+ Kids×Share low-skilled			0.15	-13.45
			(1.67)	(8.93)
State minimum wage	-0.24	-0.25	-0.25	-0.26
	(0.18)	(0.18)	(0.18)	(0.20)
Real maximum welfare benefit/1000, family size = 3	-0.09	-0.08	-0.08	-0.10
	(0.35)	(0.34)	(0.34)	(0.36)
State unemployment rate	-1.12	-1.14	-1.13	-1.02
	(1.36)	(1.32)	(1.34)	(1.32)
Fixed Effects				
State and Year FE	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y
Observations	1,220	1,220	1,220	1,220
R-squared	0.75	0.75	0.75	0.77

Appendix Table A2: Estimated State EITC Effects on EITC Participation Per Potentially Eligible Filer, SOI Data Error Correction: *Single Filers with Children, 2+ Kids vs. 1 Kid, 1997-2008*

	(1)	(2)	(3)	(4)
	Y= [EITC Filers in Public-Use Data/Potentially Eligible Population] - [(EITC Filers Public-Use Data - EITC Filers IRS SOI)/Total Filers IRS SOI])			
VARIABLES	*Single Individuals with Children, Aged 21-64*			
State EITC	-0.30	0.04	-0.01	0.59
	(0.27)	(0.19)	(0.39)	(0.53)
2+ Kids	0.24***	0.25***	0.25***	-2.64**
	(0.07)	(0.07)	(0.08)	(0.99)
Share low-skilled	1.37***	1.46***	1.37***	2.69***
	(0.45)	(0.44)	(0.48)	(0.89)
State EITC×2+ Kids	0.52		0.09	-0.36
	(0.44)		(0.66)	(0.62)
State EITC×Share low-skilled		7.29**	6.76	20.25**
		(2.96)	(4.85)	(8.58)
2+ Kids×Share low-skilled			0.15	-2.15*
			(0.25)	(1.19)
State EITC×2+ Kids×Share low-skilled			-0.11	-19.37
			(1.88)	(11.77)
State minimum wage	-0.25	-0.27	-0.27	-0.29
	(0.20)	(0.20)	(0.20)	(0.21)
Real maximum welfare benefit/1000, family size = 3	-0.07	-0.06	-0.06	-0.10
	(0.39)	(0.37)	(0.37)	(0.39)
State unemployment rate	-0.98	-1.04	-1.04	-0.95
	(1.59)	(1.54)	(1.54)	(1.51)
Fixed Effects				
State and Year FE	Y	Y	Y	Y
Kids-by-State FE and Kids-by-Year FE	Y	Y	Y	Y
Low-skilled-by-State FE and Low-skilled-by-Year FE	Y	Y	Y	Y
Kids-by-Skill-by-State FE and Kids-by-Skill-by-Year FE				Y
Observations	1,080	1,080	1,080	1,080
R-squared	0.75	0.75	0.75	0.77

Endnotes

[1] Even if it does, there might still be positive short-term effects, as evidence suggests that EITC eligible households increase consumption spending in the months that they are likely to receive their EITC refund (Barrow and McGranahan 2000).

[2] When an individual has positive unearned income, and AGI is above the kink point at which the EITC begins to phase out, the EITC is the minimum of the benefit based on their earned income or their AGI. This amounts to shifting in the downward-sloping lines in Figure 1 by the amount of unearned income, which can potentially eliminate the plateau region. See Weber (2016) for a discussion of the role of AGI in the EITC phase-out range – a distinction ignored in most descriptions of the EITC, which tend to describe the phase-out only in terms of earnings.

[3] The value of the beginning point (and hence the ending point) of the phase-out range for married taxpayers filing jointly was increased beginning in 2002. See http://www.taxpolicycenter.org/sites/default/files/legacy/taxfacts/content/PDF/historical_eitc_parameters.pdf (viewed October 11, 2016).

[4] In addition, a small number of EITCs have been introduced at a local level, including Montgomery County, Maryland, New York City, New York, and San Francisco, California.

[5] In 2015, out of the 26 states (including the District of Columbia) that offered an EITC, 22 were either partially or fully refundable.

[6] During the sample period, only two states did not express the state EITC supplement as a simple percentage of the federal EITC. In Minnesota, the state supplement percentage varies with income, so the average supplement amount is used (33 percent). In Wisconsin, the state supplement percentage depends on the number of children, so we use the supplement for families with two children (14 percent).

[7] Note that the percentages displayed in Figure 4 are much lower than estimates of EITC take-up in the research literature, which can be 75 percent or higher. For instance, Scholz (1994) matches SIPP data to individual income tax returns, and estimates that the EITC participation rate among those eligible ranges between 80 percent and 86 percent. Blumenthal et al. (2005) obtain the actual EITC claim information in

tax year 1988 using the IRS Taxpayer Compliance Measurement Program, and estimate rates between 69.4 percent and 74.3 percent. The difference is that our estimate is the ratio of federal filers to the potentially eligible population. Our potentially eligible population is much higher than an actual take-up estimate, such as in Scholz (1994), because we are not looking at imputed eligibility, but just household heads age 25-64. (In the next section, we discuss in greater detail that we do not want to use an imputed take-up rate for our analysis because the variables on which the imputation are based are endogenous.) If we instead compute filers per potentially eligible population we get much higher numbers that are consistent with these take-up rates (and indeed sometimes exceeds one, which can happen because the numerator and denominator do not come from the same data).

[8] We have no direct evidence of this. However, there is some evidence of state or local governments trying to encourage filing for the federal EITC. The San Francisco EITC we cited earlier (the Working Families Credit) is a quite explicit version of this. It is not formally a city EITC, but is a program designed to encourage families to apply for the federal EITC (and other federal benefits), by paying a one-time credit to families that qualify for and claim the federal EITC (for the first time). See http://www.icarol.info/ResourceView2.aspx?org=2339&agencynum=10610802 (viewed October 11, 2016) and Flacke and Wertheim (2006). And the state of California, in declaring a "California Earned Income Tax Credit Awareness Week," actively encourages residents to file for the state EITC in part because of federal credits "left on the table" (https://www.ca.gov/archive/gov39/2018/02/12/governor-brown-issues-proclamation-declaring-california-earned-income-tax-credit-awareness-week/index.html, viewed March 16, 2020).

[9] The dip in EITC participation in the late 1990s is likely associated with the pronounced decline in poverty from 1997 to 2000, from 13.3 percent to 11.3 percent. (See http://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-people.html, Table 2, viewed October 13, 2016.)

[10] Other possible explanations for low social program take-up include social stigma or high perceived economic costs of claiming (Bhargava and Manoli 2015). It is unlikely that social stigma is relevant to

the EITC, given that it is claimed through one's tax return, and hence participation is most likely unknown to employers or others. (Although through 2010 EITC recipients could choose to get their EITC in each paycheck, nearly all chose to take their payment as a lump sum at the end of the year, which may have been to avoid stigma effects.)

[11] For example, in 2008 the minimum gross income threshold at which one had to file a federal return was $8,950 for those under age 65 and filing singly, and $17,900 if both spouses were under age 65 and filing jointly (http://www.unclefed.com/IRS-Forms/2008/i1040gi.pdf, viewed July 18, 2017). For non-filing households with adjusted gross income below the filing requirements, potential EITC benefits can be substantial. For example, an EITC-eligible household with two children and a joint gross income just below $17,900 could potentially receive up to $4,824 in EITC benefits in 2008. See Figure 1.

[12] See https://www.ftb.ca.gov/individuals/faq/net/900_media.shtml (viewed August 9, 2016).

[13] Eissa and Hoynes (2004) find that federal EITC expansions led to a decline in labor force participation for married, secondary-earner women, and a slight increase in labor force participation for married, primary-earner men. But these could just reflect negative income effects that do not increase EITC participation.

[14] We focus on the extensive margin labor supply responses because they have the clearest implications for EITC participation. While a state EITC can also affect intensive margin labor supply decisions, these decisions do not affect federal EITC participation decisions (unless one reduces labor supply enough to become eligible).

[15] Note that there is also a literature on intensive margin labor supply effects. This research tends to find negative effects on hours of married mothers, but not evidence of hours reductions for single mothers (e.g., Meyer 2002; Eissa and Hoynes 2006).

[16] Again, while a tax credit is available for childless filers, the small credit offered is unlikely to induce a significant behavioral labor supply response.

[17] For the sample of single filers with children, estimates for the outcome of total federal tax filers per potentially eligible population are very similar to estimates for the outcome of EITC filers per potentially

eligible population, suggesting that for this group, filing for the EITC often occurred simultaneously with filing a federal tax return.

[18] The CPS ASEC is an annual survey of households that provides information related to work, program participation, income, demographics, and more. Individuals are typically surveyed in March and are asked about income and employment in the previous year.

[19] As mentioned previously, an estimate of EITC take-up would be based on actual eligibility (EITC filers per eligible filers). However, since we are interested in how state EITCs induce federal EITC participation through employment (as one channel), this measure would not be appropriate, as both EITC filing and eligibility would respond. Thus, while our potentially eligible measure overestimates the eligible population, it avoids any endogenous responses to changes in the state EITC that affect eligibility.

[20] The CPS ASEC potentially eligible population estimates are constructed using the family head's weight. The SOI tax filer estimates are constructed using the SOI sample weights.

[21] In the tax filer data, we define single to include individuals who reported their tax filing status as single, head of household (which requires the filer to be unmarried), or widowed. Additionally, since taxpayers filing as married filing separately cannot claim the EITC, we exclude these filers from the SOI sample, and we exclude from the CPS ASEC sample individuals who report being married, but spouse absent.

[22] These are available at http://www.socsci.uci.edu/~dneumark/datasets.html (viewed July 30, 2017).

[23] The state welfare data come from the Urban Institute's Welfare Rules Database (http://wrd.urban.org/wrd/query/query.cfm, viewed May 10, 2017.)

[24] It is important to note how the data years are combined. The CPS ASEC data are reported for each survey year. Each survey is given in March of the survey year, and asks about employment and income in the previous calendar year, but asks about demographic information for the current calendar/survey year. For example, data from survey year 2008 refers to employment in calendar year 2007, but demographic information in March 2008. Thus, for the employment specifications, the CPS ASEC data from the previous survey year are matched to SOI tax years and the corresponding policy data calendar years. In the EITC participation regressions, using the previous survey year's data is not appropriate,

because the demographic information is asked in March of that year. However, when determining the potentially eligible population based on children's age, it is possible that some children may not be counted properly. For example, an EITC qualifying child must be younger than 19 at the end of the tax year (December 31). So, if a child is 18 in the March 2008 survey, they would be counted as a qualifying child in tax year 2008, even if they turn 19 during that year (birthdays are not reported). To help account for this inconsistency, we take an average of the current and following survey years' potentially eligible population (and corresponding low-skilled population).

[25] There was a major increase in the generosity of the federal EITC between 1990 and 1996, especially for families with children, and a modest change increasing its generosity for families with three or more children in 2009 and married filers. Additionally, as discussed above, the value of the beginning point (and hence the ending point) of the phase-out range for married taxpayers filing jointly was increased beginning in 2002. See http://www.taxpolicycenter.org/sites/default/files/legacy/taxfacts/content/PDF/historical_eitc_parameters.pdf (viewed October 11, 2016).

[26] All share variables are coded from zero to one.

[27] These estimated magnitudes are broadly consistent with other findings. For example, Eissa and Liebman (1996) estimate the effect of the increase in the federal EITC in the 1980s. This was a fairly modest increase in the phase-in rate from 10 percent to 14 percent, which is a similar increase to that implied by a 10 percent state EITC supplement on the 34 percent to 40 percent federal phase-in rate that prevailed during our sample period. For difference-in-differences estimates based on less-educated mothers vs. less-educated non-mothers, they estimate an employment increase of 0.9 to 4.1 percentage points (see the summary in Neumark and Shirley, forthcoming).

[28] Note that the latter point is consistent with the positive (albeit insignificant) estimated effect of the *EITC*×*kids*×*low-skilled* interaction in columns 7 and 8.

[29] In Tables 3.A and 3.B there is not a negative estimated effect of the minimum wage on employment. This does not in any way contradict the existing literature, which focuses most often on teenagers or other

very low-skilled groups or industries.

[30] One might be concerned that because the participation rate and low-skilled share have the same denominator, there is the potential for positive division bias in the estimated regression coefficients of the low-skilled share variable. However, this bias should be transmitted to the main effect of the share low-skilled, not the interactions of this variable with the EITC or with *EITC*×*kids* interactions.

[31] The significant positive estimates on the unemployment rate for married filers may arise if a high unemployment rate causes secondary earners to leave the labor force, increasing EITC eligibility.

[32] The EITC participation effect in Table 4.B loads onto the *EITC*×*Share low-skilled* variable, while the employment effects in Tables 3.A and 3.B load onto the *EITC*×*Kids* interactions.

[33] We prefer this analysis to just including state-specific linear trends. First, there is a growing body of literature indicating that adding such trends, especially in short panels, can give misleading estimates of treatment effects, in part because the trends can pick up post-treatment effects that differ from a simple intercept shift. (Key examples include Meer and West (2016) and Goodman-Bacon (2018).) In contrast, leading effects can be more informative about whether policy changes are associated with prior changes or trends more generally. Second, because we are using disaggregated data, we are already estimating very saturated models that include interactions between kids and year, kids and state, low-skilled and state, low-skilled and year, and the triple interactions between these (kids-by-skill-by-state and kids-by-skill-by-year).

[34] Estimates for the other samples are available upon request. These estimates, too, were very robust to including leads.

[35] As anecdotal evidence, in response to the introduction of an EITC in California in 2016, a foundation called Golden State Opportunity (http://goldenstateopportunity.org/, viewed July 17, 2017) undertook extensive efforts to encourage residents to claim the credit – suggesting that, at a minimum, take-up is not immediate. (See also Guyton et al. 2016.)

[36] Again, results for the other samples, as well as other estimates described in this sub-section but not reported in the tables, are available from the authors upon request.

[37] It is also possible that states with different filing requirements would result in relatively more low-income households filing taxes prior to a state EITC, and thus fewer potential low-income households that could be induced to file because of a state EITC.

[38] We also found that the estimates for the sample of married filers with children are larger in magnitude (compared to Table 5), albeit still statistically insignificant (not reported in table).

[39] These results also help rule out the possibility that the federal EITC drives state EITC filing, although that seems unlikely to explain the evidence for our sample period regardless, because there is no variation in the federal EITC in our sample period. We cannot address this directly, however, because we have no data on state EITC filing.

[40] The IRS's SOI division takes a sample of federal tax returns filed each year. These data are not publicly available, but from this sample, the SOI division produces a smaller publicly available file known as the Public Use File (PUF). We are using the PUF data. These publicly available data contain state identifiers, designed to be nationally representative but not necessarily representative at the state level. Both the Office of Tax Analysis (OTA) and the Urban-Brookings Tax Policy Center (TPC) have worked on creating weights to make the data representative at the state level for their tax models (Fisher and Lin, 2015; Khitatrakun et al., 2016). However, these weights are not publicly available. Additionally, the OTA weights are based on the non-publicly available microdata from which the PUF are derived, and the TPC data do not cover most of our sample years.