Do EITC Expansions Pay for Themselves? Effects on Tax Revenue and Public Assistance Spending

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Abstract

This paper studies how behavioral responses to the Earned Income Tax Credit (EITC) affect the program's budgetary cost. The EITC encourages labor supply and increases income, thereby reducing public assistance payments to households and increasing taxes paid by households. These sources of revenue reduce the EITC's net cost. We use administrative Internal Revenue Service tax data linked to Current Population Survey data on enrollment in public assistance programs to estimate the EITC's net cost. The evidence from three decades of EITC policy expansions implies that the EITC decreases public assistance received by mothers and increases payroll and sales taxes paid. Our estimates suggest that the EITC has a self-financing rate of 87 percent, so that the EITC's true cost is only 13 percent of the "sticker price." Although the EITC is one of the largest and most important public assistance programs in the U.S., we show that the EITC is actually one of the least expensive anti-poverty programs in the U.S., costing taxpayers about half as much as the school lunch and breakfast programs.

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1. Introduction

A growing literature in economics is interested in evaluating the net cost of public policies when causal effects on tax revenue and interactions with other policies are accounted for. The Earned Income Tax Credit (EITC) is one of the U.S.'s most important anti-poverty programs, helping 28 million families at a cost of $73 billion in 2017. Although previous research has shown that the EITC improves outcomes for lower-income mothers and their children (discussed in section 2), the program's net cost to government and taxpayers is not well understood. This is the first paper to empirically estimate the EITC's impact on government revenue when behavioral responses to the program are accounted for.

Since the EITC requires that recipients work and thus has led many lower-income mothers to join the labor force, there is likely a subsequent effect on government revenue. Whether the EITC's net cost is more or less than the $73-billion "sticker price" is theoretically ambiguous and depends on whether these newly working mothers pay more taxes and whether the EITC is a complement or a substitute for other public-assistance programs. If the EITC increases the employment of lower-income mothers, this would increase payroll- and sales-tax revenue, decrease public-assistance spending, and lower the EITC's net cost.[1] However, if working mothers become eligible for public benefits that require a work history, such as unemployment (UI) and disability compensation, this would increase the EITC's cost.

Since lower-income households misreport their income in survey data (Blank and Schoeni, 2003; Meyer and Sullivan, 2003), it is important to have accurate administrative data to estimate the EITC's impact on earnings, tax credits, and taxes paid. We use newly available administrative data that links individuals in the Current Population Survey's Annual Social and Economic Supplement (CPS ASEC) to Internal Revenue Service (IRS) income tax returns. These linked data contain demographic details not available in tax data and accurate income information (Meyer et al., 2018), both of which are required to compute taxes paid and EITC received.[2] Our sample includes 1.2 million women, ages 18–64, over the years 1989–2016.

Our preferred identification strategy exploits variation in EITC eligibility—created by plausibly exogeneous federal and state EITC policy changes (discussed in section 2)—captured in the variable $MaxEITC$, equal to each household's maximum possible EITC benefits. $MaxEITC$ is determined by year, state, and number and age of children, and is

[1] These marginal tax rates are often over 50 percent and occasionally over 100 percent, when public assistance is accounted for (Mok, 2012; Kosar and Moffitt, 2017).

[2] We do not directly observe payroll or sales taxes paid or EITC benefits received; we calculate these outcomes from household traits and income, which requires linked tax-survey data. Unfortunately, we do not have administrative data on public assistance and these outcomes are self-reported.

independent of income and actual EITC eligibility, which are endogenous with socioeconomic status and our outcomes of interest. Using $MaxEITC$, we estimate the EITC's contemporaneous and longer-run effects using difference-in-differences and event-study approaches.

We first test whether $MaxEITC$ increases employment and earnings, since there may be little reason to expect effects on taxes and public assistance if labor supply is not affected. We find that each $1,000 increase in $MaxEITC$ increases average annual earnings by $558 (in 2017 dollars) and employment by 0.6 percentage points, reflecting a participation elasticity of 0.33. Although previous studies have estimated the EITC's effect on working women (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001), our data allow us to test the accuracy of studies relying on survey data or a single EITC policy change. We also provide some of the first evidence that EITC expansions after 2000 have continued to increase labor supply, though perhaps with diminishing marginal effects.[3]

Having found that the EITC increases labor supply, we turn to our main outcomes: testing how the EITC affects taxes paid and public assistance received, and then comparing this revenue to the EITC's cost. We find that a $1,000 increase in $MaxEITC$ increases EITC benefits received ($350), increases payroll and sales taxes paid ($61), and reduces public assistance received (-$242), largely due to decreases in welfare and public housing benefits. Although we do find increases in UI, we find much larger decreases in other benefits. For every $350 in EITC spending, government revenue increases by $303, an 87 percent self-financing rate. In other words, the EITC's net cost is only 13 percent of the "sticker price." Our results imply that the 2017 EITC provided $73 billion to lower-income families at a net cost of only $9.5 billion, costing the government about half as much as the school lunch and breakfast programs.

Our results contribute to a new literature that estimates how policies can help "pay for themselves," in a similar fashion as Brown et al. (2015) finds for Medicaid, Denning et al. (2017) finds for Pell Grants, Andresen and Havnes (2018) finds for childcare subsidies in Norway, and Michalopoulos et al. (2005) and Michalopoulos (2005) find for a Canadian welfare reform experiment.

$MaxEITC$ is one parameter of the EITC. Our results are robust to (1) using the phase-in rate at which the EITC subsidizes earnings, (2) using $MaxEITC$ or the phase-in rate as an instrument for EITC benefits or for earnings, and (3) a simulated-instrument approach that calculates the EITC benefits that a fixed sample of households would be eligible for in each year, implicitly capturing all EITC parameters and policy changes. Results are robust to various sets of controls; effects are concentrated among unmarried and lower-educated mothers;

[3] We find small negative effects among married mothers and large positive effects among unmarried and lower-educated mothers (as found by, e.g., Meyer and Rosenbaum (2001); Eissa and Hoynes (2004)).

and EITC expansions after 2000 continue to generate offsetting government revenue.

Our hypothesis requires that $MaxEITC$ is not associated with our outcomes of interest, except through increased labor supply and income. For example, if EITC expansions occur during economic expansions, and if the EITC appears to increase taxes paid, estimates may reflect not just EITC-led changes in female employment, but the impact of a strong economy. We account for this by: testing for pre-trends leading up to EITC expansions; comparing women with different numbers of children within each year and state; and controlling for state-by-year fixed effects. We discuss other possible confounders in section 3.1.

Our study does not directly account for several factors which may increase or decrease the EITC's net cost. Factors that increase the EITC's cost include: EITC payments made in error; payroll taxes paid back as Social Security benefits; and negative spillovers on lower-skilled workers.[4] Factors that decrease the EITC's net cost include: increasing labor supply and revenue effects over time; attenuated estimates on public-assistance reductions, since these self-reported outcomes are underreported in survey data (Meyer and Mittag, 2015); and evidence from previous research showing that the EITC improves health, decreases crime, and improves children's longer-run outcomes. We quantify these effects in section 5.8 and conclude that, overall, these factors lower the EITC's net cost even more.

Regarding potential EITC expansions today, our results show that, one, the EITC's net cost depends on the target population's labor-supply elasticity and level of public benefits, and two, the existing EITC largely pays for itself because lower-income mothers would be eligible for other programs in the EITC's absence. An EITC expansion for adults without children would likely increase labor supply and taxes paid among this group (discussed in section 6). As for public assistance, adults without children receive little welfare, food stamps, and public housing, but an increasing amount of disability insurance (DI) benefits (Autor and Duggan, 2006; Milligan and Schirle, 2017). Less DI spending and additional tax revenue would help pay for such an EITC expansion today.[5]

Hendren (2016) shows that estimating a policy's impact on revenue can be a sufficient statistic (Chetty, 2009a) for social welfare analysis. Hendren (2016) defines "fiscal externality" as the impact of behavioral responses to the EITC on government budgets and "marginal value of public funds" (MVPF) as the ratio of a policy's marginal benefits to marginal costs. In section 7, we calculate the EITC's MVPF to be \$4.20–\$5.30, suggesting that each \$1 of EITC spending generates over \$4 in social value. Since the MVPF of the top marginal income tax rate is \$1.50–\$2 (Hendren, 2016), a social-welfare-maximizing government could

[4] Another cost-effective aspect of the EITC: only 0.3 percent of the EITC budget goes to administrative costs, less than Medicaid, SNAP, public housing, and SSI (4.6, 5.4, 9.1, and 7.2 percent) (Greenstein, 2012).

[5] Increased income may also decrease crime, drug-use and mortality, and improve health (see section 5.8).

increase the EITC—financed by raising the top marginal income tax rate—up to the point where the MVPFs were identical for the EITC and for top marginal tax rates. In section 7, we illustrate how the EITC impacts the utility of the distribution of workers by expanding the theoretical framework in Saez (2002).

The paper proceeds as follows: section 2 describes the EITC; section 3 discusses the empirical strategy; section 4 describes the data; section 5 discusses the results; section 5.7 simulates the effects over a mother's lifetime; section 6 discusses potential EITC expansions today; section 7 discusses implications for social welfare; and section 8 concludes.

2. EITC Background and Literature Review

The EITC is one of the most important anti-poverty programs in the U.S., pulling millions of people out of poverty and helping 28 million families, at a cost of $73 billion in 2017. The EITC is a refundable tax credit that provides an annual earnings subsidy to lower-income workers. EITC benefits are determined at the tax-filing-unit level and are a function of annual earnings, number and age of children, state of residence, and marital status. The EITC contains a phase-in region, where benefits increase with earnings; a plateau region, where benefits do not change with earnings; and a phase-out region, where benefits decrease with adjusted gross income. Figure 1 shows how the phase-in and phase-out slopes vary by number of children and how the plateau length varies by marital status for the 2017 EITC.

Federal EITC: The EITC began in 1975 as a 10 percent earnings subsidy that did not vary by state, marital status, or number of children.[6] In 1986, the phase-in rate was increased to 14 percent. The largest expansion occurred in the 1990s: in 1990, additional benefits were made available to parents with 2+ children; in 1993, a small credit was extended to adults without children; and between 1993 and 1996, the phase-in rate increased to 34 and 40 percent for households with 1 and 2+ children (a difference worth up to about $2,000). In 2002, the plateau region was extended for married couples to decrease the "marriage penalty."[7] Finally in 2009, additional benefits were made available to parents with 3+ children. Figures 2 and A.1 show the time-series variation in the maximum possible EITC benefits and the phase-in rate for households with 0, 1, 2, and 3+ children.

State EITCs: From 1986 to 2017, 26 state EITCs were created, which generally top-up federal EITC benefits by a fixed fraction, ranging from 3.5 to 44 percent and worth from $220 up to $2,800. State EITCs exist all over country and have been enacted by both Democrats

[6] See Bastian (2018a) for more about the 1975 EITC and its impact on working mothers.

[7] A "marriage penalty" occurs when a couple's tax bill is higher if they are married and file taxes jointly than if they filed taxes individually.

and Republicans, as encouraging work and helping the poor has wide appeal. Figure 4 shows what years states introduced their EITC and the 2013 EITC rate. Figure A.2 shows a histogram of state EITC rate changes; fourteen states have changed the rate at least three times. There is substantial EITC variation over time, both within and across states.

Maximum federal EITC benefits grew from $1,700 in 1975 to $6,300 in 2017 (see Figure 2). In 2017, federal plus state EITC benefits were worth up to $9,100 for households (with 3+ children) earning between about $14,000 and $24,000. Households with 0, 1, and 2 children were eligible for a maximum of about $500, $5,000, and $8,000 in total EITC benefits.

EITC Research: Previous research shows that the EITC has numerous benefits for lower-income families. Specifically, the EITC increases maternal employment (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001; Bastian, 2018a), increases earnings (Dahl et al., 2009), improves health (Evans and Garthwaite, 2014), decreases poverty (Hoynes and Patel, 2015), decreases criminal recidivism (Agan and Makowsky, 2018), and helps children of EITC recipients by improving health (Hoynes et al., 2015; Averett and Wang, 2015), test scores (Chetty et al., 2011; Dahl and Lochner, 2012), and longer-run outcomes like educational attainment (Manoli and Turner, 2018; Bastian and Michelmore, 2018) and employment and earnings (Bastian and Michelmore, 2018). The EITC also has small heterogeneous effects on fertility (Baughman and Dickert-Conlin, 2009; Bastian, 2018b) and marriage (Ellwood, 2000; Dickert-Conlin and Houser, 2002; Michelmore, 2015; Bastian, 2018b), and may lead to lower pre-tax wages of low-skill workers (Leigh, 2010; Rothstein, 2010). See Nichols and Rothstein (2016) and Hoynes and Rothstein (2016) for recent EITC literature reviews.

Surprisingly, little is known about the EITC's impact on government budgets. If the EITC increases employment and income, mothers receiving the EITC will pay more payroll taxes—and receive less public assistance—than they would without an EITC. Increased income for lower-income families—with high marginal propensity to consume—will also increase consumption and sales taxes paid. In this paper, we account for these factors and estimate the EITC's net cost, both contemporaneously and in the longer run.

3. Conceptual Framework and Empirical Strategy

Our goal is to estimate the effect of EITC expansions on the government's net budget:

$$\frac{\partial TotalGov}{\partial EITC} = \frac{\partial (Gov - EITC)}{\partial EITC} = \frac{\partial Gov}{\partial EITC} - \frac{\partial EITC}{\partial EITC} = \frac{\partial Gov}{\partial EITC} - 1 \equiv \eta - 1. \quad (1)$$

We define η to be the effect of EITC spending on the government's budget, excluding EITC spending. To fix ideas, if EITC spending has no other effect on government budgets, then

$\eta = 0$ and the cost of a dollar of EITC spending is a dollar. But if the EITC generates offsetting government revenue and completely "pays for itself," then $\eta = 1$.

We assume a unitary government that has a budget equal to tax revenue minus spending on welfare, the EITC, and everything else: $TotalGov = Gov - EITC = Taxes - Welfare - Other - EITC$. Even with no labor-supply response to the EITC, when families spend EITC benefits, they pay more sales taxes.[8] Even if this amount is small, $\eta > 0$ since $\partial Taxes/\partial EITC > 0$. If the EITC increases labor supply and earnings, then households will pay even more sales taxes, pay more payroll taxes, and become eligible for less welfare benefits. As a result, $\eta >> 0$ since $\partial Taxes/\partial EITC > 0$ and $\partial Welfare/\partial EITC < 0$.[9]

Previous research (see section 2) shows that the EITC: (1) improves health and decreases criminal recidivism, suggesting that $\partial Other/\partial EITC < 0$ due to less government spending on public health and incarceration; and (2) improves children's longer-run outcomes, increasing future tax revenue and decreasing future public assistance spending. The present value of these factors implies that $\eta \to 1$ and perhaps even $\eta \geq 1$. As the EITC's net cost falls, so does the amount of tax revenue required to fund an EITC—and the distortions associated with raising tax revenue—and a government with lower and lower redistributive preferences would choose to have an EITC and help low-income families.

3.1. Testing the Exogeneity of State EITCs

We now consider whether or not to use state EITCs in our main analysis. State EITC expansions would yield more identifying variation, but using state EITCs requires that they are not correlated with tax revenue or public assistance usage. For example, if state EITCs tend to expand during economic expansions, then estimates of government revenue on state EITCs would also reflect economic conditions, not just EITC-led increases in employment.

In Table A.1, we test whether state EITCs are correlated with state welfare policy, minimum wage, GDP, employment rate, top income tax rate, and sales tax rate. The dependent variables in columns 1–4 and 5–8 are two measures of state EITCs: the state EITC rate (as a fraction of the federal EITC) and the maximum possible state EITC benefits. Columns 1–2 and 5–6 use the sex contemporaneous variables; columns 3–4 and 7–8 also use one-year leads of these variables. Columns 2, 4, 6, and 8 control for state and year fixed effects (FE) and columns 1, 3, 5, and 7 do not. Across these specifications, we find some evidence that minimum wage and employment, sales tax, and income tax rates are associated with higher state EITCs. The six—or twelve—variables are marginally jointly significant with

[8] Barrow and McGranahan (2000) and Goodman-Bacon and McGranahan (2008) find that EITC refunds often go towards taxable durable goods purchase (discussed in Table C.2).

[9] η is a function of public assistance generosity and take-up rates, among other things.

state and year FE (p-values 0.22, 0.11, 0.18, and 0.06 in columns 2, 4, 6, and 8) and jointly significant without state and year FE (p-values < 0.01 in columns 1, 3, 5, and 7).

These estimates are consistent with state EITCs expanding during economic expansions or with raising other tax rates.[10] Since some state policies and economic conditions are correlated with state EITC expansions, we do not include state EITCs in our main analysis and we control for these state-level factors throughout the analysis.[11] Ultimately, this decision may not make a big difference, since Table A.2 shows that federal, state, and federal plus state EITC expansions all appear to increase women's labor supply.

3.2. Defining the Treatment Variable, *MaxEITC*

We combine three decades of federal EITC expansions into the variable $MaxEITC$, equal to the maximum possible EITC benefits (in 2016 $) that a family could receive given the year and number and age of children.[12] $MaxEITC$ captures plausibly exogenous policy variation and is independent of income and actual EITC receipt, which are associated with socioeconomic status and our outcomes of interest. Previous studies have used $MaxEITC$ (e.g., Hoynes et al. (2015), Hoynes and Patel (2015), Bastian and Michelmore (2018)) to estimate the EITC's effect on lower-income families. The mean and standard deviation of $MaxEITC$ are $2,272 and $2,155 (Table 1). Figures A.3 and A.4 show how the distribution of $MaxEITC$ varies by number of children and varies over time.

Figure 2 shows the time-series variation in $MaxEITC$ for households with 0, 1, 2, and 3+ children. Figure 3 plots the residual variation from the regression of $MaxEITC$ on the full set of controls (discussed in section 4). Averaging residuals within each year-by-number-of-children bin, Figure 3 shows that the residual-variation trends look similar to the unadjusted $MaxEITC$ trends in Figure 2, suggesting that variation in $MaxEITC$ is largely exogenous and cannot be explained by trends in individual- or state-by-year-level controls.

The largest EITC policy change occurred in the 1990s; many studies compare women with 0, 1, or 2+ children, before and after this EITC expansion, to identify various outcomes (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001). Our empirical strategy of using $MaxEITC$ is a generalized difference in differences that implicitly nests this approach.

$MaxEITC$ is one parameter of the EITC. If responses to the EITC occur primarily on the extensive margin (as most evidence shows (Meyer, 2002)), $MaxEITC$ will do a good job of capturing the employment incentives of the EITC, as will the EITC's phase-in rate, which

[10] Unlike the federal government, states generally have to balance budgets each year, so an EITC expansion may be paired with revenue-generating policies.

[11] Hoynes and Patel (2015) also finds that state EITCs expand during "strong labor markets."

[12] The R-squareds from regressions of $MaxEITC$ on number of children FE or year FE shows that 73 and 13 percent of the variation in $MaxEITC$ can be explained by number of children and year FE.

we also use. However, $MaxEITC$ may not capture intensive margin incentives and will not reflect some policy changes, such as extending the EITC's plateau or phase-out regions. We implicitly capture all EITC parameters and policy changes using a simulated-instrument approach that calculates EITC benefits for a fixed sample of households.

3.3. Outcomes of Interest

Our goal is to calculate the EITC's net cost by estimating how EITC expansions affect EITC benefits, taxes paid, and public assistance received. We first test whether $MaxEITC$ increases women's labor supply (as many previous studies have found).[13] Increases in labor supply and earnings motivate why we expect the EITC to affect taxes and public assistance.

EITC Benefits: We expect a positive relationship between $MaxEITC$ and actual EITC benefits received for two reasons: one, if the EITC encourages women to begin working, then these newly working women will start receiving EITC benefits; two, as $MaxEITC$ increases, women already working and receiving the EITC will be eligible for more benefits. We do not have the IRS EITC recipient data or observe actual EITC benefits, but we have administrative data on earnings and tax-filing status, which Jones and Ziliak (2018) shows enable accurate imputation of EITC benefits.

Taxes Paid: We look at payroll, sales, and unemployment taxes. The payroll tax rate is 15.3 percent, split in half between the employer and the employee, though the incidence falls mostly on workers (Gruber, 1997; Deslauriers et al., 2018). We calculate payroll taxes using a tax simulator, and we discuss in section 5.8 how to value payroll taxes since they are often paid back as Social Security and Medicare benefits. We calculate sales taxes in Table C.2 using annual state sales tax rates and decomposing the spending of lower-income households (out of earnings and, separately, out of EITC benefits) into taxable and non-taxable goods. Finally, we calculate federal and state unemployment taxes from annual state information on the tax rate and the amount of wages subject to the tax. Complete details for calculating each tax are discussed in Appendix C.

Public Assistance Received: We look at self-reported welfare,[14] food stamps, public housing,[15] disability and unemployment insurance compensation,[16] Supplemental Security Income (SSI), and workers' compensation benefits. Because we do not have administrative

[13] For example, Dickert et al. (1995), Eissa and Liebman (1996), Meyer and Rosenbaum (2001), Grogger (2003), Hotz and Scholz (2006), Eissa et al. (2008), and Bastian (2018a).

[14] Welfare refers to Aid to Families with Dependent Children (AFDC) before 1996 and Temporary Assistance to Needy Families (TANF) after 1996.

[15] Increased earnings while on public housing could decrease government spending when the number of units is fixed, but not for housing vouchers where the budget is fixed. However, if households lose public housing eligibility, benefits would go to a family on the waitlist and government spending would not change.

[16] UI benefits require working at least one quarter in the previous year and being laid off by an employer.

data on public assistance, these estimates may be attenuated since these outcomes are known to be under-reported in survey data (Meyer and Mittag, 2015).

3.4. Estimating Equations

We use equation (2) to estimate the EITC's average effect on outcomes discussed above.

$$Y_{ist} = \alpha_0 + \alpha_1 MaxEITC_{g(i),t} + \alpha_2 X_{ist} + \gamma^1_{st} + \epsilon_{ist} \tag{2}$$

Equation (2) is a generalized difference-in-differences approach. $MaxEITC$ is a function of year and number of children and is in \$1,000 units (in CPI-adjusted 2016 \$). α_1 measures the effect of an additional unit of $MaxEITC$ on each outcome Y_{ist}. State-by-year FE are denoted by γ^1_{st}. Individual-level controls, annual state-level factors, and state-specific linear time trends are in X_{ist}. ϵ_{ist} is an idiosyncratic error term. Standard errors are robust to heteroskedasticity and clustered at the state level to address serial correlation within a state over time (results are very similar when clustered at the level of treatment: year times number of children). We use CPS ASEC person weights for all estimates.

We also test for heterogeneous effects with equations (3) and (4), since the EITC has larger effects on unmarried and lower-educated mothers (Eissa and Hoynes, 2006).

$$Y_{ist} = \beta_1 MaxEITC \times Married_{ist} + \beta_2 MaxEITC \times Unmarried_{ist} + \beta_3 X_{ist} + \gamma^2_{st} + \epsilon_{ist} \tag{3}$$

$$Y_{ist} = \delta_1 MaxEITC \times LowerEd_{ist} + \delta_2 MaxEITC \times HigherEd_{ist} + \delta_3 X_{ist} + \gamma^3_{st} + \epsilon_{ist} \tag{4}$$

4. Linked CPS-IRS Data and Tax Simulator

We link the 1990, 1995, 1996, and 1998–2017 CPS ASEC to Form 1040 individual income tax returns, using an internal Census Bureau dataset containing a protected identification key (PIK), which maps to a unique Social Security Number (SSN).[17] The CPS ASEC is administered in March and asks questions about the preceding tax year. Upon linking datasets, we replace self-reported income, earnings, and marital status with the 1040 values whenever

[17] 1991–1994 and 1997 tax data do not have a PIK and cannot be linked. In 2006, the ASEC stopped collecting SSNs and probabilistic matching is used (based on name, address, date of birth, etc.) to create PIKs (Layne et al., 2014). Data are compared against a master file of all known addresses by name and date of birth, leading to CPS PIK rates around 90 percent. All personally identifying information is removed for research purposes. Appendix D shows PIK rates over time. Table D.2 shows estimates using a selection-correction model, weighting individuals by the probability that they do not have a PIK.

possible, which reduces measurement error.[18] We use survey data for observations without a 1040. Since tax data report household-level income, we capture individual earnings by assigning the full amount of household earnings to single and head of household filers, and by splitting the amount for married filers in the same ratio as their self-reported CPS earnings.[19] Since this may introduce measurement error, we also run household-level regressions where we do not split up earnings (Table A.14).

The sample consists of 1.2 million women 18–64 years old who are not child dependents, regardless of whether they or their spouse filed a 1040. We use a wide age range to estimate the overall effect of the EITC on government budgets. We also run analysis using the sample of all households, to capture potential effects on men or spillovers.

Tax Simulators: The Bakija tax simulator calculates various state and federal taxes paid and credits received—including EITC benefits—using dozens of input variables (e.g., income, number of children, and filing status). We identify tax-filing units based on family traits reported in the CPS (details in Appendix C). We would not need a tax simulator if the 1040 data had the EITC refund (it does not) and if EITC take-up was 100 percent. Although we do not observe actual EITC benefits, Jones and Ziliak (2018) do, and they find that EITC payments calculated using the CPS-IRS data and Bakija's tax simulator are very close to actual EITC payouts reported in the IRS EITC recipient files (and much more accurate than payments calculated from survey data, because of misreported income).[20]

Summary Statistics: Table C.1 describes the variables used in the analysis and whether they are derived from federal and state policy, the CPS, IRS Form 1040, or the tax simulator. Table 1 shows summary statistics for these variables. Women in the sample average 41.1 years old and have 0.81 children; 42 percent have a high school degree or less; 58 percent are married; 20 percent are nonwhite; and 74 percent work and average 34.1 annual work weeks, 27.4 weekly work hours, and $26,000 and $58,000 in individual and household annual earnings (in 2017 dollars). Women receive $407 in EITC benefits; pay $3,689, $613, and $257 in payroll, sales, and unemployment insurance taxes; and receive $1,111 worth of public assistance, broken down into welfare ($98), public housing ($206), SNAP ($308), DI ($95), SSI ($191), Workers Comp ($48), and UI ($166).

Control Variables: For each outcome, we show estimates using various sets of controls. In Tables A.4, A.6, A.7, and A.8: column 1 controls for number of children fixed effects

[18] Table A.3 crosswalks labor supply results using: CPS data; CPS data with administrative marital status; CPS data with administrative earnings; and CPS data with administrative marital status and earnings.

[19] For brevity, "CPS ASEC" and "CPS" are used interchangeably throughout.

[20] The Bakija calculator produces similar estimates of tax liability and EITC benefits as NBER's TAXSIM (Jones and Ziliak, 2018). Also, we are not able to export the CPS-IRS data out of the U.S. Census to run TAXSIM. Complete details here: https://web.williams.edu/Economics/wp/BakijaIncTaxCalcDoc.pdf.

(FE); columns 2–4 add controls for year and state FE; column 5 controls for education, race, marital status, an age cubic, and having a child under 5; column 6 adds interactions between marital status and education, with year, state, and number of children FE; and column 7 controls for state-by-year economic conditions and policies (from section 3.1), and linear state time trends. Column 7 contains our preferred set of controls and is used throughout the analysis, unless otherwise specified. In columns 8–10, we show that results are robust to state x number of children FE, state x year FE, and a more flexible accounting of welfare reform: interacting 7 state-welfare variables with unmarried and low education.

5. Results

5.1. The EITC Increases Labor Supply and Income

We first test whether EITC expansions increase labor supply. Previous research has found that the EITC does increase maternal labor supply, but our data allow us to test the accuracy of these studies, many of which rely on survey data or a single EITC policy change. Table 2 columns 1, 3, 5, and 7 show that every $1,000 increase in $MaxEITC$ increases average annual weeks worked (0.60), weekly work hours (0.49), employment (0.6 percentage points), and annual earnings ($558).[21] Results represent percent increases of 1.8, 1.8, 0.8, and 2.1 and are robust to alternate sets of controls (Table A.4) and to defining $MaxEITC$ as the maximum possible federal, state, or federal plus state EITC (Table A.2).[22] Table A.3 crosswalks the results from using just the CPS to using the linked data. Results imply a participation elasticity of 0.33 (0.14), calculated as the change in log employment rates divided by the change in the log net-of-tax-and-transfer income (following Chetty et al. (2012, Apx. B)).[23]

Table 2 columns 2, 4, and 6 use equation (3) to test for—and find—large positive effects among unmarried women, and null or small negative effects among married women, consistent with previous research (Meyer and Rosenbaum, 2001; Eissa and Hoynes, 2004; Yang, 2018). For married women, a $1,000 increase in $MaxEITC$ decreases annual work weeks (-0.33), weekly work hours (-0.26), and employment (-1.4 percentage points). The EITC has a work disincentive for some secondary earners since benefits are based on household earnings. For unmarried women, estimates of weeks, hours, and employment are large and positive: 2.75, 2.22, and 5.2 percentage points. Earnings estimates are also significantly

[21] Estimates are smaller than EITC studies that focus on younger women (Hoynes et al., 2015; Bastian and Michelmore, 2018); age is negatively associated with EITC response (Bastian, 2018a, Table A.4).

[22] A log-log specification yields estimates of 0.23, 0.21, and 0.74 for weeks worked, hours worked, and earnings plus EITC benefits (Table A.13).

[23] Using estimates and means in Tables 2 and 4: [log(.736+.006)-log(.736)]/[log(25,170-4,544+1,111+444+350-242-110+558)-log(25,170-4,544+1,111+444)]=0.328. Similarly, we calculate an earnings elasticity of 0.6.

larger for unmarried women ($795 vs $455). For each outcome, we find the largest effects among lower-educated unmarried women.[24]

$MaxEITC$ is one parameter of the EITC; results are robust to using the EITC's phase-in rate (Table A.2) and a simulated instrument (SI) approach that implicitly captures all EITC parameters and policy expansions, while also eliminating endogenous decisions about household income and family structure (Currie and Gruber, 1996; Bulman and Hoxby, 2015; Pilkauskas and Michelmore, 2018). We construct SIs by (1) using the 1989 CPS (the first year in our sample) and calculating the EITC benefits that households would be eligible for in each year between 1989 and 2016;[25] (2) collapsing average EITC benefits into (state x year x number of kids) and (year x number of kids) bins, using CPS weights and federal or federal plus state EITCs; and (3) merging these SIs into the main sample. In Table 3, we estimate equation (2), replacing $MaxEITC$ with a SI, and find that across each of the four SIs, a $1,000 in simulated EITC benefits increases weeks worked (1.6 to 1.7), work hours (1.6 to 2.0), employment (0.7 to 2.0 percentage points), and earnings ($1,600 to $2,900).

Some argue that the EITC receives too much credit for increasing women's labor supply since the largest EITC expansion occurred in the 1990s, just after welfare reform (Mead, 2014, 2018). We disentangle these two policies by (1) flexibly controlling for welfare reform[26] and (2) testing the EITC's impact on labor supply before and after 1998. Table A.12 shows that the EITC increased labor supply before and after 1998, and if anything, the estimates after 1998 are larger.[27] Our estimates suggest that the EITC is responsible for a third of the 1990s increase in maternal employment.[28]

Finally, Table 2 columns 9–10 show that a $1,000 increase in $MaxEITC$ increases average EITC benefits by $350, with larger effects on unmarried than married women ($529 vs. $272).[29] EITC benefits increase for two reasons: those already working and receiving EITC benefits will receive more, and newly working women will start receiving EITC benefits.

[24] Table A.5 shows (1) similar effects when the sample is restricted to unmarried women and (2) largest effects among lower-educated unmarried women: 3.12 weeks, 2.53 hours, and 0.063 employment.

[25] We keep household traits constant and CPI-adjust 1989 earnings and income into 1990–2016 values.

[26] We control for welfare reform using 21 state-by-year variables: the maximum welfare available for a family with 1–4 children; when states introduced time limits; when time limits began to bind; whether states had a time limit; and these seven variables interacted with single and low education (Table A.4 column 8).

[27] We use equation (3), but replace $Married$ and $Unmarried$ with $Pre1998$ and $Post1998$. We find similar results interacting $MaxEITC$ with years before and after state welfare time limits begin to bind.

[28] Calculated as: (estimate of 0.6) x (1990s change in average maternal $MaxEITC$: 4.5-1.7) / (1990s change in maternal employment rate 0.77-0.72) = 0.33. Meyer and Rosenbaum (2001) finds that the EITC is responsible for about 60 percent of the 1990s increase in working mothers, though our estimate may be smaller because our sample includes older women up to age 64.

[29] $MaxEITC$'s impact on EITC benefits depends on where in the EITC schedule households are. Households in the EITC's phase-in, plateau, phase-out, and beyond-phase-out regions (see Figure 1), a $1,000 increase in $MaxEITC$ increases benefits by about $550, $950, $500, and $0 (with or without controls).

At a cost of $350 per woman, government spending on the EITC increased female employment by 0.6 percentage points and average annual earnings by $558.[30] Next, we examine how the EITC's per-woman cost of $350 changes when we account for changes in taxes paid and public assistance received.

5.2. Does the EITC Increase Various Sources of Tax Revenue?

Perhaps as an unintended consequence of the EITC, increased employment may increase payroll and unemployment taxes paid to the government, and higher income—and EITC benefits—could increase consumption and the sales taxes that these households pay. Even though many EITC recipients pay no federal income tax, we expect 20–25 percent of an EITC recipient's earnings to be paid in taxes, since payroll, sales, and unemployment tax rates are 15.3, 1–8, and 1–2 percent. From the earnings and EITC estimates in Table 2 ($558 and $350), we expect a $1,000 increase in $MaxEITC$ to increase taxes paid by around $100. (We decompose taxes into federal and state components in section 5.5.)

In Table 4 column 1, we use equation (2) and the sum of payroll, sales, and unemployment taxes paid as the outcome. We find that each $1,000 increase in $MaxEITC$ increases average taxes paid by $95 (or 2 percent), suggesting that a contemporaneous increase in taxes paid offsets 31 percent of the EITC's per-woman cost ($350) to government.[31] We provide intuition for this estimate by plotting the residuals—averaged into year-by-number-of-children bins—from a regression of taxes paid on the full set of controls: Figure A.5 shows that the trends in residuals follow the time-series trend in $MaxEITC$ (Figure 2).

Since unmarried women have larger labor supply responses to the EITC, they should also have larger increases in taxes paid. We test for this using equation (3) in Table 4 column 2 and find that a $1,000 increase in $MaxEITC$ increases taxes paid by $152, suggesting that tax revenue offsets 29 percent of the per-unmarried-woman's cost of the EITC ($529). The effect on married women is statistically smaller $69.

In Table A.9, we decompose taxes paid into payroll, sales, and unemployment (UI) taxes. We find that each $1,000 increase in $MaxEITC$ increases average payroll, sales, and UI taxes by $68, $26, and $0.2.[32] Of course, payroll and UI taxes are generally paid back as Social

[30] There were about 95 million U.S. women 18–64 in 2016 and average $MaxEITC$ was $2,200, implying aggregate federal EITC benefits of $65 billion, close to the actual number of $73 billion. Any difference between these two numbers would be due to the difference between EITC eligible households that do not take up their benefits and EITC payments made in error; and EITC benefits received by single male households not in our sample (Meyer (2010) estimates they receive about 8 percent of total EITC benefits).

[31] This may be an underestimate of the real value since (1) local sales taxes are not accounted for; (2) most of these taxes are paid in the year prior to receiving EITC benefits, and have a slightly higher present value.

[32] Tax results are all robust to alternate sets of controls (Table A.6); are larger among unmarried women ($104, $44, and $4); and are marginally significant among married women ($52, $18, and -$2). 95 million

Security (SS) benefits and UI benefits; one approach would be to assign a zero present value to these taxes. However, for a retired individual with low income, every dollar of SS income crowds out 50 cents of Supplemental Security Income (SSI) that the government would have otherwise spent.[33] Regarding UI taxes, we observe UI benefits in the next section and find that these two cancel out. These factors reduce the present value of the payroll-tax estimate from \$68 to \$34, and the overall taxes-paid estimate from \$95 to \$61.[34]

In addition to estimating the reduced-form effect of $MaxEITC$ on taxes paid, we use $MaxEITC$ as an instrument for earnings and for EITC benefits. OLS will do a better job of estimating the population average effect, while an IV captures the local average treatment effect from compliers and will scale up the OLS estimates. Table 5 shows that the first stage is strong—as would be expected from Table 2—and shows that a \$1,000 increase in earnings leads to \$259 in taxes paid and a \$1,000 increase in EITC benefits leads to \$1,270 in taxes paid (reflecting the labor-supply response associated with receiving the EITC).

5.3. Does the EITC Decrease Public Assistance Usage?

We now test whether the EITC is a complement or a substitute for other public programs. Previous evidence shows that the EITC reduced usage of some benefits, including cash welfare, in the 1990s (Grogger, 2003, 2004; Hoynes and Patel, 2015). We test the EITC's effect after the 1990s and on various types of public assistance.

Based on the earnings estimates in Table 2, we expect each \$1,000 increase in $MaxEITC$ to reduce public assistance benefits received by around \$200, since (1) each dollar earned by a low-income parent reduces TANF, SNAP, and public housing benefits by around \$0.30 (Nichols and Kassabian, 2012; Dean, 2017; Center on Budget and Policy Priorities, 2017) and (2) take-up rates for these three programs are around 50, 60, and 10–20 percent (Currie, 2004). On the other hand, newly working mothers may also become eligible for unemployment and disability insurance benefits, which require a work history. As a result, the overall effect of the EITC on public assistance spending is theoretically ambiguous.

In Table 4 columns 3–6, we use public assistance received as the outcome, which includes cash welfare, food stamps, public housing, disability and unemployment insurance benefits, supplemental security income, and workers compensation. We find that each \$1,000 increase in $MaxEITC$ decreases average public assistance received by \$242, suggesting that a contemporaneous decrease in public assistance spending offsets 69 percent of the EITC's

women and an average $MaxEITC$ of \$2,200 in 2016 imply that \$14.2 billion in annual payroll taxes can be attributed to the EITC, which constitutes about 1.8 percent of total payroll taxes in 2016 (payroll taxes totaled almost \$800 billion and about 24 percent of total federal tax receipts).

[33] Federal SSI was worth up to \$9,000 in 2018 and most states top-up that amount (see Table C.1).

[34] In section 5.7, we simulate the EITC's cost over a woman's lifetime with alternate payroll-tax valuations.

per-woman cost ($350) to the government. We provide intuition for this estimate by plotting the residuals from a regression of public assistance on the full set of controls: Figure A.6 shows that the trends in residuals follow the time-series trend in $MaxEITC$ (Figure 2). We also find that $1,000 in $MaxEITC$ decreases the probability of receiving any benefits by 0.5 percentage point (or 3 percent).[35] Public-assistance results are robust to alternate sets of controls (Tables A.7 and A.8) and may be attenuated since public assistance is underreported in CPS survey data (Meyer and Mittag, 2015).[36]

Since unmarried women have larger labor supply and taxes-paid responses to the EITC, they should also have larger decreases in public assistance usage. We test for this in Table 4 columns 4 and 6 and find that a $1,000 increase in $MaxEITC$ decreases public assistance received by unmarried women by $844 and decreases the probability of receiving any public assistance by 3 percentage points (or 12 percent). Less public assistance spending completely offsets the EITC's per-unmarried-woman cost ($529).[37] For married women, the estimates are small and positive: $21 and 1 percentage point.

In Tables A.10 and A.11 we decompose public assistance into sub-components. Table A.10 columns 1, 3, 5, 7, and 9 show that a $1,000 increase in $MaxEITC$ decreases average welfare (-$259), public housing (-$24), and DI plus SSI (-$17), but increases food stamps ($56) and UI ($1).[38] It makes sense that UI increases for these newly working mothers, but it is unclear why the EITC would increase food stamps. Perhaps the regression is conflating the 2009 EITC expansion for families with 3+ children and the 2009 increase in food-stamps benefits and recipients, largely due to the Great Recession (Ganong and Liebman, 2018). Table A.11 shows that a $1,000 increase in $MaxEITC$ decreases the probability of receiving any welfare, public housing, food stamps, and DI plus SSI, by 2.8, 0.3, 0.2, and 0.1 percentage points and increases the probability of receiving UI by 0.1 percentage points.[39]

Among unmarried women, Table A.10 columns 2, 4, 6, 8, and 10 show that a $1,000 increase in $MaxEITC$ decreased welfare (-$764) and public housing (-$91), and had insignificant effects on food stamps ($4), DI and SSI (a smaller decrease of -$10), and UI (a larger increase of $12). In Table A.11, a $1,000 increase in $MaxEITC$ decreased the probability of receiving any welfare, public housing, food stamps, and DI plus SSI, by 8.4, 1.2, 2.6,

[35] A log-log specification shows an EITC-public-assistance-received elasticity of -0.45 (Table A.13).

[36] Meyer and Mittag (2015) find that 40, 60, and 35 percent of SNAP, TANF/SSI, and subsidized housing recipients report receiving zero benefits, and among households that report receiving public assistance, the value of SNAP, TANF/SSI, and subsidized housing is underreported by 6, 40, and 74 percent.

[37] This large response does not necessarily require a behavioral interpretation, since unmarried women trade off these benefits with $1,324 in earnings and EITC benefits (Table 4).

[38] UI taxes and UI benefits essentially cancel out (Tables A.9 and A.10).

[39] A $1,000 increase in $MaxEITC$ also decreases WIC benefits among all women, unmarried women, and lower-educated unmarried women ($5, $13, and $19; 0.2, 0.7, and 1.0 percentage points).

and (an insignificant) 0.2 percentage points, but increased UI by 0.3 percentage points.[40]

The largest EITC expansion occurred in the 1990s, around the time of welfare reform. We test whether the large negative association between the EITC and welfare is mechanical—instead of reflecting increases in labor supply—by (1) flexibly controlling for 21 state-by-year measures of welfare reform in Table A.7 (described in footnote 26); and (2) estimating the EITC's impact on public assistance before and after 1998. Table A.12 shows that estimates are significant at the 99 percent level—before and after 1998—and suggest that the EITC actually had a larger effect on public assistance after 1998.[41] Our results imply that the EITC is responsible for a third of the 1990s decline in welfare spending.[42]

We also use $MaxEITC$ as an instrument for earnings and for EITC benefits in Table 5. We find that a $1,000 increase in EITC-led earnings decreases public assistance by $117 and a $1,000 increase in EITC benefits decreases public assistance by $574 (reflecting the behavioral labor-supply response associated with receiving the EITC). Using the EITC phase-in rate instead of $MaxEITC$ yields similar IV results.

5.4. Diminishing Returns? Recent EITC Expansions

The EITC increased maternal employment in the 1970s (Bastian, 2018a), 1980s (Eissa and Liebman, 1996), and 1990s (Meyer and Rosenbaum, 2001), but there is little evidence on whether recent expansions continued to affect labor supply. The 2009 federal EITC expansion for families with 3+ children raised $MaxEITC$ from about $5,400 to $6,300. If recent expansions had a diminishing or null effect on labor supply—and on government revenue—then our findings that the EITC largely "pays for itself" may have been true over the last three decades, but may not hold for recent expansions or additional expansions today.

Less Parametric Approaches: In equation (5), we divide $MaxEITC$ into categorical quartile bins and estimate the EITC's impact over time and whether recent expansions have had diminishing marginal effects on labor supply and government revenue.[43]

$$Y_{ist} = \theta_0 + \sum_c \theta_1^c MaxEITC\ Quartile_{ist}^c + \theta_2 X_{ist} + \gamma_s^1 + \gamma_t^2 + \epsilon_{ist} \tag{5}$$

EITC expansions have consistently increased work weeks, work hours, employment, and earn-

[40] Among married women, these estimates are -$38, $5, $79, -$21, and -$3 in Table A.10; and -0.4, 0.1, 0.8, -0.1, and 0.1 percentage points in Table A.11.

[41] We find similar results before and after state welfare time limits begin to bind.

[42] Calculated by: (estimate of $89 in Table A.12) x (average $MaxEITC$ increase of $1,300) x (95 million women ages 18–64) = $11 billion decrease in welfare out of the 1990s $30 billion decrease.

[43] Results are similar using 5 or 6 bins. Bins means are 0, 506, 3351, and 5524. Equation (5) is identical to equation (2) except $MaxEITC$ is divided into four bins; the full set of controls is used, except children is linear instead of FE (otherwise 0 and 3+ children is collinear with the lowest and highest $MaxEITC$ bins).

ings (Figure 5). For each outcome, estimates suggest that the most recent EITC expansion continued to increase labor supply, although perhaps with diminishing marginal effects.[44]

Figures 6 and 7 use EITC benefits and government revenue as outcomes and show that the most recent EITC expansion in 2009 had a positive marginal effect on both outcomes.[45] That recent EITC expansions helped pay for themselves suggests that EITC expansions today might continue to do so as well.

EITC Expansions After 1998: We also test for diminishing marginal effects by interacting $MaxEITC$ with years before and after 1998 and using labor supply, EITC benefits, taxes paid, and public assistance received as outcomes. Table A.12 shows that the effect of the EITC on labor supply is statistically identical before and after 1998,[46] as is taxes paid ($60 and $81, before and after 1998), but the effects are *larger* after 1998 for EITC benefits ($308 and $333) and public assistance received (-$89 and -$181). Table A.12 Panel B restricts the sample to unmarried women and finds a similar pattern, though with larger point estimates. If anything, the EITC has had larger effects after 1998.

5.5. EITC's Costs and Benefits for State, Federal Government

Results so far assume a unitary government, but tax revenue and public assistance spending can be decomposed into state and federal components. For taxes: payroll taxes are paid to the federal government, sales taxes to state governments, and UI taxes are paid to both state and federal governments. For public assistance: welfare and UI is paid by state and federal governments, and the federal government bears almost all the cost of public housing, SNAP, SSI, DI, and workers' compensation (see Appendix C for program details).

Table 6 Panel A shows the effect of federal EITC expansions on the federal government's budget. Each $1,000 increase in $MaxEITC$ leads to $350 in federal EITC benefits; $68 in payroll tax revenue; -$158, -$24, and $56 in welfare, public housing assistance, and SNAP; and an insignificant -$17 in DI and SSI. For every $350 in EITC spending, the federal government recoups $212 in increased government revenue: a 61 percent self-financing rate.[47]

In Table 6 Panel B, we test whether the federal EITC affects state budgets. A $1,000 increase in $MaxEITC$ leads to $21 in state EITC spending, $31 in sales tax revenue, and $101 in welfare savings. For every $350 in federal EITC spending, state budgets net $111 (=-$21+$31+$101). Of course, not all states have an EITC: Among states that have ever

[44] We are not able to statistically rule out constant or diminishing marginal effects.

[45] Figure A.7 is a locally weighted, double-residual regression (Cleveland, 1979), showing that the EITC's effect is fairly constant and roughly linear (details in Figure A.7 notes).

[46] Estimates for annual weeks worked (0.41 and 0.52), weekly hours worked (0.38 and 0.45), employment (0.007 and 0.007), and earnings ($262 and $439) are similar before and after 1998.

[47] Calculated as: $212 =$68+$158+$24-$56+$17. The positive SNAP estimate is discussed in 5.3.

had an EITC, a $1,000 increase in $MaxEITC$ leads to $37 in state EITC spending and $168 in tax revenue and welfare savings (columns 4–6). Among states that never have an EITC, a $1,000 increase in $MaxEITC$ leads to $0 in state EITC spending and $72 in tax revenue and welfare savings (columns 7–8). States with EITCs gain more from the federal EITC, perhaps because state EITCs raise awareness and increase federal EITC take-up (Neumark and Williams, 2016). The EITC represents a transfer from federal to state governments.

5.6. Aggregate State-Level Outcomes

We use equation (6) to estimate the EITC's effect on aggregate state employment, tax revenue, tax filers, and welfare spending. Aggregate effects will reflect the EITC's effects on mothers, as well as any—positive or negative—spillovers on men and women without children. To carry out this state-level panel analysis, we require state-level variation, so we define $MaxEITC$ as the maximum possible state plus federal EITC.[48]

$$Y_{sj} = \alpha_0 + \alpha_1 MaxEITC_{st} + \alpha_2 X_{st} + \gamma_s^1 + \gamma_t^2 + \epsilon_{st}, \quad \text{for} \quad j \in [-7, 7] \tag{6}$$

Figure 8 shows that a $1,000 increase in $MaxEITC$ in year t has a contemporaneous effect on employment, tax revenue, tax filers, and welfare spending—as would be expected from results in Tables 2 and 4—with increasingly large effects for 3–4 years, before remaining flat and positive through year $t + 7$.[49] Bastian (2018a), Eissa and Liebman (1996), and Meyer and Rosenbaum (2001) also show that it took mothers a few years to fully respond to the 1975, 1986, and 1993 EITCs.[50] For each outcome, we run placebo regressions to test—and fail to reject—parallel pre-trends in the years leading up to an EITC expansion.

Estimates in Figure 8 are robust to various sets of controls: Table A.15 columns 1–6 progressively add controls for state and year FE, population, state economic conditions and policies (minimum wage, welfare policy, sales tax rate, top income tax rate, and unemployment rate), one and two year leads of these factors, leads of the outcome variable, region-specific trends, and region-by-year FE. Columns 6–8 use the full set of controls, used in Figure 8. Columns 7–8 weight observations by state population. Column 8 uses state EITCs only. A year after a $1,000 increase in $MaxEITC$, state employment increases by 1.5 percent, tax revenue increases by 5 percent, and welfare spending decreases by 9 per-

[48] These results should be interpreted cautiously since state EITCs may be endogenous (section 3.1) However, flat pre-trends in Figure 8 suggests that state EITCs may not be endogenous.

[49] Tax revenue slowly increases after year $t + 3$—while employment does not—perhaps because of wage increases for those who already responded to the EITC (consistent with Dahl et al. (2009)).

[50] Effects may grow over time for two reasons: one, it takes a few years for mothers to fully respond to the EITC (Bastian, 2018a); two, these women may continue working, gain work experience, see earnings growth (Dahl et al., 2009), and perhaps eventually earn beyond the EITC limit and pay net positive income taxes.

cent.[51] Across each specification, we find consistent evidence that EITC expansions increased aggregate employment, tax revenue, number of tax filers, and decreased welfare spending.

5.7. The EITC's Cost Over a Woman's Lifetime

We simulate the EITC's costs over the lifetime of a woman with two children. In our sample, such women have an average $MaxEITC$ of \$5,244 (\$5,237 and \$5,266 for married and unmarried women). In Table A.16, we use these values of $MaxEITC$ to calculate the EITC's average annual effect on employment, earnings, EITC benefits, payroll and sales taxes paid, and public assistance received (using estimates in Tables 2, 4, and A.10). We find that the EITC's average annual cost for a woman with two children is \$252, since she receives \$1,835 in EITC benefits, pays \$314 more payroll and sales taxes, and receives \$1,269 less public assistance. For a married woman, the average cost is \$1,304. For an unmarried woman, the EITC more than pays for itself, costing *negative* \$2,164. The EITC's self-financing rate is 0.86 on average, and is 0.085 and 1.78 for married and unmarried women.

In Table A.17, we take the annual estimates in Table A.16, discount by 3 percent per year, and calculate the EITC's present-value cost over a woman's lifetime. We calculate this cost (1) with and without assuming a 2 percent annual earnings—and taxes paid—increase;[52] (2) by valuing \$1 of payroll taxes at \$0 or \$0.50 (see section 5.2); and (3) by assuming public-assistance reductions occur each year or only occur for five years, since most states have welfare time limits. As would be expected from the large effects on public assistance in Table 4, the third assumption has the largest impact on the EITC's net cost. For simplicity, we assume that a woman receives the EITC for 20 years and then is unaffected by the EITC.

To summarize, we find that the EITC costs \$19,000–\$23,000 per married woman with two children over a 20 year period (across each specification), much more than the cost for an unmarried woman: \$14,000–\$19,000 if public assistance reductions occur for five years and *negative* \$30,000–\$35,000 if these reductions occur each year. Even if the government's average per-woman cost of the EITC is on the higher end of our calculations—around \$21,000—this cost leads to around \$60,000 in increased earned income.

5.8. Factors Which May Increase or Decrease the EITC's Net Cost

Results above indicate that the EITC offsets 87 percent of its contemporaneous cost, since each \$1,000 in $MaxEITC$ costs the government \$350 per woman, but increases government

[51] Results are robust to using logs or interacting $MaxEITC$ with state population and dropping state FE and population. \$1,000 in $MaxEITC$ and a million-person increase in state population leads to 1,100 more workers and \$15,000 in tax revenue. Results for tax filers are less significant than the other outcomes.

[52] Looney and Manoli (2016) find a 2 percent return to experience for low-skilled working women.

revenue by $303 ($61 in tax revenue and $242 less in public assistance spending). In this section, we discuss previous research that has implications for the net cost of the EITC.

EITC Payments Made in Error: It is estimated that 20–25 percent of EITC payments are made in error (Jones, 2014), suggesting that each $1,000 expansion in $MaxEITC$ costs the government $420, not $350. Jones and Ziliak (2018) show that most over-payments go to lower-income households; if these excess payments affect labor supply or generate sales tax revenue, then this cost scaling should be lower.

Labor-Market Spillovers: The EITC may have negative spillovers on the economic outcomes of lower-skill workers if firms respond to the EITC by reducing pre-tax wages (as found by Leigh (2010) and Rothstein (2010)).[53] Most labor-demand-elasticity estimates are 0.1–0.3 (Card, 1990; Borjas, 2003), suggesting that our government revenue estimates may need to be scaled down by about 10–30 percent.[54]

On the other hand, there could be positive labor-market spillovers if increased labor supply and consumption spending reverberate through the economy, as found in other contexts (Carrington, 1996; Moretti, 2004; Black et al., 2005; Bartik, 2017).[55] The sign and magnitude of potential economic spillovers are theoretically ambiguous.

We account for potential spillovers with state-level analysis (section 5.6) and household-level analysis (Table A.14), both of which include all men and women. Figure 8 shows increases in employment and revenue that are consistent with null or very small labor-market spillovers.[56] Table A.14 shows that a $1,000 increase in $MaxEITC$ (insignificantly) increases household earnings ($596) and taxes paid ($49), and significantly increases EITC benefits ($316) and decreases public assistance ($242).[57]

[53] Although Nichols and Rothstein (2016) shows that results in Leigh (2010) are likely biased upwards: "Leigh's estimates imply that employers capture approximately 500 percent of total EITC spending."

[54] In the extreme case with perfectly elastic labor demand, all new workers are hired at the existing wage and there are no negative spillovers. In the opposite extreme with perfectly inelastic labor demand, EITC-eligible workers crowd out EITC-ineligible workers one for one. In the latter case, the net effect of the EITC on tax revenue may be near zero, although government spending could still decline if EITC-eligible workers (i.e. lower-income mothers) receive more public assistance than adults without children, which need not be true if displaced workers begin receiving more public health services, DI and SSI, commit more crime, etc.

[55] There is also a large macroeconomic literature on "the fiscal multiplier" that focuses on public spending (Auerbach and Gorodnichenko, 2012; Ilzetzki et al., 2013; Acconcia et al., 2014).

[56] Estimates in Figure 8 represent a 0.9 percent increase in total contemporaneous employment. If men and women each make up half of the labor force, then a 1.8 percent increase in working women would be consistent with a 0.9 percent increase in total employment (assuming no effect on men or women without children). Maternal employment estimates in Table 2 reflect a 0.8 percent employment increase relative to women without children; the top of the 95 percent confidence interval reflects a 1.7 percent increase. If anything, these results suggest a small positive employment spillover on men and women without children.

[57] Although men are eligible for the EITC, there is little evidence that the EITC affects their labor supply (Eissa and Hoynes, 2004), implying that these estimates average over the large positive responses by unmarried women, small negative responses by married women, and noisy null responses by men. This interpretation is consistent with the estimates in Table A.14, which resemble the results in Tables 2 and 4.

Raising Taxes to Pay for the EITC: To the degree that the EITC does not completely pay for itself, the government uses tax revenue—which generally leads to labor supply distortions—to pay for the EITC. The size of this efficiency cost has long been debated. Harberger (1964) argues that the overall cost of $1 in taxes is $1.09–$1.16. Slemrod and Yitzhaki (1996) finds a value of $1.20. Feldstein (1999) analyzes the effect of taxes on taxable income and concludes that $1 in taxes costs $1.30. However, some of this decrease in taxable income is due to income shifting and tax avoidance; Chetty (2009b) argues that some of the costs of tax evasion and avoidance are paid to other agents in the economy and that the overall distortion is closer to zero.

Health: The social value of healthier lower-income families depends on how much of their health care costs are passed on to the public and how being healthier translates into taxes paid and public assistance received. The EITC increases family resources and may improve maternal and child health via normal goods, such as doctor visits, medication, and healthy food, and may lower stress associated with financial insecurity.

The EITC improves maternal mental health and decreases risky biomarkers like high cholesterol, high blood pressure, and inflammation (Evans and Garthwaite, 2014). It also increases financial security (Mendenhall et al., 2012; Jones and Michelmore, 2016) and access to prenatal care, and decreases smoking during pregnancy (Cowan and Tefft, 2012; Averett and Wang, 2015) and the incidence of having low-birth-weight children (Hoynes et al., 2015). Healthier mothers and children have many short- and long-run social benefits (Currie, 2011).

Crime: The EITC reduces female criminal recidivism and parole violations (Agan and Makowsky, 2018). Arresting, prosecuting, and jailing individuals is a cost shouldered by taxpayers. Agan and Makowsky (2018) finds that a state EITC worth an average of $207–$362 a year would decrease female recidivism by 1.6 percentage points (from a base of 6.7), which we calculate to be worth $683 per woman, or 2–3 times the cost of the EITC.[58]

Another social cost of incarcerating mothers relates to the 150,000 children with a mother in jail (Christian, 2009). 3 percent of these women have a child in foster care and each child in foster care costs taxpayers over $26,000 a year (National Council for Adoption, 2009).[59]

Intergenerational Education, Health, Crime: By increasing children's educational

[58]The average parole-violation sentence is about 1.3 years (California Department of Corrections and Rehabilitation, 2016; Colorado Department of Corrections, 2017) and incarceration costs about $32,000 per year (State of New Jersey Department of Corrections State Parole Board Juvenile Justice Commission, 2013; Department of Justice, 2016); the administrative costs of these types of court prosecutions average about $1,100 (Hunt et al., 2017). $32,000 x 0.016 x 1.3 + $1,100 x 0.016 = $683. Less incarceration also improves labor-market outcomes and decreases future recidivism and public assistance usage (Mueller-Smith, 2015).

[59]62 and 56 percent of women in state and federal prison were parents of minors (Christian, 2009). 3 percent may be high if the sample of all mothers in jail is not an appropriate comparison for parole violators. 3 percent of a 1.6 percentage point decrease in female recidivism implies $12 in social savings.

attainment (Bastian and Michelmore, 2018; Manoli and Turner, 2018), the EITC may improve health and decrease criminal activity. An additional year of schooling reduces smoking rates by 10 percent (Kenkel et al., 2006) and reduces 10-year mortality rates by 0.01, worth \$1500–\$2500 per year (Lochner, 2011). A 1 percent increase in male high school graduation saves \$1.4 billion (or \$2,100 per graduate) in annual crime-related costs.[60] Since a \$1,000 increase in family $MaxEITC$—for a teenager—leads to a 1.2 percent increase in high school and college graduation and 0.08 years of schooling (Bastian and Michelmore, 2018), this generates social savings of \$120–\$200 in reduced mortality and \$2,100 in reduced crime.[61]

Intergenerational Earnings, Taxes Paid, and Public Assistance Received: The intergenerational employment correlation is about 0.25 (Bastian and Michelmore, 2018) and earnings correlation is 0.3–0.6 (Solon, 1992; Mazumder, 2005; Chetty et al., 2014). The earnings estimate of \$558 (in Table 2) may increase their children's earnings by \$190–\$375,[62] mapping to \$2600–\$5140 in total present discounted earnings and \$520–\$1025 in taxes paid.[63]

Increased employment and earnings likely decreases public assistance usage. Hartley et al. (2016) finds that children with mothers who used welfare, SNAP, or SSI, are 25 percentage points more likely to also be on these programs.[64] The public assistance estimate of -\$242 (in Table 4) may decrease their children's public assistance usage by \$60 a year, with a total present discounted value of \$830.[65]

Bottom Line: The factors discussed above suggest that each \$1,000 increase in $MaxEITC$ costs the government about \$420, generates \$49 in tax revenue, saves \$194 in public assistance spending,[66] and saves around \$800 on public spending related to health and crime. The EITC also affects children's long-run outcomes: in present value, a \$1,000 in $MaxEITC$

[60] Having a working mother is another channel that decreases youth crime (Corman et al., 2017a). Reducing parental crime may also affect crime, teen pregnancy, and intergenerational employment (Dobbie et al., 2018). Education may reduce crime through dynamic incapacitation (Bell et al., 2018).

[61] An additional outcome (that is harder to place a social value on) is increased voting and political participation by mothers (Corman et al., 2017b) and eventually their children (Akee et al., 2018).

[62] Bastian and Michelmore (2018) finds that a \$1,000 increase in family $MaxEITC$—when a child is a teenager—leads to a \$564 increase in annual earnings when these children are in their mid-20s (though their 95 percent confidence interval nests \$190–\$375).

[63] For an EITC expansion when a child is 15 who then works from age 25 to 50, with 20 percent of this income goes to taxes, discounted at 3 percent per year. We are careful not to double-count effects on intergenerational earnings: if birth weight, childhood test scores, parental income, graduating high school, criminal activity, and health, are all highly correlated and improving one outcome affects subsequent outcomes, then if the EITC improves each of these outcomes, the effect on earnings should only be counted once.

[64] Antel (1992), Levine et al. (1996), and Beaulieu et al. (2005) find correlations of 0.25, 0.16–0.18, and 0.29. Dahl et al. (2014), Dahl and Gielen (2018), and De Haan and Schreiner (2018) use policy changes and find estimates of 0.12 for DI, 0.11 for DI, and 0.04 and 0.22 for DI and welfare. Having a parent on public assistance may also reduce education and earnings (Dahl and Gielen, 2018; Fallesen and Bernardi, 2018).

[65] For an EITC expansion when a child is 15, who then receives \$60 less in annual public assistance from age 25 to 50, discounted at 3 percent per year.

[66] After scaling down taxes and public assistance estimates by 20 percent to account for negative spillovers.

increases lifetime taxes paid by at least $500, decreases lifetime public-assistance received by at least $800, and reduces public spending on health and crime by at least $2,000. Even if these numbers were too high by an order of magnitude, a full accounting of government spending strongly suggests that the EITC "pays for itself."

6. Potential EITC Expansions Today

We find that the existing EITC largely "pays for itself." Additional EITC expansions today would likely continue to increase labor supply and government revenue, though with diminishing marginal effects. Our results illustrate that the EITC's cost depends on the target population's labor-supply elasticity and level of public benefits. The existing EITC largely pays for itself because lower-income mothers would be eligible for other programs in the EITC's absence and when these mothers respond to the EITC by working, they become eligible for less public assistance benefits.

Most discussions about expanding the EITC today focus on adults without children (Edelman et al., 2009; Marr et al., 2014), which is relevant in light of declining male and female labor-force participation (Eberstadt, 2016; Black et al., 2017; Abraham and Kearney, 2018). In 2017, the maximum federal EITC for adults without children was only $510 and a single adult earning minimum wage and at least $15,000 a year is beyond the phase-out region and ineligible for the EITC (see Figure 1). A pilot study (Paycheck Plus) expanded the EITC for workers without children and found that it increased employment, income, tax-filing rates, receiving the federal EITC, and decreased severe poverty (Miller et al., 2018).[67] Also, such an EITC expansion may have larger effects on older adults—on the margin of retiring—since older workers have higher labor-supply elasticities (Dustmann et al., 2017; Laun, 2017; Borgschulte et al., 2018) and since adults work less when their children grow up and they lose various tax credits (Feldman et al., 2016; Moulton et al., 2016). Such an EITC could also help offset the steady decline in employment among young adults (Ross and Svajlenka, 2015).

If an EITC expansion for adults without children increased employment, this would generate additional tax revenue. Regarding public assistance, adults without children receive little welfare, food stamps, and public housing, so there may be less government spending to be saved. However, especially among older men, there has been an increasing amount of DI and SSI spending since the 1990s (Autor and Duggan, 2006; Milligan and Schirle, 2017). Federal spending on DI and SSI was $143 billion and $59 billion in 2017; even small

[67] Paycheck Plus had a phase-in rate of 30 percent, was worth $2,000 a year to workers earning between about $7,000 and $18,000 without dependent children, and was available to workers earning below $30,000.

percent-decreases in these programs would represent substantial government revenue.

Finally, increasing the employment and income of lower-skill adults without children would likely have additional positive effects. Paycheck Plus and a New York state EITC for non-custodial parents both increased child-support payments, primarily among white men in their 30s (Nichols et al., 2012; Miller et al., 2018). Research in other contexts suggest that such an EITC may also decrease crime (Gould et al., 2002) and drug-use (Autor et al., 2013; Laird and Nielsen, 2016), improve health (Case and Deaton, 2017; Chetty et al., 2016), and increase the number of "marriageable men" (Dorn et al., 2017). The social value of these benefits—and increased tax revenue—would offset much of the cost of expanding the EITC to this group of adults.

7. Implications for Social Welfare

Having shown that the EITC largely pays for itself in a budgetary sense, we now consider the EITC's impact on social welfare. Since the EITC is a redistribution policy that is funded through tax revenue—leading to deadweight loss—and requires recipients to work—leading to work disutility—there is no guarantee that the EITC increases social welfare. In this section, we apply our estimates to the theoretical framework in Hendren (2016) and Saez (2002). Back of the envelope calculations suggest that EITC expansions have had large positive effects on social welfare.

Social Welfare with Small Behavioral Responses: Hendren (2016) shows that estimating a policy's impact on revenue can be a sufficient statistic (Chetty, 2009a) for social welfare analysis when the envelope theorem holds and small behavioral responses to policy changes do not affect individual utility. Hendren (2016) defines "fiscal externality" (FEx) as the impact of behavioral responses to the EITC on government budgets.[68] We find that the EITC's FEx is -$0.87, whereas many redistributive policies, like welfare and food stamps, have small work disincentives and a positive FEx. Hendren (2016) defines "marginal value of public funds" (MVPF) as the ratio of individuals' "willingness to pay" for the EITC to the EITC's cost to the government. Using $MVPF = 1/(1 + FEx)$ suggests that the EITC's MVPF is $7.70. However, not every dollar of EITC benefits is worth $1 to recipients, since many mothers change their behavior to receive the EITC. In converting EITC dollars to social welfare, we must determine what fraction of EITC benefits are "mechanical" and increase social welfare and what fraction are due to behavioral responses and—because of the envelope theorem—do not increase social welfare.[69] We calculate this ratio using two different

[68] Sales taxes from spending EITC benefits are not technically a FEx and require no "behavioral" response.

[69] Assuming that these women are indifferent between not working and working with the EITC. The next

approaches: One simple approach observes that 19 percent of our sample receives the EITC; therefore the mechanical cost of increasing $MaxEITC$ by \$1,000 is about \$190 (55 percent of the \$350 estimate in Table 4) and the cost due to behavioral responses is about \$160 (45 percent of \$350).[70] A second approach is related to the simulated instrument described in section 5.1 and uses the sample of households from the first year of our data (1989) and calculates the EITC benefits that each household would receive in each year, through 2016. Using this outcome, the fixed set of 1989 households, and equation 2, we find that 72 percent of EITC benefits are mechanical (\$252 of \$350). Using $MVPF = B/(1 + FEx)$ for $B \in \{0.55, 0.72\}$, yields MVPF estimates of \$4.20 and \$5.30, suggesting that each \$1 of EITC spending generates over \$4 in social value.[71]

Since the MVPF of the top marginal income tax rate is \$1.50–\$2 (Hendren, 2016), a social-welfare-maximizing government could increase the EITC—financed by raising the top marginal income tax rate—up to the point where the MVPFs were identical for the EITC and for top marginal tax rates.[72] These MVPFs also imply that a government would be indifferent between an EITC expansion and cutting this top tax rate if it valued an extra \$1 for wealthy individuals the same as \$2.10–\$2.80 for lower-income EITC recipients (requiring utility be convex in income or higher social-welfare weights on wealthy individuals).[73]

Social Welfare with Discrete Behavioral Responses: Since the EITC is not a marginal policy change and leads to discrete changes in labor supply, the envelope theorem may not hold. Non-convex budget sets allow for fixed work costs and first-order welfare effects on the extensive margin (Heim and Meyer, 2004; Kleven and Kreiner, 2006; Eissa et al., 2008), meaning that the EITC's MVPF of \$4.20–\$5.30 estimated above is a lower-bound estimate.[74] Following this intuition, we calculate the EITC's impact on social welfare

paragraph discusses why this approach likely yields a lower-bound welfare estimate.

[70] An ideal experiment by which to calculate the fraction of EITC benefits that are due to behavioral responses would be a randomized control trial, with one group exposed to an EITC expansion and an identical group that was not. The first group would adjust their labor supply and the second group would not. Ex post, the experiment would assign EITC benefits to both groups according to the expanded EITC schedule. Subtracting the EITC benefits received by the second group from the those received by the first group—and dividing this amount by the total EITC benefits received by the first group—would show the fraction of EITC benefits received that can be attributed to behavioral responses.

[71] Hendren (2016) calculates the EITC's MVPF from previous EITC studies, since (until this paper) "there is no study that estimates the impact of the behavioral response to EITC expansions on government expenditures directly" and finds a MVPF of \$0.88 for the EITC, but only considers EITC benefits, so that the FEx is positive and says "To the extent to which an EITC expansion crowds out take-up of other government services, the analysis will underestimate the social desirability of increasing funding of the EITC."

[72] For reference, the MVPFs of other programs have been estimated as \$0.79 for housing vouchers, \$0.53–\$0.64 for Food Stamps, \$1.52 for job training programs (Hendren, 2016), \$10.20 for the introduction of Medicaid (Goodman-Bacon, 2017), and \$1.10–\$2.36 for Head Start (Kline and Walters, 2016).

[73] \$2.10 and \$2.80 is calculated as $4.2/2$ and $4.2/1.5$.

[74] Policies like the EITC have a larger effect on individual welfare coming from changes on the participation margin, compared to intensive margin responses, since policies like the EITC have larger effects on

using a quasi-linear utility function, $U(x, y) = y - F(x)$, where utility is linear in income y.

Our results imply that the 2017 EITC had a net cost of \$9.5 billion and increased after-tax-and-transfer income by \$119.3 billion.[75] However, because of the disutility of working, this income increase should be scaled down to capture the change in social welfare. We can bound the change in utility among EITC recipients: As a lower bound, if individuals are indifferent between working and not, this increased income equals the disutility of working and the utility change is zero. As an upper bound, if individuals are indifferent between working and not before the EITC existed, then the full value of EITC benefits (\$73 billion) increases utility. A first-order Taylor approximation of the upper and lower estimates yields a value of \$32.5 billion and an increase in social welfare of \$23 billion.[76] (Quasi-linear utility will underestimate this increase in social welfare if individual utility is concave in income.)

Expanding Saez (2002): Kleven and Kreiner (2006) and Eissa et al. (2008) argue that the EITC increases social welfare through increasing the utility of EITC recipients. This result, combined with our estimates that the EITC imposes a smaller tax burden on taxpayers than previously known, suggests that the EITC's social welfare gains are larger than previously understood. We illustrate this point and show how the EITC impacts the utility of the distribution of workers by expanding the theoretical framework in Saez (2002).

We assume a government maximizes a classical welfare function in an economy with $I+1$ increasingly skilled occupations that each pay a wage w_i, where $0 < w_1 < w_2 < ... < w_I$. Each occupation is associated with net taxes and transfers T_i, a net income of $c_i = w_i + T_i$,[77] and a disutility of working that increases in i. Occupational choice captures intensive margin responses. Not working yields $w_0 = 0$ and $T_0 = c_0 > 0$. The fraction of the population in occupation i is h_i and the population is measure 1, so $\sum_i h_i = 1$. Heterogeneous individuals of skill type $s \in \{0, 1, 2, ..., I\}$ choose an occupation—or choose unemployment—based on the net income of each option: $h_i = h_i(c_0, c_1, ..., c_I)$. The government places social weights g_i on individuals based on their occupation. The social welfare function is $\sum_{i=0}^{I} g_i h_i c_i$.[78]

In the baseline scenario without an EITC, individuals of skill type s either: work in occupation $i = s$ and consume c_i or do not work and consume c_0. There exists a unique skill type s^2 where each individual chooses to work if and only if $s > s^2$.[79]

Assume now that the government introduces an EITC worth $T_i^E > 0$ to workers in occupation i ($\forall i < i^3$ and $i^3 > i^2$) and financed with an EITC tax ($T_i^E < 0$, where $T_i^E \perp T_i$)

households' average tax rates rather than marginal tax rates (Eissa et al., 2008).

[75] Calculated as: 13 percent of the EITC's cost of \$73 billion is \$9.5 billion; and \$558+\$350-\$95-\$242 (estimates in Tables 2 and 4) x 2.2 (average $MaxEITC$ in 2017 is \$2,200) x 95,000,000 women in 2017.

[76] For a simple social welfare function that sums up individual utility.

[77] We use $c_i = w_i + T_i$ to represent the EITC as positive income, whereas Saez (2002) uses $c_i = w_i - T_i$.

[78] Saez (2002) shows these weights are a sufficient statistic for a government's redistributive preferences.

[79] Assuming standard monotonicity and a distribution of wages W, transfers T, and net wages C.

on occupations above i^3.[80] In response, skill types $s \in [s^1, s^2]$ choose to work that previously did not, while types $s \in [s^3, s^4]$ decrease labor supply on the intensive margin and choose an occupation lower than i^3 to receive the EITC and have a lower tax liability. For simplicity, assume no income effect, so that skill types $s \in [s^2, s^3]$ do not change their occupation.

Figure 0 shows that each type s falls into one of five categories, those that: never work; work only with an EITC; always work and receive the EITC; always work but choose a lower occupation to receive the EITC; or always work and are unaffected by the EITC. These five skill types are defined by the following ranges: $0 - s^1$, $s^1 - s^2$, $s^2 - s^3$, $s^3 - s^4$, $s^4 - I$.

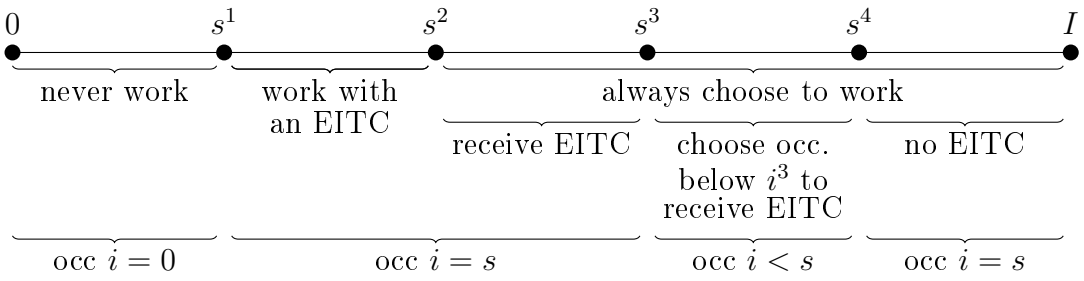


Fig. 0. Illustrating How the EITC Affects Different Skill Types

The EITC affects social welfare by: (1) increasing the consumption of lower-skill workers;[81] (2) decreasing the consumption of higher-skill workers via tax increases to fund the EITC; and (3) inducing a negative intensive margin response, which may affect consumption, and will exacerbate (2) by eroding the tax base.[82]

Now, assume that the government maximizes social welfare by choosing an optimal EITC ($T^E \equiv \sum_{i=0}^{I} T_i^E = \sum_{i=0}^{I} T_i^E(T_1^E, T_2^E, ..., T_I^E)$), subject to a balanced budget (where $T_i > 0$ and $T_i^E > 0$ represent government expenditures and $T_i, g_i, w_i \perp T^E$ and $h_i, T_i^E \not\perp T^E$):

$$\max_{T^E} \sum_{i=0}^{I} g_i h_i c_i = \sum_{i=0}^{I} g_i h_i (w_i + T_i + T_i^E) \quad \text{subject to} \quad \sum_{i=0}^{I} h_i (T_i + T_i^E) = 0. \tag{7}$$

The budget constraint in equation (7) can be decomposed into five occupation categories

[80] In the Mirrlees (1971) optimal tax model, there is no place for the EITC's negative tax rates, but Diamond (1980) shows that this is not necessarily true when work hours are fixed. Building on these results, Saez (2002) shows that the optimal redistribution program resembles an EITC when labor supply responses generally occur on the extensive margin, and resembles a negative income tax (with a guaranteed income for non-workers) when responses are concentrated on the intensive margin.

[81] Increased employment would also increase social welfare for a society that prefers that people work (i.e. $g_1 > g_0$) or an equivalent non-welfarist social welfare function (Weinzierl, 2017).

[82] Increased employment is generally considered to be a more important margin than negative intensive margin responses (Meyer, 2002; Saez, 2002), implying that $\sum_{s=s^1}^{s^2} h_s \partial c_s > \sum_{s=s^3}^{s^4} h_s \partial c_s$.

shown in Figure 0: $i = 0$, $i \in [1, i^2]$, $i \in [i^2, i^3]$, $i \in [i^3, i^4]$, and $i \in [i^4, I]$.

$$\sum_{i=0}^{I} h_i(T_i + T_i^E) = 0 =$$
$$\underbrace{h_0 T_0}_{>0} + \underbrace{h_0 T_0^E}_{=0} + \underbrace{\sum_{i=1}^{i^2} h_i T_i}_{\lesseqgtr 0} + \underbrace{\sum_{i=1}^{i^2} h_i T_i^E}_{>0} + \underbrace{\sum_{i=i^2}^{i^3} h_i T_i^E}_{>0} + \underbrace{\sum_{i=i^2}^{i^4} h_i T_i}_{<0} + \underbrace{\sum_{i=i^3}^{I} h_i T_i^E}_{<0} + \underbrace{\sum_{i=i^4}^{I} h_i T_i}_{<0} \tag{8}$$

The sign of the third term depends on whether this group's net taxes and transfers are positive or negative. With an EITC, $\sum_{i=i^E}^{i^4} h_i = 0$, as shown in Figure 0.

If the government expands the EITC and maintains a balanced budget by not changing T_i, and setting $\sum_{i=0}^{I} h_i T_i^E = 0$, this is how each component in equation (8) would be affected:

$$\frac{\partial \sum_{i=0}^{I} h_i(T_i + T_i^E)}{\partial T^E} = 0 =$$
$$\underbrace{\underbrace{\frac{\partial h_0 T_0}{\partial T^E}}_{<0} + \underbrace{\frac{\partial \sum_{i=1}^{i^2} h_i T_i}{\partial T^E}}_{\lesseqgtr 0}}_{<0} + \underbrace{\frac{\partial \sum_{i=1}^{i^2} h_i T_i^E}{\partial T^E}}_{>0} + \underbrace{\frac{\partial \sum_{i=i^2}^{i^3} h_i T_i^E}{\partial T^E}}_{>0} + \underbrace{\frac{\partial \sum_{i=i^2}^{i^4} h_i T_i}{\partial T^E}}_{>0} + \underbrace{\frac{\partial \sum_{i=i^3}^{I} h_i T_i^E}{\partial T^E}}_{<0} + \underbrace{\frac{\partial \sum_{i=i^4}^{I} h_i T_i}{\partial T^E}}_{=0}. \tag{9}$$

Equation (9) shows that the two sources of government revenue used to pay for the EITC are (1) increased taxes and decreased transfers coming from newly working lower-skill workers and (2) increased "EITC taxes" on higher-skill workers not receiving the EITC.[83] In this paper, we are not able to estimate each component of equation (9), but we can estimate $\left(\frac{\partial h_0 T_0}{\partial T^E} + \frac{\partial \sum_{i=1}^{i^2} h_i T_i}{\partial T^E} + \frac{\partial \sum_{i=i^2}^{i^4} h_i T_i}{\partial T^E}\right)$ and $\left(\frac{\partial \sum_{i=1}^{i^2} h_i T_i^E}{\partial T^E} + \frac{\partial \sum_{i=i^2}^{i^3} h_i T_i^E}{\partial T^E}\right)$. From these two estimates, we can impute the EITC taxes paid by higher-skill types: $\frac{\partial \sum_{i=i^3}^{I} h_i T_i^E}{\partial T^E}$. The more that the EITC "pays for itself," the less that the consumption of higher-skill workers change: $\eta \equiv \frac{\partial Gov}{\partial EITC} \to 1 \implies \frac{\partial \sum_{i=i^3}^{I} h_i T_i^E}{\partial T^E} \to 0$ and $\frac{\partial \sum_{i=i^3}^{I} h_i c_i}{\partial T^E} \to 0$.[84]

From equation (7), the first order condition for the social-welfare-maximizing EITC is:

[83] Equation (9) also shows that EITC expansions do not affect the "regular taxes" T_i paid by high-skill types; increase the EITC benefits paid to occupations $i \in [1, i^E]$; and decrease the "regular taxes" paid by occupations $i \in [i^2, i^4]$ (since the mass of workers in these occupations is now measure zero).

[84] Comparative statics using equation (9) and the implicit function theorem yield the same insight: $\partial\left(\frac{\partial \sum_{i=i^3}^{I} h_i(-T_i^E)}{\partial T^E}\right) / \partial\left(\frac{\partial h_0 T_0}{\partial T^E} + \frac{\partial \sum_{i=1}^{i^2} h_i T_i}{\partial T^E}\right) < 0$. $-T_i^E$ is more intuitive since $-T_i^E > 0$ for these occupations.

$$\sum_{i=0}^{I} \frac{\partial h_i}{\partial T^E}\Big[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\Big] + \sum_{i=0}^{I} \frac{\partial T_i^E}{\partial T^E}(g_i - \lambda)h_i = 0 \tag{10}$$

and decomposing equation (10) into the five occupation categories from Figure 0 yields:

$$\begin{aligned}
&\underbrace{\frac{\partial h_0}{\partial T^E}(g_0 - \lambda)T_0}_{(1)} + \underbrace{\sum_{i=i^3}^{i^4} \frac{\partial h_i}{\partial T^E}\Big[g_i w_i + (g_i - \lambda)(T_i)\Big]}_{(2)} + \underbrace{\sum_{i=i^3}^{I} \frac{\partial T_i^E}{\partial T^E}(g_i - \lambda)h_i}_{(3)} + \\
&\underbrace{\sum_{i=1}^{i^2} \frac{\partial h_i}{\partial T^E}\Big[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\Big]}_{(4)} + \underbrace{\sum_{i=1}^{i^3} \frac{\partial T_i^E}{\partial T^E}(g_i - \lambda)h_i}_{(5)} + \\
&\underbrace{\sum_{i=i^2}^{i^3} \frac{\partial h_i}{\partial T^E}\Big[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\Big]}_{(6)} + \underbrace{\sum_{i=i^3}^{i^4} \frac{\partial h_i}{\partial T^E}\Big[(g_i - \lambda)(T_i^E)\Big]}_{(7)} = 0.
\end{aligned} \tag{11}$$

The optimal EITC equates the marginal social-welfare (SW) cost (1)+(2)+(3) with the marginal SW benefit (4)+(5)+(6)+(7). These seven terms represent: (1) less aggregate SW from the non-employed (since many are now working and in (4)); (2) less SW from these occupations, since types $s \in [s^3, s^4]$ choose a lower occupation $i < s$ to receive the EITC (and are now in (6))[85]; (3) lower consumption by higher-skill workers since their EITC taxes pay for the EITC and make up for the less taxes paid by $s \in [s^3, s^4]$; (4) more SW from lower-skill workers (who used to be unemployed); (5) higher consumption from EITC benefits; (6) more SW from workers in these occupations (however, they used to have higher wages); and (7) more SW from less people paying EITC taxes.

Using equation (11) and the implicit function theorem, comparative statics show that the optimal EITC increases as newly working lower-skill workers fund more of the EITC, but decreases as higher-skill workers fund more of it with new taxes:

$$\frac{\partial \sum_{i=1}^{i^3} T_i^E}{\partial\Big(\sum_{i=1}^{i^2} \frac{\partial h_i}{\partial T^E} T_i\Big)} > 0 \quad \text{and} \quad \frac{\partial \sum_{i=1}^{i^3} T_i^E}{\partial\Big(\sum_{i=i^3}^{I} \frac{\partial(-T_i^E)}{\partial T^E} h_i\Big)} < 0. \tag{12}$$

See footnote 84 and see Appendix B for proof.

Interestingly, if the EITC largely pays for itself, this means that the net taxes and trans-

[85] Whether skill types $s \in [s^3, s^4]$ are better or worse off with the EITC is ambiguous.

fers provided to lower-skill workers is lower than previously understood. A government with redistributive preferences (i.e., $\partial g_i/\partial i < 0$) may find this surprising and decide to further expand the EITC. Likewise, as $\frac{\partial Gov}{\partial EITC} \to 1$ and $\frac{\partial \sum_{i=i^3}^{I} h_i c_i}{\partial T^E} \to 0$, an EITC expansion looks more and more like a "free lunch," the optimal EITC becomes larger, and a government with lower and lower (perhaps even zero) redistributive preferences would have an EITC.[86]

8. Conclusion

In this paper we find that the EITC helps "pay for itself" through contemporaneous increases in tax revenue and decreases in public assistance. The EITC has a self-financing rate of 87 percent, so that every $1 of EITC spending has a net budgetary cost to government of $0.13. Instead of costing $73 billion, the 2017 EITC's net cost was about $9.5 billion, costing taxpayers about half as much as the school lunch and breakfast programs. If anything, the net cost of the EITC is even lower when longer-run and spillover effects are accounted for.

We find that recent EITC expansions continue to largely pay for themselves. Additional EITC expansions today—for adults with or without children—would likely continue to increase labor supply, decrease poverty, and improve the well-being of lower-income families at a cost much lower than the "sticker price."

Since we find that every $1 in EITC benefits is associated with a $0.69 decrease in other public benefits (=242/350), one possible reaction to these results is "so does the EITC not help families as much as we thought?" This is not true for EITC research that looks at after-tax-and-transfer income (e.g., Dahl and Lochner (2012) and Hoynes and Patel (2015)). However, analysis that does not fully account for public assistance will (1) overstate the effect of the EITC on income and (2) *underestimate* the impact of higher household income on outcomes for lower-income families and children, since the estimated effect of $1,000 will actually reflect the impact of around $750.

Our results contribute to a newer literature that estimates how policies can help "pay for themselves," in a similar fashion as Brown et al. (2015) finds for Medicaid, Denning et al. (2017) finds for Pell Grants, Andresen and Havnes (2018) finds for childcare subsidies in Norway, and Michalopoulos et al. (2005) and Michalopoulos (2005) find for a Canadian welfare reform experiment.

Lower-income households deciding whether to join the labor force face high marginal and average tax rates, often over 50 percent and occasionally over 100 percent, when public

[86] However, even if $\eta \geq 1$, the optimal EITC remains finite because eventually the negative behavioral response by higher skilled individuals would dominate the positive response by lower skilled individuals.

assistance is accounted for (Mok, 2012; Kosar and Moffitt, 2017). The EITC acts as a tax cut on these lower-income households, decreasing these high tax rates by up to 45 percentage points. For intuition, consider the Laffer curve: since the EITC largely pays for itself, this suggests that the EITC moves households from near the top of the Laffer curve to the left of the peak. (Among unmarried women, the EITC more than pay for itself, suggesting that these mothers started to the right of the Laffer curve peak.)

The net cost of the EITC is much lower than previously thought and may be a Kaldor-Hicks-improving policy. In fact, if the long-run and spillover benefits of the EITC are sufficiently large to completely offset their cost to government, then no taxpayer dollars would be required to fund the EITC, and the program would be a Pareto-improving policy. The EITC appears to have a positive effect on social welfare and additional EITC expansions today would likely increase social welfare even more.

References

Abraham, K. G. and M. S. Kearney 2018. Explaining the decline in the us employment-to-population ratio: A review of the evidence.

Acconcia, A., G. Corsetti, and S. Simonelli 2014. Mafia and Public Spending: Evidence on the Fiscal Multiplier from a Quasi-Experiment. *American Economic Review*, 104(7):2185–2209.

Agan, A. and M. Makowsky 2018. The Minimum Wage, EITC, and Criminal Recidivism. *Rutgers University, Working Paper*.

Akee, R., W. Copeland, E. J. Costello, J. B. Holbein, and E. Simeonova 2018. Family Income and the Intergenerational Transmission of Voting Behavior: Evidence from an Income Intervention.

Aladangady, A., S. Aron-Dine, D. B. Cashin, W. E. Dunn, L. Feiveson, P. Lengermann, K. Richard, and C. Sahm 2018. High-Frequency Spending Responses to the Earned Income Tax Credit. *FED Notes No. 2018-06-21*.

Andresen, M. E. and T. Havnes 2018. Child Care, Parental Labor Supply and Tax Revenue.

Antel, J. J. 1992. The Intergenerational Transfer of Welfare Dependency: Some Statistical Evidence. *The Review of Economics and Statistics*, Pp. 467–473.

Auerbach, A. J. and Y. Gorodnichenko 2012. Fiscal Multipliers in Recession and Expansion. In *Fiscal Policy after the Financial crisis*, Pp. 63–98. University of Chicago press.

Autor, D., D. Dorn, and G. Hanson 2013. The China Syndrome: Local Labor Market Effects of Import Competition in the United States. *American Economic Review*, 103(6):2121–68.

Autor, D. and M. Duggan 2006. The growth in the social security disability rolls: a fiscal crisis unfolding. *Journal of Economic perspectives*, 20(3):71–96.

Averett, S. and Y. Wang 2015. The Effects of the Earned Income Tax Credit on Children's Health, Quality of Home Environment, and Non-Cognitive Skills. *IZA Working Paper*.

Barrow, L. and L. McGranahan 2000. The Effects of the Earned Income Credit on the Seasonality of Household Expenditures. *National Tax Journal*, Pp. 1211–1243.

Bartik, T. J. 2017. New Evidence on State Fiscal Multipliers: Implications for State Policies. *Upjohn Institute Working Papers*.

Bastian, J. 2018a. The Rise of Working Mothers and the 1975 Earned Income Tax Credit.

Bastian, J. 2018b. Unintended Consequences? More Marriage, More Children, and the EITC.

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

Baughman, R. and S. Dickert-Conlin 2009. The Earned Income Tax Credit and Fertility. *Journal of Population Economics*, 22(3):537–563.

Beaulieu, N., J.-Y. Duclos, B. Fortin, and M. Rouleau 2005. Intergenerational Reliance on Social Assistance: Evidence from Canada. *Journal of Population Economics*, 18(3):539–562.

Bell, B., R. Costa, and S. Machin 2018. Why does education reduce crime? *IZA Working Paper*.

Black, D., T. McKinnish, and S. Sanders 2005. The Economic Impact of the Coal Boom and Bust. *The Economic Journal*, 115(503):449–476.

Black, S. E., D. W. Schanzenbach, and A. Breitwieser 2017. The recent decline in women's labor force participation. *Driving Growth through Women's Economic Participation*, P. 5.

Blank, R. M. and R. F. Schoeni 2003. Changes in the distribution of children's family income over the 1990's. *American Economic Review*, 93(2):304–308.

Borgschulte, M., H. Cho, et al. 2018. Minimum wages and retirement.

Borjas, G. J. 2003. The Labor Demand Curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market. *The quarterly journal of economics*, 118(4):1335–1374.

Brown, D., A. Kowalski, and I. Lurie 2015. Medicaid as an Investment in Children: What is the Long-Term Impact on Tax Receipts?

Bulman, G. B. and C. M. Hoxby 2015. The returns to the federal tax credits for higher education. *Tax Policy and Economy*, 29(1):13–88.

California Department of Corrections and Rehabilitation 2016. *Outcome Evaluation Report*. https://www.cdcr.ca.gov/Adult_Research_Branch/Research_Documents/2015_Outcome_Evaluation_Report_8-25-2016.pdf accessed June 19, 2018.

Card, D. 1990. The Impact of the Mariel Boatlift on the Miami Labor Market. *ILR Review*, 43(2):245–257.

Carlson, S., Z. Neuberger, and D. Rosenbaum 2015. WIC Participation and Costs are Stable. *Center on Budget and Policy Priorities*.

Carrington, W. J. 1996. The Alaskan Labor Market During the Pipeline Era. *Journal of Political Economy*, 104(1):186–218.

Case, A. and A. Deaton 2017. Mortality and Morbidity in the 21st Century. *Brookings papers on economic activity*, 2017:397.

Center on Budget and Policy Priorities 2017. Policy Basics: Public Housing. *Center on Budget and Policy Priorities*.

Chetty, R. 2009a. Is the Taxable Income Elasticity Sufficient to Calculate Deadweight Loss? The Implications of Evasion and Avoidance. *American Economic Journal: Economic Policy*, 1(2):31–52.

Chetty, R. 2009b. Sufficient statistics for welfare analysis: A bridge between structural and reduced-form methods. *Annu. Rev. Econ.*, 1(1):451–488.

Chetty, R., J. Friedman, and J. Rockoff 2011. New Evidence on the Long-Term Impacts of Tax Credits. *IRS Statistics of Income White Paper*.

Chetty, R., A. Guren, D. Manoli, and A. Weber 2012. Does Indivisible Labor Explain the Difference Between Micro and Macro Elasticities? A Meta-Analysis of Extensive Margin Elasticities. In *NBER Macroeconomics Annual 2012, Volume 27*, Pp. 1–56. University of Chicago Press.

Chetty, R., N. Hendren, P. Kline, E. Saez, and N. Turner 2014. Is the United States Still a Land of Opportunity? Recent Trends in Intergenerational Mobility. *American Economic Review*, 104(5):141–47.

Chetty, R., M. Stepner, S. Abraham, S. Lin, B. Scuderi, N. Turner, A. Bergeron, and D. Cutler 2016. The Association between Income and Life Expectancy in the United States, 2001-2014. *JAMA*, 315(16):1750–1766.

Christian, S. 2009. *Children of Incarcerated Parents*. https://www.ncsl.org/documents/cyf/childrenofincarceratedparents.pdf accessed July 15, 2018.

Cleveland, W. 1979. Robust Locally Weighted Regression and Smoothing Scatterplots. *Journal of the American Statistical Association*, 74(368):829–836.

Colorado Department of Corrections 2017. *FY 2016 Statistical Report*. https://drive.google.com/file/d/0B21TrpBx507cTlQxM3h1eHhDMms/view accessed July 17, 2018.

Corman, H., D. Dave, A. Kalil, and N. E. Reichman 2017a. Effects of Maternal Work Incentives on Youth Crime. *Labour economics*, 49:128–144.

Corman, H., D. Dave, and N. E. Reichman 2017b. Effects of Welfare Reform on Women's Voting Participation. *Economic Inquiry*, 55(3):1430–1451.

Cowan, B. and N. Tefft 2012. Education, Maternal Smoking, and the Earned Income Tax Credit. *The BE Journal of Economic Analysis & Policy*, 12(1).

Currie, J. 2004. The Take Up of Social Benefits.

Currie, J. 2011. Inequality at Birth: Some Causes and Consequences. *American Economic Review*, 101(3):1–22.

Currie, J. and J. Gruber 1996. Health insurance eligibility, utilization of medical care, and child health. *The Quarterly Journal of Economics*, 111(2):431–466.

Dahl, G. and L. Lochner 2012. The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit. *American Economic Review*, 102(5):1927–1956.

Dahl, G. B. and A. C. Gielen 2018. Intergenerational Spillovers in Disability Insurance.

Dahl, G. B., A. R. Kostøl, and M. Mogstad 2014. Family Welfare Cultures. *The Quarterly Journal of Economics*, 129(4):1711–1752.

Dahl, M., T. DeLeire, and J. Schwabish 2009. Stepping Stone or Dead End? The Effect of the EITC on Earnings Growth. *National Tax Journal*, 62(2):329–347.

De Haan, M. and R. Schreiner 2018. The Intergenerational Transmission of Welfare Dependency.

Dean, S. 2017. The Future of SNAP. *Testimony of Stacy Dean, House Agriculture's Nutrition Subcommittee*.

Denning, J., B. Marx, and L. Turner 2017. ProPelled: The Effects of Grants on Graduation, Earnings, and Welfare.

Department of Justice 2016. *Bureau of Prisons Annual Determination of Average Cost of Incarceration*. https://www.gpo.gov/fdsys/pkg/FR-2016-07-19/pdf/2016-17040.pdf, July 15, 2018.

Deslauriers, J., B. Dostie, R. Gagné, J. Paré, et al. 2018. Estimating the Impacts of Payroll Taxes: Evidence from Canadian Employer-Employee Tax Data.

Diamond, P. 1980. Income Taxation with Fixed Hours of Work. *Journal of Public Economics*,

13(1):101–110.

Dickert, S., S. Houser, and J. K. Scholz 1995. The Earned Income Tax Credit and Transfer Programs: A Study of Labor Market and Program Participation. *Tax Policy and the Economy*, 9:1–50.

Dickert-Conlin, S. and S. Houser 2002. EITC and Marriage. *National Tax Journal*, 55(1):25–40.

Dobbie, W., H. Grönqvist, S. Niknami, M. Palme, and M. Priks 2018. The Intergenerational Effects of Parental Incarceration.

Dorn, D., G. Hanson, et al. 2017. When Work Disappears: Manufacturing Decline and the Falling Marriage-Market Value of Men.

Dustmann, C., U. Schönberg, and J. Stuhler 2017. Labor supply shocks, native wages, and the adjustment of local employment. *The Quarterly Journal of Economics*, 132(1):435–483.

Eberstadt, N. 2016. *Men without work: America's invisible crisis*. Templeton Foundation Press.

Edelman, P., M. Greenberg, S. Holt, and H. Holzer 2009. Expanding the EITC to Help More Low-Wage Workers. *Georgetown Center on Poverty, Inequality, and Public Policy, Washington, DC*.

Eissa, N. and H. Hoynes 2004. Taxes and the Labor Market Participation of Married Couples: The Earned Income Tax Credit. *Journal of Public Economics*, 88(9):1931–1958.

Eissa, N. and H. Hoynes 2006. Behavioral Responses to Taxes: Lessons from the EITC and Labor Supply. In *Tax Policy and the Economy, Volume 20*, Pp. 73–110. The MIT Press.

Eissa, N., H. Kleven, and C. Kreiner 2008. Evaluation of Four Tax Reforms in the U.S.: Labor Supply and Welfare Effects for Single Mothers. *Journal of Public Economics*, 92(3):795–816.

Eissa, N. and J. Liebman 1996. Labor Supply Response to the Earned Income Tax Credit. *Quarterly Journal of Economics*, 111(2):605–637.

Ellwood, D. 2000. The Impact of the Earned Income Tax Credit and Social Policy Reforms on Work, Marriage, and Living Arrangements. *National Tax Journal*, 53(4):1063.

Evans, W. and C. Garthwaite 2014. Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health. *American Economic Journal: Economic Policy*, 6(2):258–290.

Fallesen, P. and F. Bernardi 2018. Parental Welfare Dependency and Children's Educational Attainment in Denmark.

Feldman, N. E., P. Katuščák, and L. Kawano 2016. Taxpayer confusion: Evidence from the child tax credit. *American Economic Review*, 106(3):807–35.

Feldstein, M. 1999. Tax Avoidance and the Deadweight Loss of the Income Tax. *Review of Economics and Statistics*, 81(4):674–680.

Ganong, P. and J. B. Liebman 2018. The decline, rebound, and further rise in snap enrollment: Disentangling business cycle fluctuations and policy changes. *American Economic Journal: Economic Policy*.

Goodman-Bacon, A. 2017. The long-run effects of childhood insurance coverage: Medicaid implementation, adult health, and labor market outcomes.

Goodman-Bacon, A. and L. McGranahan 2008. How do EITC Recipients Spend Their Refunds? *Economic Perspectives*, 32(2):17–33.

Gould, E., B. Weinberg, and D. Mustard 2002. Crime Rates and Local Labor Market Opportunities in the United States: 1979âĂŤ1997. *Review of Economics and statistics*, 84(1):45–61.

Greenstein, R. 2012. Romney's Charge that Most Federal Low-Income Spending Goes for "Overhead" and "Bureaucrats" Is False. *Center on Budget and Policy Priorities*.

Grogger, J. 2003. The Effects of Time Limits, the EITC, and Other Policy Changes on Welfare Use, Work, and Income Among Female-Headed Families. *Review of Economics and Statistics*, 85(2):394–408.

Grogger, J. 2004. Welfare Transitions in the 1990s: The Economy, Welfare Policy, and the EITC. *Journal of Policy Analysis and Management*, 23(4):671–695.

Gruber, J. 1997. The Incidence of Payroll Taxation: Evidence from Chile. *Journal of Labor Economics*, 15(3):72–101.

Harberger, A. 1964. Taxation, Resource Allocation, and Welfare. In *The role of direct and indirect taxes in the Federal Reserve System*, Pp. 25–80. Princeton University Press.

Hartley, R. P., C. Lamarche, and J. P. Ziliak 2016. Welfare Reform and the Intergenerational Transmission of Dependence. *University of Kentucky CPR, Working Paper*.

Heim, B. T. and B. D. Meyer 2004. Work costs and nonconvex preferences in the estimation of labor supply models. *Journal of Public Economics*, 88(11):2323–2338.

Hendren, N. 2016. The policy elasticity. *Tax Policy and the Economy*, 30(1):51–89.

Hotz, J. and J. Scholz 2006. Examining the Effect of the Earned Income Tax Credit on the Labor Market Participation of Families on Welfare.

Hoynes, H., D. Miller, and D. Simon 2015. Income, the Earned Income Tax Credit, and Infant Health. *American Economic Journal: Economic Policy*, 7(1):172–211.

Hoynes, H. and A. Patel 2015. Effective Policy for Reducing Inequality? The Earned Income Tax Credit and the Distribution of Income.

Hoynes, H. and J. Rothstein 2016. Tax Policy Toward Low-Income Families.

Hunt, P., J. Anderson, and J. Saunders 2017. The Price of Justice: New National and State-Level Estimates of the Judicial and Legal Costs of Crime to Taxpayers. *American journal of criminal justice*, 42(2):231–254.

Ilzetzki, E., E. G. Mendoza, and C. A. Végh 2013. How Big (Small?) are Fiscal Multipliers? *Journal of monetary economics*, 60(2):239–254.

Jones, L. and K. Michelmore 2016. Timing is Money: Does Lump-Sum Payment of Tax Credits Induce High-Cost Borrowing? *Working Paper*.

Jones, M. R. 2014. Changes in eitc eligibility and participation, 2005–2009. *Center for Administrative Records Research and Applications Working Paper*, 4.

Jones, M. R. 2017. Tax Preparers, Refund Anticipation Products, and EITC Noncompliance. *CARRA Working Paper*.

Jones, M. R. and J. Ziliak 2018. The Antipoverty Impact of the EITC: Comparing Simulated EITC Benefits in the CPS ASEC and NBER TAXSIM to Administrative Tax Records. Technical report, Center for Economic Studies, US Census Bureau.

Kenkel, D., D. Lillard, and A. Mathios 2006. The Roles of High School Completion and GED Receipt in Smoking and Obesity. *Journal of Labor Economics*, 24(3):635–660.

Kleven, H. J. and C. T. Kreiner 2006. The marginal cost of public funds: Hours of work versus labor force participation. *Journal of Public Economics*, 90(10-11):1955–1973.

Kline, P. and C. R. Walters 2016. Evaluating public programs with close substitutes: The case of head start. *The Quarterly Journal of Economics*, 131(4):1795–1848.

Kosar, G. and R. A. Moffitt 2017. Trends in Cumulative Marginal Tax Rates Facing Low-Income Families, 1997–2007. *Tax Policy and the Economy*, 31(1):43–70.

Laird, J. and T. Nielsen 2016. The Effects of Physician Prescribing Behaviors on Prescription Drug Use and Labor Supply: Evidence from Movers in Denmark.

Laun, L. 2017. The effect of age-targeted tax credits on labor force participation of older workers. *Journal of Public Economics*, 152:102 – 118.

Layne, M., D. Wagner, and C. Rothhaas 2014. Estimating Record Linkage False Match Rate for the Person Identification Validation System. *CARRA Working Paper*, 2.

Leigh, A. 2010. Who Benefits from the Earned Income Tax Credit? Incidence Among Recipients, Coworkers and Firms. *The BE Journal of Economic Analysis & Policy*, 10(1):1–43.

Levine, P. B., D. J. Zimmerman, et al. 1996. *The Intergenerational Correlation in AFDC Participation: Welfare Trap or Poverty Trap?* IRP Discussion Paper 1100-96.

Lochner, L. 2011. Nonproduction Benefits of Education: Crime, Health, and Good Citizenship. In *Handbook of the Economics of Education*, volume 4, Pp. 183–282. Elsevier.

Looney, A. and D. Manoli 2016. Are there returns to experience at low-skill jobs? evidence from single mothers in the united states over the 1990s.

Manoli, D. and N. Turner 2018. Cash-on-Hand and College Enrollment: Evidence from Population Tax Data and the Earned Income Tax Credit. *American Economic Journal: Economic Policy*.

Marr, C., C.-C. Huang, and N. Frentz 2014. Strengthening the EITC for Childless Workers Would Promote Work and Reduce Poverty. *Washington: Center on Budget and Policy Priorities*.

Mazumder, B. 2005. Fortunate Sons: New Estimates of Intergenerational Mobility in the United States Using Social Security Earnings Data. *Review of Economics and Statistics*, 87(2):235–255.

Mead, L. 2014. Overselling the earned income tax credit. *National Affairs*, 21:20–33.

Mead, L. 2018. Can benefits and incentives promote work? *Journal of Policy Analysis and Management*.

Mendenhall, R., K. Edin, S. Crowley, J. Sykes, L. Tach, K. Kriz, and J. R. Kling 2012. The Role of EITC in the Budgets of Low-Income Households. *Social Service Review*, 86(3):367–400.

Meyer, B. 2010. The Effects of the Earned Income Tax Credit and Recent Reforms. In *Tax Policy and the Economy, Volume 24*, Pp. 153–180. University of Chicago Press.

Meyer, B., V. Mooers, and D. Wu 2018. The use and misuse of income data and the rarity of extreme poverty in the united states.
Meyer, B. and D. Rosenbaum 2001. Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers. *Quarterly Journal of Economics*, 116(3):1063–1114.
Meyer, B. D. 2002. Labor Supply at the Extensive and Intensive Margins: The EITC, Welfare, and Hours Worked. *American Economic Review*, 92(2):373–379.
Meyer, B. D. and N. Mittag 2015. Using Linked Survey and Administrative Data to Better Measure Income: Implications for Poverty, Program Effectiveness and Holes in the Safety Net. (21676).
Meyer, B. D. and J. X. Sullivan 2003. Measuring the well-being of the poor using income and consumption. *Journal of Human Resources*, 38(4).
Michalopoulos, C. 2005. *Does making work pay still pay?: An update on the effects of four earnings supplement programs on employment, earnings, and income*. MDRC.
Michalopoulos, C., P. K. Robins, and D. Card 2005. When financial work incentives pay for themselves: evidence from a randomized social experiment for welfare recipients. *Journal of public economics*, 89(1):5–29.
Michelmore, K. 2015. The EITC and Union Formation: The Impact of Expected Spouse Earnings.
Miller, C., L. F. Katz, G. Azurdia, A. Isen, C. Schultz, and K. Aloisi 2018. Boosting the eitc for singles: Final impact findings from the paycheck plus demonstration in new york city.
Milligan, K. and T. Schirle 2017. Push and pull: Disability insurance, regional labor markets, and benefit generosity in canada and the united states. (23405).
Mirrlees, J. A. 1971. An Exploration in the Theory of Optimum Income Taxation. *The review of economic studies*, 38(2):175–208.
Mok, S. 2012. *Effective Marginal Tax Rates for Low- and Moderate-Income Workers*.
Moretti, E. 2004. Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions. *American Economic Review*, 94(3):656–690.
Moulton, J., A. Graddy-Reed, and L. Lanahan 2016. Beyond the eitc: the effect of reducing the earned income tax credit on labor force participation. *National Tax Journal*, 69(2):261–284.
Mueller-Smith, M. 2015. The Criminal and Labor Market Impacts of Incarceration.
National Council for Adoption 2009. *Better Prospects, Lower Cost: The Case for Increasing Foster Care Adoption*.
Neumark, D. and K. E. Williams 2016. Do state eitcs increase participation in the federal eitc.
Nichols, A. and D. Kassabian 2012. TANF Recipients' Implicit Tax Rates from Earnings Disregard Policies. *Washington, DC: The Urban Institute*.
Nichols, A. and J. Rothstein 2016. The Earned Income Tax Credit. *Economics of Means-Tested Transfer Programs in the United States*, 1:137.
Nichols, A., E. Sorensen, and K. Lippold 2012. The new york noncustodial parent eitc: Its impact on child support payments and employment. *Washington, DC: Urban Institute*.
Pilkauskas, N. and K. Michelmore 2018. The effect of income on housing instability and living arrangements: Evidence from the earned income tax credit.
Ross, M. and N. Svajlenka 2015. Worrying declines in teen and young adult employment. *Brookings*.
Rothstein, J. 2010. Is the EITC as Good as an NIT? Conditional Cash Transfers and Tax Incidence. *American Economic Journal: Economic Policy*, 2(1):177–208.
Saez, E. 2002. Optimal Income Transfer Programs: Intensive versus Extensive Labor Supply Responses. *Quarterly Journal of Economics*, 117(3):1039–1073.
Slemrod, J. and S. Yitzhaki 1996. The costs of taxation and the marginal efficiency cost of funds. *Staff Papers*, 43(1):172–198.
Solon, G. 1992. Intergenerational Income Mobility in the United States. *The American Economic Review*, Pp. 393–408.
State of New Jersey Department of Corrections State Parole Board Juvenile Justice Commission 2013. *Release Outcome 2013 A Three-Year Follow-Up*. http://www.state.nj.us/corrections/pdf/offender_statistics/2013_Release_Recidivism_Report.pdf accessed June 19, 2018.
Stone, C. and W. Chen 2013. Introduction to Unemployment Insurance. *Center on Budget and Policy Priorities*.
Weinzierl, M. 2017. A Welfarist Role for Nonwelfarist Rules: An Example with Envy.
Yang, T.-T. 2018. Family Labor Supply and the Timing of Cash Transfers: Evidence from the Earned Income Tax Credit. *Journal of Human Resources*, 53(2):445–473.

Table 1: Summary Statistics (in Real 2016 Dollars)

	Full sample		Single sample	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Age	41.1	12.6	38.2	13.3
Less than HS education	0.42	0.49	0.44	0.50
Single or Head of HH filer	0.46	0.50	1.0	0.00
White	0.80	0.40	0.72	0.45
Black	0.14	0.34	0.22	0.41
Other	0.06	0.25	0.06	0.23
Hispanic	0.14	0.34	0.15	0.36
Number of children	0.81	1.0	0.54	0.90
Children under 5	0.25	0.58	0.17	0.48
Employed	0.74	0.44	0.77	0.42
Annual Weeks Worked	34.1	22.9	35.5	22.2
Weekly Hours Worked	27.4	18.9	29.1	18.4
Individual Earnings	26,000	44,000	25,000	38,000
Households Earnings	58,000	83,000	27,000	42,000
FICA/Payroll Taxes	3,689	4,236	3,609	3,964
Sales Taxes Paid	613.4	1,122	596.4	963
Unemployment Taxes	257	239	267	231
Total Taxes	4,544	5,190	4,490	4,816
Welfare (AFDC/TANF) benefits	98.0	899	178	1,190
Public Housing Benefits	206	1,307	376	1,740
Food Stamp/SNAP Benefits	308	1,236	511	1,548
Disability Benefits	95.3	1,611	114	1,735
SSI Benefits	191	1,377	330	1,781
Workers' Comp. Benefits	48.3	1,047	54.3	1,114
Unemployment Benefits	166	1,488	205	1,607
Total Public Assistance	1,111	3,845	1,763	4,615
Any Public Assistance	0.16	0.37	0.25	0.43
AFDC 1	426	271	433	267
AFDC 2	624	368	634	362
AFDC 3	770	455	783	449
AFDC 4	913	546	930	539
State Minimum Wage	7.6	0.81	7.6	0.81
State GDP (In Millions)	700	630	730	630
Employment Ratio	0.46	0.05	0.46	0.06
Sales Tax Rate	0.05	0.01	0.05	0.01
Max Fed EITC	2,272	2,155	1,711	1,922
Max State EITC	132	357	98.2	291
Federal EITC Benefits	390	1,119	499	1,225
State EITC Benefits	16.7	133	22.5	153
Total EITC Benefits	407	1,174	522	1,289
Observations	1,209,019	1,209,019	509,928	509,928

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data. CPS ASEC person weights used. Tax calculator used to generate EITC eligible received.

Table 2: The EITC's Effect on Maternal Labor Supply, By Marital Status

Panel A: Labor Supply						
	Annual Weeks		Weekly Hours		Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
MaxEITC	0.60***		0.49***		.006*	
	(0.13)		(0.13)		(.003)	
MaxEITC X Married		-0.33**		-0.26		-.014***
		(0.12)		(0.13)		(.003)
MaxEITC X Single		2.75***		2.22***		.052***
		(0.22)		(0.19)		(.005)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.097	0.098	0.102	0.103	0.092	0.092
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019
Mean Dep. Var.	34.14		27.36		0.736	
Panel B: Earnings and EITC Benefits						
	Annual Earnings		EITC Benefits		Earnings with EITC	
	(7)	(8)	(9)	(10)	(11)	(12)
MaxEITC	558***		350***		908***	
	(129)		(10)		(128)	
MaxEITC X Married		455**		272***		727***
		(167)		(12)		(162)
MaxEITC X Single		795**		529***		1324***
		(255)		(15)		(249)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.072	0.072	0.302	0.303	0.070	0.070
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019
Mean Dep. Var.	25,170		406.7		25,577	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Tax calculator used to generate EITC benefits received. Employment defined as having positive weekly work hours, though estimates are very similar for positive annual work weeks, positive earnings, or labor force participation. Table A.4 shows results with various sets of controls. Full set of controls include: fixed effects for state, year, number of children, four education categories, marital status, an age cubic, race, having children under 5, the interaction of married and low-education with state, year, and number of children, and controls for state linear time trends and annual state factors (GDP, employment-to-population ratio, welfare generosity for a family with 1, 2, 3, or 4 children, top marginal tax rates, sales tax rates, and minimum wage). Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: The EITC and Labor Supply, A Simulated-Instrument Approach

	Federal EITC Benefits		Federal Plus State EITC Benefits	
Simulated Instrument (SIV) Bin:	State x Year x Kids	Year x Kids	State x Year x Kids	Year x Kids
	(1)	(2)	(3)	(4)
Panel A: Annual Weeks Worked				
EITC (1000s of 2016 $)	1.64***	1.70**	1.59***	1.61**
	(0.36)	(0.49)	(0.35)	(0.47)
R-squared	0.132	0.132	0.132	0.132
Panel B: Weekly Hours Worked				
EITC (1000s of 2016 $)	2.03***	1.69**	1.93***	1.59**
	(0.35)	(0.49)	(0.33)	(0.47)
R-squared	0.137	0.136	0.137	0.137
Panel C: Binary Employment				
EITC (1000s of 2016 $)	0.020**	0.008	0.019*	0.007
	(0.008)	(0.011)	(0.007)	(0.011)
R-squared	0.122	0.122	0.122	0.122
Panel D: Annual Wage and Salary Earnings				
EITC (1000s of 2016 $)	1,589***	2,889***	1,686***	2,789***
	(427)	(628)	(393)	(598)
R-squared	0.140	0.140	0.140	0.140
Full controls	Yes	Yes	Yes	Yes
Observations	1,209,019	1,209,019	1,209,019	1,209,019
Mean SIV:	0.359	0.354	0.372	0.369
Min SIV:	0.0	0.0	0.0	0.0
Max SIV:	2.67	1.39	2.93	1.47

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data. Sample includes all women 18–64. For the simulated instrument, we take the 1989 CPS sample of households and calculate the EITC benefits that each household would receive in in each between 1989 and 2016. To carry this out, we use this fixed sample of households and keep household traits constant, except we use the CPI to adjust 1989 earnings and income into 1990–2016 values. We do this for federal EITC benefits and for federal plus state EITC benefits. Just using state benefits yield similar but noisier point estimates. We then collapse these average EITC benefits, using CPS weights, at either the state x year x number of kids level or the year x number of kids level. These average EITC benefits capture more than just $MaxEITC$, it implicitly captures all EITC parameters and expansions and shows the average benefits households receive. We then merge these average EITC cell values (i.e. the simulated instrument) into the main sample and run regressions using equation (2) except we replace $MaxEITC$ with the simulated instrument. CPS ASEC weights used. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: The EITC's Effect on Taxes Paid and Public Assistance Received

	Total Taxes Paid		Total Public Assistance Received		Any Public Assistance Received	
	(1)	(2)	(3)	(4)	(5)	(6)
MaxEITC	95***		-242***		-.005**	
	(22)		(36)		(.002)	
MaxEITC X Married		69**		21		.006***
		(26)		(19)		(.001)
MaxEITC X Single		152***		-844***		-.031***
		(40)		(104)		(.004)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.324	0.324	0.089	0.089	0.134	0.134
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019
Mean Dep. Var.	4,544		1,111		0.161	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Taxes paid include payroll, sales, and unemployment insurance taxes. Public assistance received includes welfare, food stamps, public housing, disability and unemployment insurance benefits, Supplemental Security Income, and Workers Comp. Table A.6–A.8 shows results with various sets of controls. Full set of controls listed in Table 2. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: The EITC, Taxes Paid, and Public Assistance Received: An IV Approach

Instrument:	*MaxEITC*				EITC Phase-In Rate			
Outcome:	Taxes Paid		Public Assistance		Taxes Paid		Public Assistance	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Earnings (in $1,000s)	259***		-117***		257***		-128***	
	(15)		(16)		(17)		(17)	
EITC (in $1,000s)		1270***		-574***		1284***		-637***
		(212)		(107)		(223)		(116)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,209,019		1,209,019		1,209,019		1,209,019	
Kleibergen-Paap rk LM statistic	15.2	19.2	15.2	19.2	14.2	19.4	14.2	19.4
Kleibergen-Paap rk Wald F-statistic	60.0	677.0	60.0	677.0	49.8	756.2	49.8	756.2
First-Stage Estimate	1.440	.293	1.440	.293	2.267	.455	2.267	.455
	(.186)	(.011)	(.186)	(.011)	(.321)	(.017)	(.321)	(.017)

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data. Sample includes all women 18–64 years old, except for women who are dependents. *MaxEITC* calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. Units are $1,000 of real 2016 dollars. See Figures 2 and A.1 for time-series variation in *MaxEITC* and the phase-in rate. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: The EITC's Effect on State and Federal Budgets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Costs and Benefits for Federal Government								
	Federal EITC Received	Payroll Taxes Paid	Welfare Received	Public Housing Received	Food Stamps Received	SSI and DI Received		
MaxEITC	350***	68***	-158***	-24**	56***	-17.4		
	(9.7)	(18.5)	(20.4)	(7.5)	(8.85)	(10.0)		
Full controls	Yes	Yes	Yes	Yes	Yes	Yes		
R-squared	0.302	0.145	0.091	0.055	0.161	0.014		
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019		
Mean Dep. Var.	407	3,689	60	206	308	335		
Panel B: Costs and Benefits for State Governments								
	All States			Ever Had An EITC			No EITC	
	State EITC Received	Sales Taxes Paid	Welfare Received	State EITC Received	Sales Taxes Paid	Welfare Received	Sales Taxes Paid	Welfare Received
MaxEITC	21.1**	30.9***	-100.6***	36.7**	39.5***	-127.8***	17.2*	-55.4***
	(3.6)	(6.7)	(16.8)	(11.2)	(6.5)	(19.6)	(6.9)	(8.6)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.117	0.092	0.090	0.139	0.092	0.106	0.068	0.061
Observations	1,209,019	1,209,019	1,209,019	704,068	704,068	704,068	504,951	504,951
Mean Dep. Var.	17	1,425	38	28	1,497	49	1,318	21

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Tax calculator used to generate EITC benefits and payroll taxes. Public assistance benefits are self-reported in CPS data. Sales taxes computed by authors (see Table C.2) and are a function of earnings, EITC benefits, state, and year. Full set of controls listed in Table 2. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

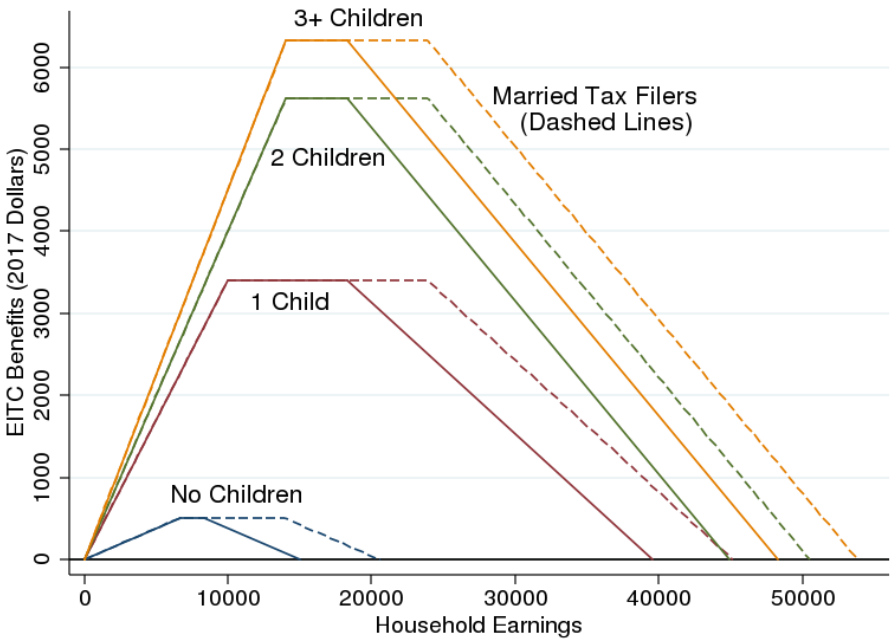


Fig. 1. Federal EITC Structure, 2017

Source: Authors' calculations from IRS data.

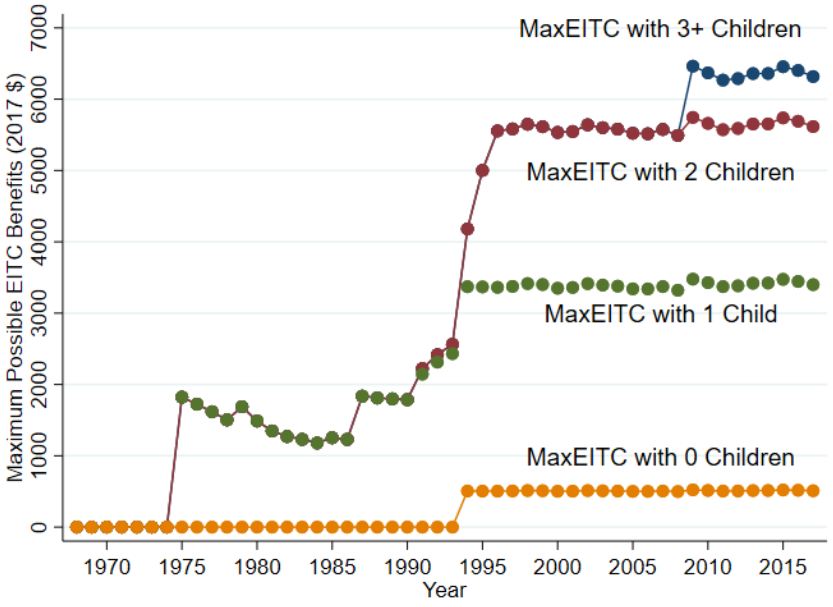


Fig. 2. Time-Series Variation in $MaxEITC$ by Number of Children

Source: Authors' calculations from IRS data.

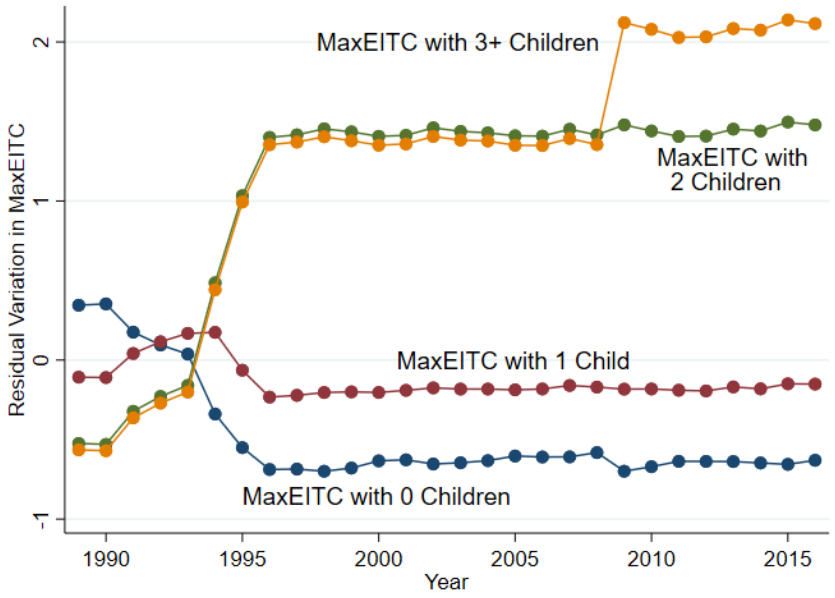


Fig. 3. Trends in Residual Variation from Regressing *MaxEITC* on Full Set of Controls

Source: 1990–2017 CPS ASEC. Residuals come from a regression of *MaxEITC* on the full set of controls, using CPS weights. Residuals are averaged into year x number of children bins. Including state x year FE produces nearly identical results. Units are $1,000 in real 2016 dollars. These trends look very similar to the unadjusted *MaxEITC* trends in Figure 2.

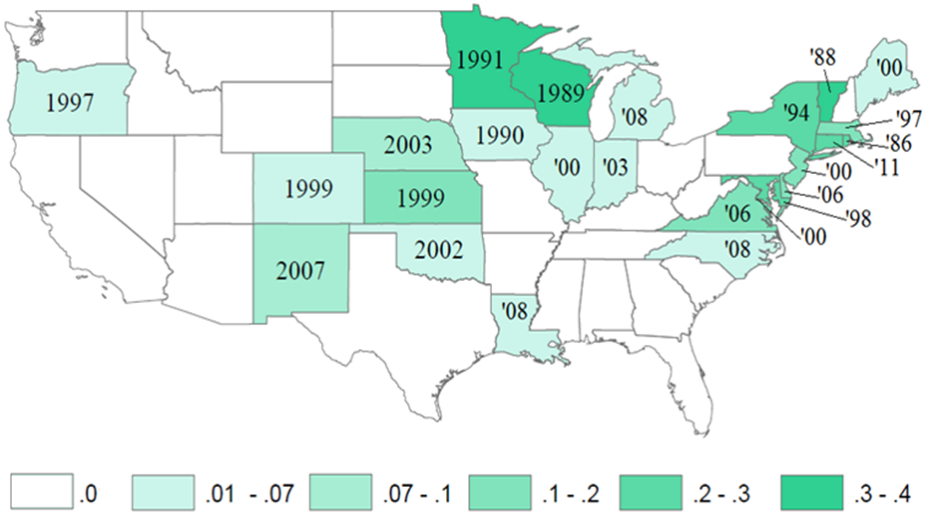


Fig. 4. Year of State EITC Implementation and 2013 Rate

Source: Authors' calculations from NBER data: http://users.nber.org/~taxsim/state-eitc.html.

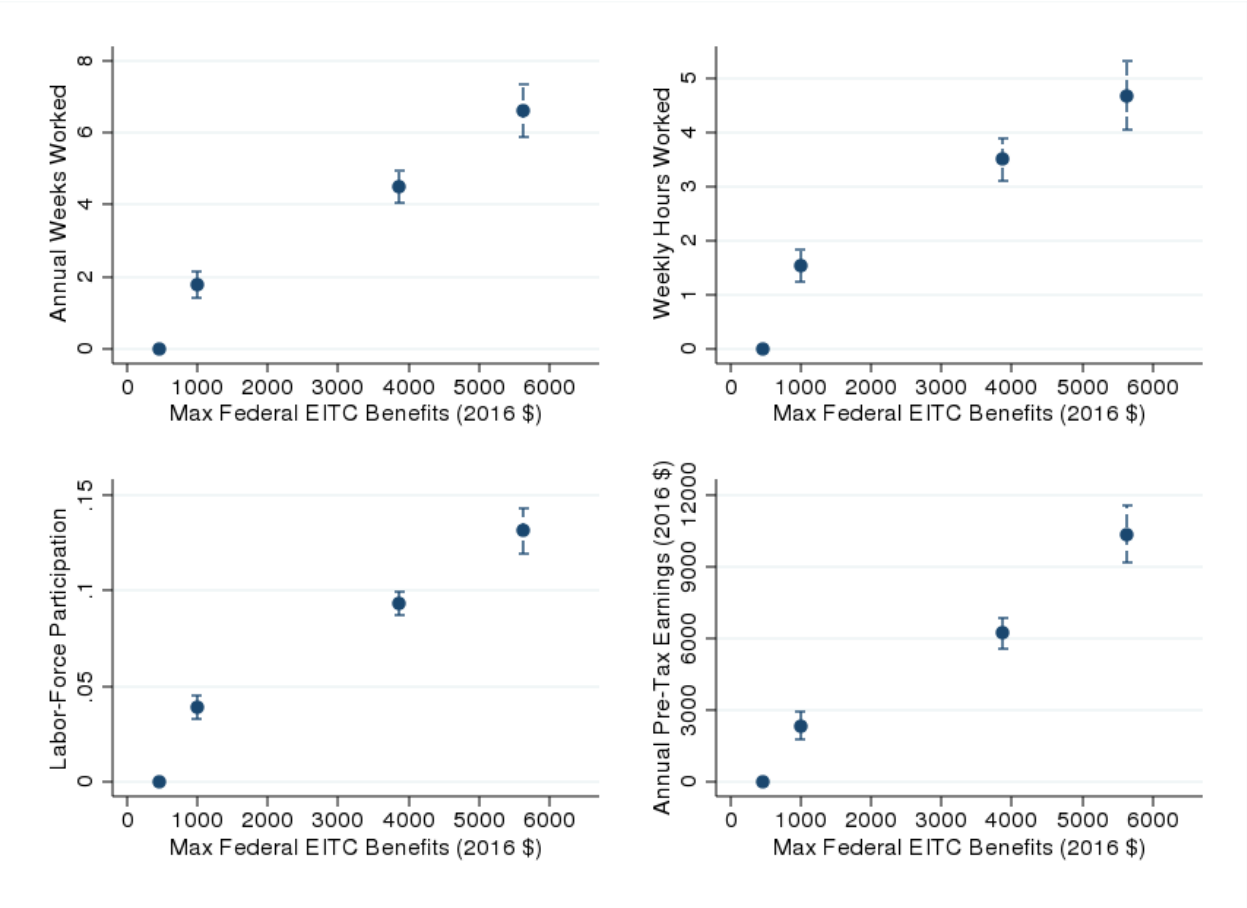


Fig. 5. Categorical EITC Exposure and Positive Marginal Effects on Labor Supply

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Regression reflects equation (5) and the full set of controls listed in Table 2. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar.

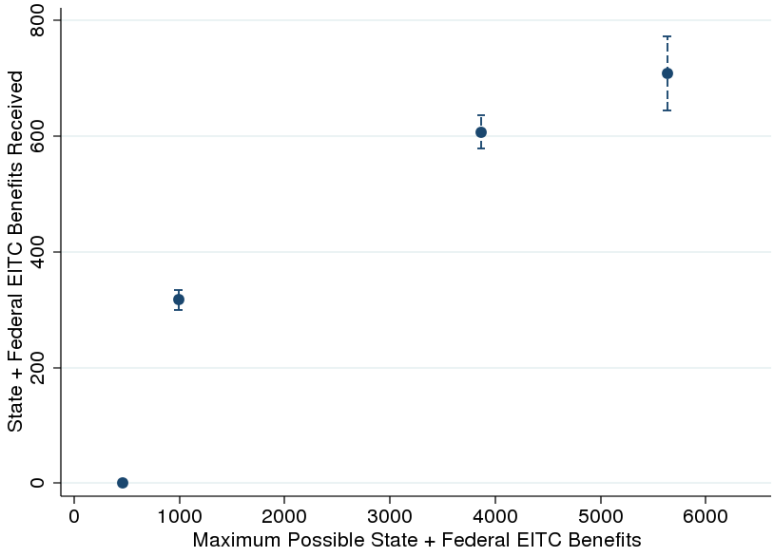


Fig. 6. Categorical EITC Exposure and EITC Benefits Received

Source: Data, sample, and empirical approach is identical to Figure 5, but with EITC benefits as the outcome.

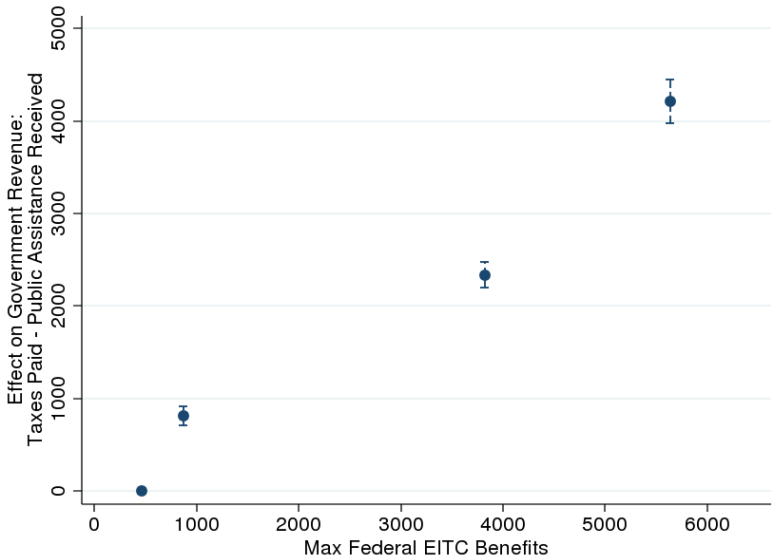


Fig. 7. Categorical EITC Exposure and Net Effect on Government Revenue

Source: Data, sample, and empirical approach is identical to Figure 5, but with government revenue (tax revenue minus public assistance) as the outcome.

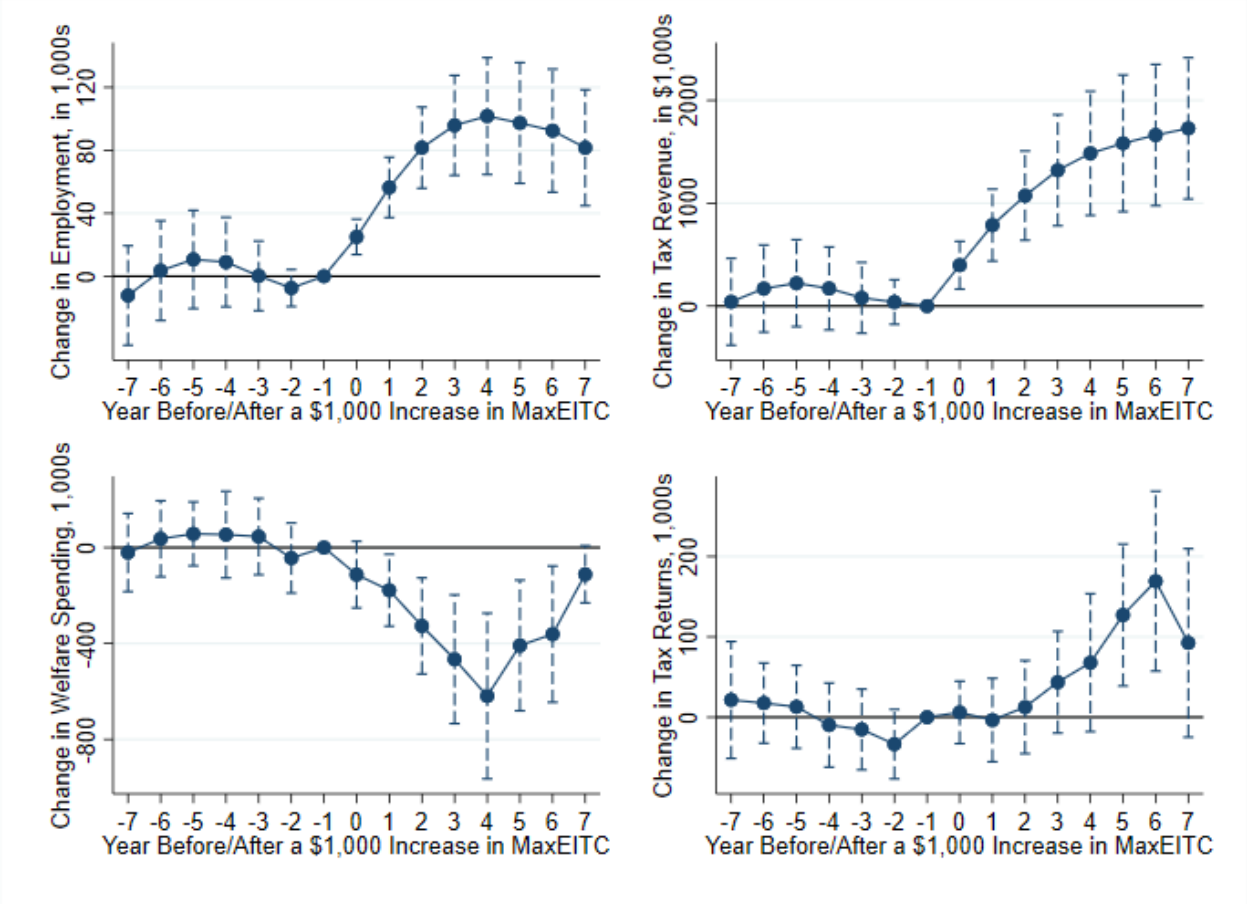


Fig. 8. State-Level Employment, Tax Revenue, Tax Filers, and Welfare Spending

Source: Maximum possible EITC benefits (*MaxEITC*) calculated by authors from IRS and NBER data and is a function of year and state (amount used for a household with 3+ children is used). Employment data source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Income Division (SA4_1929_2016__ALL_AREAS.csv); sample years 1986–2014. Tax revenue data source: https://www.census.gov/govs/www/class_ch7_tax.html; sample years 1986–2014. Welfare data source: https://www.acf.hhs.gov/ofa/resource-library/search?area%5B2377%5D=2377&topic%5B2351%5D=2351&type%5B3084%5D=3084; sample years 1986–2004. Information on tax filers from Tax Policy Center. Estimates are robust to various sets of controls, shown in Table A.15.

Appendix A: Additional Tables and Figures

Table A.1: Testing the Exogeneity of State EITCs

	State EITC Rate				Max State EITC Benefits			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Max AFDC with 3 Kids	-0.03	-0.01	-0.03	-0.20	-0.08	0.14	-0.13	-1.31
	(0.17)	(0.18)	(0.58)	(0.19)	(0.98)	(1.16)	(3.33)	(1.23)
Minimum Wage	0.02***	0.01	0.03***	0.01	0.15***	0.03	0.18***	0.04
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.05)	(0.04)
State GDP	0.01	0.05	-0.47	0.30	0.09	0.21	-2.68	1.83
	(0.05)	(0.06)	(0.35)	(0.23)	(0.26)	(0.38)	(2.12)	(1.43)
Employment Rate	0.35***	0.53	0.58	0.33	2.01***	3.70	2.80	2.56
	(0.07)	(0.39)	(0.43)	(0.33)	(0.39)	(2.24)	(2.70)	(2.23)
Top Income Tax Rate	1.06***	0.67*	0.07	0.02	6.09***	4.60**	0.84	-0.25
	(0.29)	(0.38)	(0.20)	(0.28)	(1.66)	(2.18)	(1.20)	(1.79)
Sales Tax Rate	1.17**	2.03*	1.09	2.04**	6.78**	12.96**	6.74	12.82**
	(0.55)	(1.09)	(1.22)	(0.85)	(3.17)	(6.41)	(6.86)	(5.25)
Lagged Max AFDC with 3 Kids			-0.00	0.20			0.05	1.49
			(0.51)	(0.16)			(2.98)	(1.00)
Lagged Minimum Wage			-0.01	-0.00			-0.03	-0.02
			(0.01)	(0.01)			(0.06)	(0.04)
Lagged State GDP			0.50	-0.27			2.85	-1.74
			(0.40)	(0.21)			(2.40)	(1.33)
Lagged Employment Rate			-0.24	0.24			-0.80	1.40
			(0.41)	(0.48)			(2.56)	(3.26)
Lagged Top Income Tax Rate			1.06***	1.00*			5.60***	7.37**
			(0.36)	(0.58)			(1.93)	(3.40)
Lagged Sales Tax Rate			0.09	0.06			0.06	0.69
			(1.20)	(0.97)			(6.67)	(5.55)
State and Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1,122	1,122	1,122	1,122	1,122	1,122	1,122	1,122
R-squared	0.260	0.824	0.271	0.827	0.282	0.816	0.292	0.821
p-value from Joint F-test								
Excluding State, Year FE	0.00	0.22	0.00	0.11	0.00	0.18	0.00	0.06

Source: 1990, 1995, 1996, 1998–2017 sample years. Employment rates from BLS. GDP from BEA regional data. Income tax data from the NBER. Minimum wage from the Tax Policy Center's Tax Facts. Welfare benefits from the Urban Institute's Welfare Rules Database. Sales tax data sources described in Appendix C.
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.2: Alternate Measures of the EITC

EITC Measure:	Max Federal EITC	Max State EITC	Max Total EITC	Federal EITC Phase-In Rate	Total EITC Phase-In Rate
Units:	$1,000 (2016 $)	$1,000 (2016 $)	$1,000 (2016 $)	10 Pct Points	10 Pct Points
Mean of EITC Measure:	1.31	0.04	1.35	1.09	1.13
	(1)	(2)	(3)	(4)	(5)
Panel A: Annual Weeks Worked					
EITC	.74***	1.09***	0.66***	1.45***	1.22***
	(0.11)	(0.29)	(0.09)	(0.22)	(0.16)
R-squared	0.132	0.132	0.132	0.132	0.132
Panel B: Weekly Hours Worked					
EITC	0.49***	0.71*	0.44***	0.92***	0.77***
	(0.10)	(0.29)	(0.08)	(0.18)	(0.14)
R-squared	0.137	0.136	0.137	0.137	0.137
Panel C: Binary Employment					
EITC	.008**	.009	.007**	.017**	.013**
	(.003)	(.006)	(.002)	(.005)	(.004)
R-squared	0.122	0.122	0.122	0.122	0.122
Panel D: Annual Wage and Salary Earnings					
EITC	700***	1345***	656***	1219***	1090***
	(95)	(237)	(78)	(183)	(138)
R-squared	0.140	0.140	0.140	0.140	0.140
Full controls	Yes	Yes	Yes	Yes	Yes
Observations	1,563,990	1,563,990	1,563,990	1,563,990	1,563,990

Source: Public CPS ASEC data. Sample includes all women 18–64 and years include 1987–2016. MaxEITC in columns 1–3 are defined as maximum possible EITC benefits as a function of state, year, and number of children. Average EITC benefits in columns 4–6 are created by calculating the average EITC dollars households are actually eligible for and vary by state x year x number of children cells. Employment defined as having positive weekly work hours, though estimates are very similar for positive annual work weeks, positive earnings, or labor force participation. These three measures of the EITC may be a more direct measure of the dollar value of EITC expansions. Columns 7–8 are the slope of the phase-in region of the EITC (see Figure 1) for just the federal EITC and for federal plus state EITCs. Mean dependent variable in Panels A–D are 33.3, 27.1, 0.74, 21,920. CPS ASEC weights used. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3: Crosswalking CPS and Linked IRS-CPS Results

Years:	1987–2016	1989,1994, 1995, 1998–2016	1989,1994, 1995, 1998–2016	1989,1994, 1995, 1998–2016	1989,1994, 1995, 1998–2016
Data Source for Marital Status:	CPS	CPS	Tax Data	CPS	Tax Data
Data Source for Earnings:	CPS	CPS	CPS	Tax Data	Tax Data
	(1)	(2)	(3)	(4)	(5)
Panel A: Annual Weeks Worked					
Maximum EITC	0.73***	0.27***	0.60***	0.64***	0.60***
	(0.11)	(0.08)	(0.13)	(0.12)	(0.13)
R-squared	0.13	0.11	0.10	0.09	0.10
Panel B: Weekly Hours Worked					
Maximum EITC	0.49***	0.16**	0.49**	0.54**	0.49***
	(0.10)	(0.07)	(0.13)	(0.12)	(0.13)
R-squared	0.14	0.10	0.10	0.10	0.10
Panel C: Binary Employment					
Maximum EITC	.008***	.002	.006*	.007*	.006*
	(.003)	(.002)	(.003)	(.003)	(.003)
R-squared	0.12	0.09	0.09	0.09	0.09
Panel D: Annual Wage and Salary Earnings					
Maximum EITC	700***	419***	791***	569***	558***
	(95)	(140)	(165)	(127)	(129)
R-squared	0.14	0.10	0.09	0.07	0.07
Full controls	Yes	Yes	Yes	Yes	Yes
Observations	1,563,990	1,209,019	1,209,019	1,209,019	1,209,019

Source: Regressions crosswalk the results in Table A.2 to those using earnings and marital status in IRS tax data in Table 4. Employment defined as having positive weekly work hours, though estimates are very similar for positive annual work weeks, positive earnings, or labor force participation. Mean dependent variable in Panels A–D are 33.3, 27.1, 0.74, 21,920. CPS ASEC weights used. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: EITC Increases Maternal Labor Supply, Robust to Various Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Annual Weeks Worked										
MaxEITC	.82***	1.03***	.84***	1.03***	.78***	.70***	.60***	.60***	.60***	.60***
	(.12)	(.13)	(.11)	(.12)	(.12)	(.13)	(.13)	(.13)	(.12)	(.12)
R-squared	0.007	0.008	0.014	0.015	0.083	0.090	0.097	0.097	0.098	0.099
Panel B: Weekly Hours Worked										
MaxEITC	.35**	.85***	.35**	.85***	.65***	.55***	.49***	.49***	.48***	.48***
	(.13)	(.12)	(.12)	(.12)	(.12)	(.13)	(.13)	(.13)	(.13)	(.13)
R-squared	0.008	0.010	0.013	0.015	0.089	0.097	0.102	0.102	0.103	0.104
Panel C: Employment										
MaxEITC	0.004	.013***	0.007	.012***	.008**	.008*	.006*	.006*	.006*	.006*
	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)
R-squared	0.005	0.007	0.012	0.014	0.077	0.086	0.092	0.092	0.092	0.093
Panel D: Annual Earnings										
MaxEITC	2667***	1105***	2691***	1061***	672***	587***	558***	564***	548***	554***
	(165.2)	(171.8)	(159.8)	(157.8)	(135.4)	(129.1)	(129.3)	(131.2)	(130.6)	(131.1)
R-squared	0.003	0.004	0.010	0.011	0.067	0.071	0.072	0.072	0.072	0.073
Observations	1,209,019		1,209,019		1,209,019		1,209,019		1,209,019	
Controls										
# Children FE	X	X	X	X	X	X	X	X	X	X
Year FE		X		X	X	X	X	X	X	X
State FE			X	X	X	X	X	X	X	X
Education, Married, Age, Race, Child Under 5					X	X	X	X	X	X
(Married, Educ) x (Year, State, # Children) FE						X	X	X	X	X
Annual State Factors and Time Trends							X	X	X	X
7 Welfare Reform Variables x (Single, Education)								X		
State x # Children FE									X	
State x Year FE										X

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Tax calculator used to generate EITC benefits received. Employment defined as having positive weekly work hours, though estimates are very similar for positive annual work weeks, positive earnings, or labor force participation. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. Mean dependent variable in Panels A–D are 33.3, 27.1, 0.74, 21,920. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5: EITC's Effect on Unmarried Mothers' Labor Supply, By Education

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Labor Supply						
	Annual Weeks		Weekly Hours		Employment	
MaxEITC	2.70***		2.13***		.052***	
	(.22)		(.19)		(.005)	
MaxEITC x High Educ		1.99***		1.47***		.033***
		(.26)		(.24)		(.005)
MaxEITC x Low Educ		3.12***		2.53***		.063***
		(.28)		(.22)		(.006)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.101	0.101	0.106	0.106	0.090	0.090
Observations	509,928		509,928		509,928	
Mean Dep. Var.	35.48		29.08		0.77	
Panel B: Earnings and EITC Benefits						
	Annual Earnings		EITC Benefits		Earnings with EITC	
MaxEITC	736**		513***		1250***	
	(221)		(13.9)		(215)	
MaxEITC x High Educ		807		427***		1234*
		(469)		(18.4)		(461)
MaxEITC x Low Educ		695***		565***		1259***
		(139)		(15.6)		(140)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.097	0.097	0.408	0.408	0.095	0.095
Observations	509,928		509,928		509,928	
Mean Dep. Var.	24,070		592.5		24,660	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all unmarried women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Tax calculator used to generate EITC benefits received. Employment defined as having positive weekly work hours, though estimates are very similar for positive annual work weeks, positive earnings, or labor force participation. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6: EITC and Payroll, Sales, UI Taxes Paid, Robust to Various Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Payroll Taxes Paid										
MaxEITC	320***	132***	324***	126***	73.6***	72***	68***	68.6***	66***	66***
	(20.4)	(22.3)	(19.5)	(21.1)	(18.2)	(18.7)	(18.5)	(18.7)	(18.5)	(18.6)
R-squared	0.007	0.008	0.019	0.020	0.136	0.144	0.145	0.145	0.145	0.146
Panel B: Sales Taxes Paid										
MaxEITC	100***	38.7***	100***	37***	28***	27***	26***	26***	26***	26***
	(11)	(4)	(11)	(4)	(3)	(3)	(3)	(3)	(3)	(3)
R-squared	0.003	0.006	0.028	0.030	0.074	0.082	0.083	0.083	0.084	0.084
Panel C: Unemployment Taxes Paid										
MaxEITC	-7.4***	0.71	-6.8***	0.34	-1.3	0.61	0.16	0.14	0.03	0.11
	(1.5)	(1.3)	(1.3)	(1.1)	(1.1)	(1.1)	(1.0)	(1.0)	(1.0)	(1.0)
R-squared	0.004	0.007	0.227	0.229	0.268	0.279	0.285	0.285	0.287	0.297
Panel D: Total Taxes Paid										
MaxEITC	413***	172***	416***	164***	101***	100***	95***	96***	92***	92***
	(26)	(27)	(25)	(25)	(21)	(22)	(22)	(22)	(22)	(22)
R-squared	0.007	0.008	0.022	0.024	0.133	0.141	0.141	0.142	0.142	0.143
Observations	1,209,019		1,209,019		1,209,019		1,209,019		1,209,019	
Controls										
# Children FE	X	X	X	X	X	X	X	X	X	X
Year FE		X		X	X	X	X	X	X	X
State FE			X	X	X	X	X	X	X	X
Education, Married, Age, Race, Child Under 5					X	X	X	X	X	X
(Married, Educ) x (Year, State, # Children) FE						X	X	X	X	X
Annual State Factors and Time Trends							X	X	X	X
7 Welfare Reform Variables x (Single, Education)								X		
State x # Children FE									X	
State x Year FE										X

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Tax calculator used to calculate payroll taxes. Sales taxes computed by authors (see Table C.2) and are a function of earnings, EITC benefits, state, and year. Unemployment taxes computed by authors and described in Appendix C. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.7: The EITC and Public-Assistance Benefits, Robust to Various Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: AFDC/TANF Welfare										
MaxEITC	-185***	-197***	-184***	-197***	-195***	-260***	-259***	-258***	-253***	-253***
	(27)	(30)	(28)	(30)	(30)	(38)	(37)	(37)	(38)	(38)
R-squared	0.022	0.026	0.026	0.030	0.048	0.087	0.091	0.092	0.099	0.100
Panel B: Public Housing										
MaxEITC	1	-23***	3	-23***	-19**	-26**	-24**	-24**	-22**	-22**
	(7)	(6)	(7)	(6)	(6)	(8)	(8)	(8)	(7)	(7)
R-squared	0.002	0.002	0.008	0.008	0.033	0.054	0.055	0.055	0.056	0.057
Panel C: SNAP/Food Stamps										
MaxEITC	67***	46***	68***	47***	53***	51***	56***	56***	57***	57***
	(8)	(9)	(8)	(9)	(8)	(9)	(9)	(9)	(8)	(8)
R-squared	0.036	0.045	0.040	0.049	0.107	0.156	0.161	0.162	0.163	0.165
Panel D: SSI/Disability Insurance										
MaxEITC	8	-21*	10	-21*	-21*	-19	-17	-17	-17	-17
	(8)	(10)	(8)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
R-squared	0.001	0.001	0.002	0.002	0.012	0.013	0.014	0.014	0.014	0.015
Panel E: Unemployment Insurance										
MaxEITC	32***	-4	32***	-4	-6	.68	1	2	2	2
	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
R-squared	0.000	0.004	0.001	0.006	0.008	0.008	0.009	0.009	0.009	0.010
Panel F: Total Public Assistance										
MaxEITC	-78**	-199***	-71**	-197***	-187***	-252***	-242***	-241***	-234***	-234***
	(24)	(31)	(24)	(31)	(31)	(38)	(36)	(35)	(36)	(36)
R-squared	0.007	0.010	0.011	0.014	0.060	0.084	0.088	0.088	0.089	0.089
Observations	1,209,019		1,209,019		1,209,019		1,209,019		1,209,019	
Controls										
# Children FE	X	X	X	X	X	X	X	X	X	X
Year FE		X		X	X	X	X	X	X	X
State FE			X	X	X	X	X	X	X	X
Education, Married, Age, Race, Child Under 5					X	X	X	X	X	X
(Married, Educ) x (Year, State, # Children) FE						X	X	X	X	X
Annual State Factors and Time Trends							X	X	X	X
7 Welfare Reform Variables x (Single, Education)								X		
State x # Children FE									X	
State x Year FE										X

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Public assistance outcomes are all self-reported. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.8: EITC and Receiving Any Public Assistance, Robust to Various Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: AFDC/TANF Welfare										
MaxEITC	-.021***	-.020***	-.021***	-.020***	-.020***	-.028***	-.028***	-.028***	-.027***	-.027***
	(.001)	(.001)	(.001)	(.001)	(0.001)	(.001)	(.001)	(.001)	(.001)	(.001)
R-squared	0.020	0.023	0.022	0.025	0.056	0.094	0.098	0.098	0.101	0.102
Panel B: Public Housing										
MaxEITC	.000	-.003***	.000	-.003***	-.003**	-.003**	-.003**	-.003**	-.003**	-.003**
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
R-squared	0.002	0.002	0.005	0.006	0.033	0.053	0.054	0.054	0.055	0.057
Panel C: SNAP/Food Stamps										
MaxEITC	.009***	-.004*	.009***	-.003*	-.002	-.003*	-.002	-.002	-.002	-.002
	(.002)	(.002)	(.002)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
R-squared	0.018	0.027	0.024	0.033	0.119	0.154	0.159	0.159	0.160	0.161
Panel D: Supplemental Security Insurance + Disability Insurance										
MaxEITC	.000	-.001	.000	-.001	-.001	-.002*	-.001	-.001	-.001	-.001
	(.001)	(.001)	(.001)	(.001)	(0.00)	(.001)	(.001)	(.001)	(.001)	(.001)
R-squared	0.002	0.002	0.004	0.004	0.027	0.031	0.031	0.031	0.031	0.032
Panel E: Unemployment Insurance										
MaxEITC	.000	.000	.000	.000	.000	.001	.001	.001	.001	.001
	(.000)	(.000)	(.000)	(.000)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
R-squared	0.000	0.003	0.002	0.005	0.009	0.010	0.010	0.010	0.010	0.011
Observations	1,209,019		1,209,019		1,209,019		1,209,019		1,209,019	
Controls										
# Children FE	X	X	X	X	X	X	X	X	X	X
Year FE		X		X	X	X	X	X	X	X
State FE			X	X	X	X	X	X	X	X
Education, Married, Age, Race, Child Under 5					X	X	X	X	X	X
(Married, Educ) x (Year, State, # Children) FE						X	X	X	X	X
Annual State Factors and Time Trends							X	X	X	X
7 Welfare Reform Variables x (Single, Education)								X		
State x # Children FE									X	
State x Year FE										X

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits (*MaxEITC*) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Public assistance outcomes are all self-reported. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.9: Heterogeneous Effects of EITC on Various Forms of Taxes Paid

	(1)	(2)	(3)	(4)	(5)	(6)
	Payroll Taxes		Sales Taxes		Unemployment Taxes	
MaxEITC	68***		26***		0.2	
	(18)		(3)		(1.0)	
MaxEITC X Married		52*		18***		-1.5
		(22)		(4)		(1.3)
MaxEITC X Single		104**		44***		4.0*
		(31)		(8)		(1.7)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.145	0.145	0.083	0.083	0.285	0.285
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019
Mean Dep. Var.	3,689		613.4		256.9	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Tax calculator used to calculate payroll taxes. Sales taxes computed by authors (see Table C.2) and are a function of earnings, EITC benefits, state, and year. Unemployment taxes computed by authors and described in Appendix C. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.10: Effect of the EITC on the Amount of Public Assistance Received

	(1)	(2)	(3)	(4)	(5)	(6)
	Cash Welfare		Public Housing		Food Stamps	
MaxEITC	-259***		-24**		56***	
	(37)		(8)		(9)	
MaxEITC X Married		-38**		5		79***
		(11)		(4)		(6)
MaxEITC X Single		-764***		-91***		4
		(102)		(22)		(26)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.088	0.095	0.056	0.056	0.161	0.162
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019
Mean Dep. Var.	98.0		206.2		308.0	

	(7)	(8)	(9)	(10)
	DI and SSI		Unemployment Insurance	
MaxEITC	-17.5		1.3	
	(10.1)		(3.9)	
MaxEITC X Married		-20.9		-3.3
		(10.8)		(4.4)
MaxEITC X Single		-9.6		12.1
		(15.6)		(9.2)
Full controls	Yes	Yes	Yes	Yes
R-squared	0.014	0.014	0.009	0.009
Observations	1,209,019	1,209,019	1,209,019	1,209,019
Mean Dep. Var.	334.8		166.3	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Public assistance outcomes are all self-reported. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.11: Effect of the EITC on Receiving Any Public Assistance

	(1)	(2)	(3)	(4)	(5)	(6)
	Cash Welfare		Public Housing		Food Stamps	
MaxEITC	-0.028***		-0.003**		-0.002	
	(0.001)		(0.001)		(0.001)	
MaxEITC X Married		-0.004***		0.001		0.008***
		(0.001)		(0.001)		(0.001)
MaxEITC X Single		-0.084***		-0.012***		-0.026***
		(0.004)		(0.003)		(0.004)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.098	0.104	0.054	0.054	0.159	0.159
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019
Mean Dep. Var.	0.022		0.027		0.101	
	DI and SSI		Unemployment Insurance			
MaxEITC	-0.001		0.001			
	(0.001)		(0.001)			
MaxEITC X Married		-0.001*		0.004		
		(0.001)		(0.001)		
MaxEITC X Single		-0.002		0.003*		
		(0.002)		(0.001)		
Full controls	Yes	Yes	Yes	Yes		
R-squared	0.031	0.031	0.010	0.010		
Observations	1,209,019	1,209,019	1,209,019	1,209,019		
Mean Dep. Var.	0.037		0.031			

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Public assistance outcomes are all self-reported. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.12: Effects of the EITC Before and After 1998

	Weeks Worked	Hours Worked	Employed	Annual Earnings	Total Taxes Paid	Public Assistance Received	EITC Benefits Received
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Full Sample							
MaxEITC Pre1998	.41**	.38***	.007**	262	60.2*	-89.3***	308***
	(.12)	(.10)	(.002)	(172)	(25)	(24)	(9)
MaxEITC Post1998	.52***	.45***	.007*	439**	81***	-181***	333***
	(.115)	(.114)	(.003)	(134)	(22)	(30)	(9)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.097	0.102	0.092	0.072	0.141	0.088	0.302
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019
Panel B: Sample of Unmarried Women							
MaxEITC Pre1998	1.73***	1.49***	.038***	453	95.2*	-449***	514***
	(.15)	(.12)	(.003)	(259)	(37)	(81)	(11)
MaxEITC Post1998	2.27***	1.85***	.046***	612*	122**	-628***	513***
	(.17)	(.15)	(.004)	(232)	(35)	(87)	(10)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.096	0.103	0.086	0.097	0.176	0.100	0.376
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits ($MaxEITC$) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Public assistance outcomes are all self-reported. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.13: Log-Log Specification

	Weeks Worked	Hours Worked	Annual Earnings and EITC	Total Taxes Paid	Public Assistance Received
	(1)	(2)	(3)	(4)	(5)
Log MaxEITC	.225**	.209**	.738***	.889***	-.447***
	(.064)	(.070)	(.076)	(.177)	(.097)
Full controls	Yes	Yes	Yes	Yes	Yes
R-squared	0.097	0.100	0.146	0.092	0.140
Observations	1,209,019	1,209,019	1,209,019	1,209,019	1,209,019

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 18–64 years old, except for women who are dependents. Maximum possible EITC benefits (*MaxEITC*) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.14: Household-Level Regressions

	Household Earnings	EITC Benefits Received	Taxes Paid	Public Assistance Received
	(1)	(2)	(3)	(4)
MaxEITC	596	316***	49	-242***
	(1430)	(9)	(160)	(38)
Full controls	Yes	Yes	Yes	Yes
Mean Dep. Var.	55,000	360	8,800	1,065
R-squared	0.111	0.265	0.241	0.031
Observations	1,401,595	1,401,595	1,401,595	1,401,595

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes one observation per household, which includes married couples, single men, and single women. Maximum possible EITC benefits (*MaxEITC*) calculated by authors from IRS and NBER data and is a function of year and number and age of children, and is independent of income or actually receiving the EITC. Public assistance outcomes are all self-reported. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year-by-number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table A.15: The EITC and State-Level Employment, Tax Revenue, Welfare Spending

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Total State Employment (in 1000s), in Year t+1								
MaxEITC	87.17***	126.5***	65.66***	64.1***	38.54***	50.05***	68.21***	68.04***
	(15.79)	(15.66)	(12.13)	(11.9)	(8.707)	(9.525)	(15.99)	(16.01)
R-squared	0.998	0.998	0.999	0.999	0.999	0.999	1.000	1.000
Observations	1400	1400	1350	1300	1300	1300	1300	1300
Mean Dep. Var.	3202	3202	3272	3295	3295	3295	7150	7150
Panel B: Total State Tax Revenue (in 1000s), in Year t+1								
MaxEITC	1,809***	1,677***	810***	853.1***	691***	788***	1,213***	1,207***
	(252.8)	(250.5)	(201.3)	(204.1)	(174)	(179)	(309.9)	(310.3)
R-squared	0.984	0.989	0.990	0.991	0.991	0.993	0.997	0.997
Observations	1400	1400	1350	1300	1300	1300	1300	1300
Mean Dep. Var.	14416	14416	14563	14727	14727	14727	33896	33896
Panel C: Total State Welfare Spending (in 1000s), in Year t+1								
MaxEITC	-278.3***	-284.8***	-101.1*	-86.19	-52.01	-51.17	-182*	-182*
	(78.73)	(77.99)	(43.7)	(48.54)	(42.52)	(39.64)	(76.63)	(76.63)
R-squared	0.933	0.949	0.953	0.955	0.964	0.972	0.991	0.991
Observations	896	896	844	790	790	790	790	790
Mean Dep. Var.	532	532	521	505	505	505	1524	1524
Controls								
State and Year FE	X	X	X	X	X	X	X	X
Population	X	X	X	X	X	X	X	X
State Factors, Year t		X	X	X	X	X	X	X
State Factors, Year t-1			X	X	X	X	X	X
State Factors, Year t-2				X	X	X	X	X
Lagged Outcome Variable				X	X	X	X	X
Region-Specific Trends					X	X	X	X
Region by Year FE						X	X	X
Weighted by State Pop							X	X
MaxEITC Defined as Max State EITC								X

Source: Maximum possible EITC benefits (*MaxEITC*) calculated by authors from IRS and NBER data and is a function of year and state (amount used for a household with 3+ children is used). Employment data source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Income Division (SA4_1929_2016__ALL_AREAS.csv); sample years 1986-2014. Tax revenue data source: https://www.census.gov/govs/www/class_ch7_tax.html; sample years 1986–2014. Welfare data source: https://www.acf.hhs.gov/ofa/resource-library/search?area%5B2377%5D=2377&topic%5B2351%5D=2351&type%5B3084%5D=3084; sample years 1986–2004.

Table A.16: Implied Short-Run Effects for a Woman with Two Kids

Variables	All Women (1)	Unmarried Women (2)	Married Women (3)
Average MaxEITC (unadjusted)	5,244	5,266	5,237
LFPR (adjusted)	0.031	0.274	-0.073
Earnings (adjusted)	2,926	4,186	2,383
Avg EITC Received $ (adjusted)	1,835	2,786	1,424
FICA Taxes Paid (adjusted)	178	274	136
Sales Taxes Paid (adjusted)	136	232	94
Public Assistance Received (adjusted)	1,269	4,445	-110
Government Revenue (adjusted)	1,584	4,950	120
Government Revenue - EITC $ (adjusted)	-252	2,164	-1,304
Government Revenue / EITC $ (adjusted)	0.863	1.777	0.085

Source: We consider a woman with two children with an average $MaxEITC$ value of $5,244 (for a woman with two children). We multiply the regression-adjusted estimates of labor supply, taxes paid, and public assistance received (from Tables 2, 4, and A.10) by 5.244. Payroll taxes are valued at 50 cents on the dollar. We ignore UI taxes and benefits since they essentially cancel out. Gov. Revenue is equal to payroll and sales taxes minus public assistance.

Table A.17: Implied Cost of the EITC Over a Woman's Lifetime

Assuming:	Public Assistance Declines for 5 Years		Public Assistance Declines Each Year	
Assuming:	Earnings Growth	No Earnings Growth	Earnings Growth	No Earnings Growth
Panel A: All Women				
Assuming $1 in Payroll Taxes Is Worth	(1)	(2)	(3)	(4)
$0	-$20,554	-$20,990	-$6,391	-$6,827
$0.50	-$17,152	-$18,160	-$2,989	-$3,997
Panel B: Always Unmarried				
	(5)	(6)	(7)	(8)
$0	-$18,844	-$19,586	$30,759	$30,016
$0.50	-$13,619	-$15,238	$35,984	$34,364
Panel C: Always Married				
	(9)	(10)	(11)	(12)
$0	-$21,337	-$21,639	-$22,564	-$22,866
$0.50	-$18,739	-$19,477	-$19,966	-$20,704

Source: We simulate the EITC's cost over a woman's lifetime for a representative woman with two children that receives the EITC for 20 years and then is unaffected by the EITC. We simulate the costs by varying various assumptions: (1) with and without a 2 percent annual earnings (and taxes paid) growth; (2) if the effect on public assistance occurs every year and if the effect only lasts for five years (since welfare is only available for five years in many states); (3) if payroll taxes are valued at $0 or valued at 50 cents on the dollar. We also assume that she receives the same amount of EITC benefits in each year. All dollars are discounted at 3 percent per year and are in present value dollars.

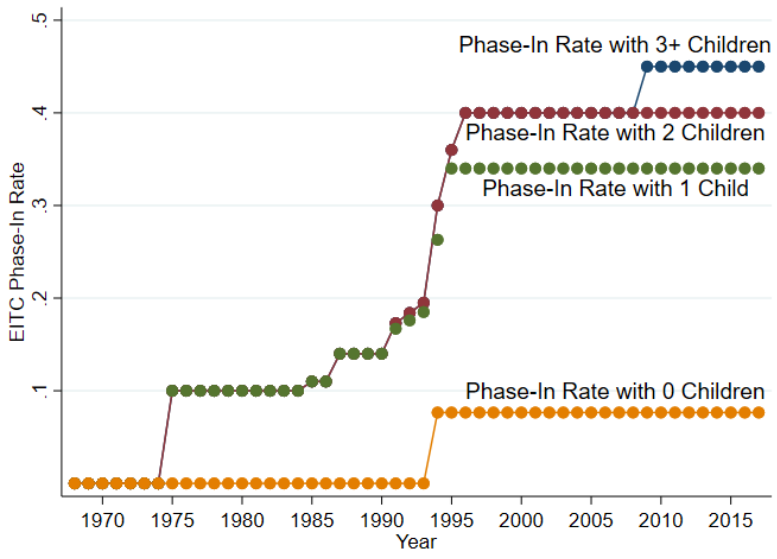


Fig. A.1. Time-Series Variation in Phase-In Rate by Number of Children

Notes: Authors' calculations from IRS data.

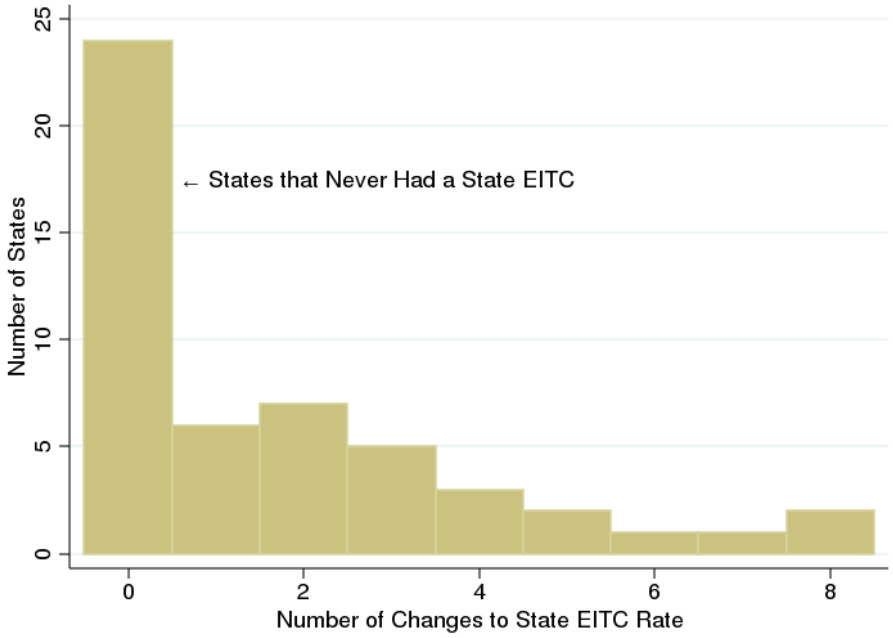


Fig. A.2. Histogram of State EITC Changes

Source: Authors' calculations from NBER data: http://users.nber.org/~taxsim/state-eitc.html.

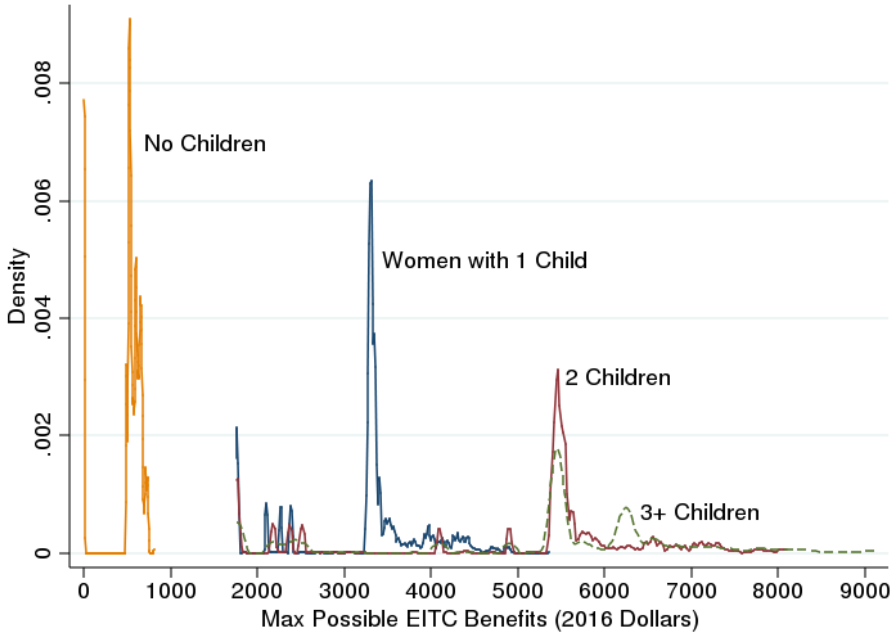


Fig. A.3. Distribution of $MaxEITC$ by Number of Children

Source: Authors' calculations from 1988–2017 CPS ASEC data.

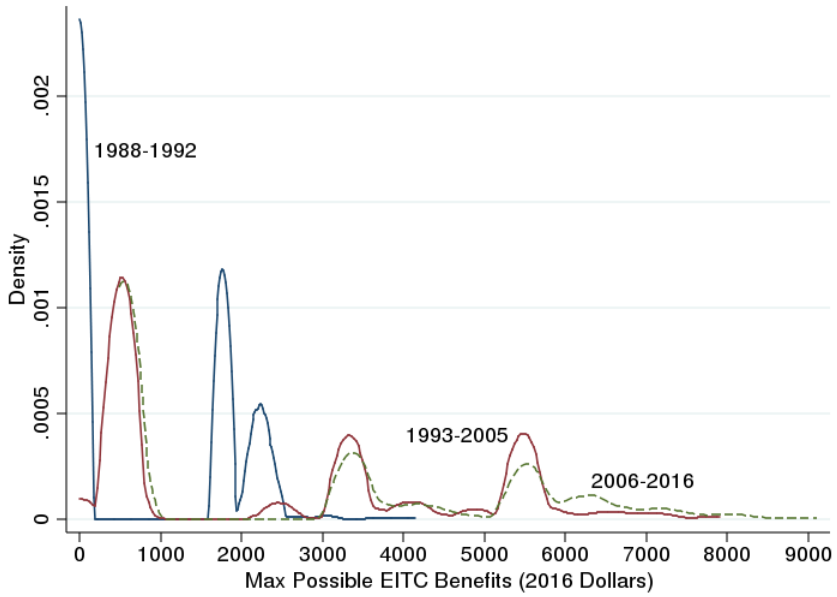


Fig. A.4. Distribution of $MaxEITC$ Over Time

Source: Authors' calculations from 1988–2017 CPS ASEC data.

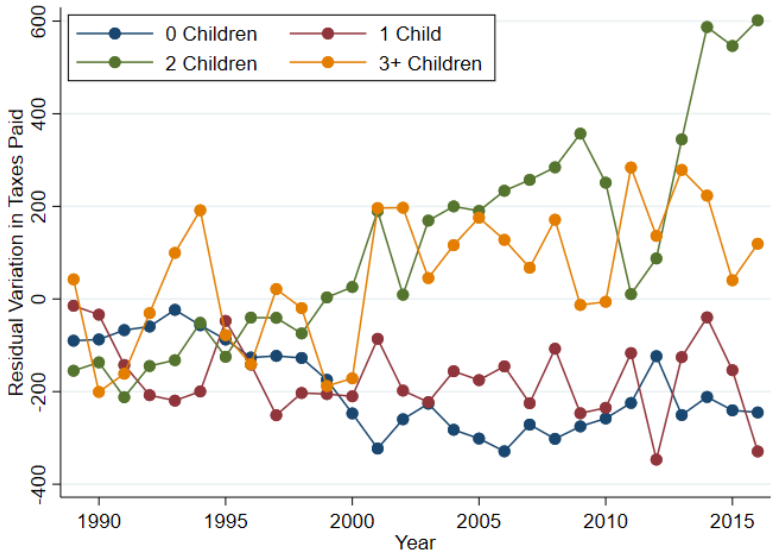


Fig. A.5. Residual Variation from Regressing Taxes Paid on Full Set of Controls

Notes: 1990-2017 CPS ASEC. Residuals come from a regression of payroll, sales, plus unemployment taxes paid on the full set of controls, using CPS weights. Residuals are averaged into year x number of children bins. Including state x year FE produces nearly identical results. Units are real 2016 dollars. Comparing these trends with Figures 2 and 3 provides the intuition behind the estimates in Table 4.

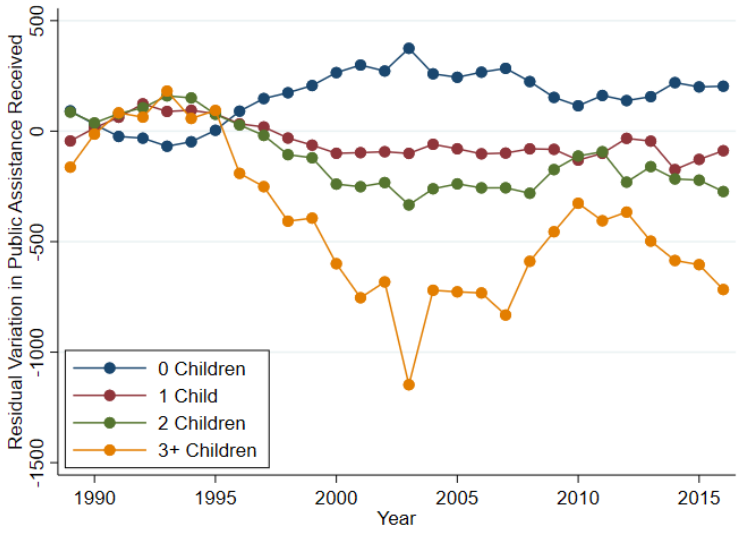


Fig. A.6. Residual Variation from Regressing Public Assistance on Full Set of Controls

Notes: Same data, sample, and empirical approach as Figure A.5, except public assistance is used instead of taxes. Comparing these trends with Figures 2 and 3 provides the intuition behind the estimates in Table 4.

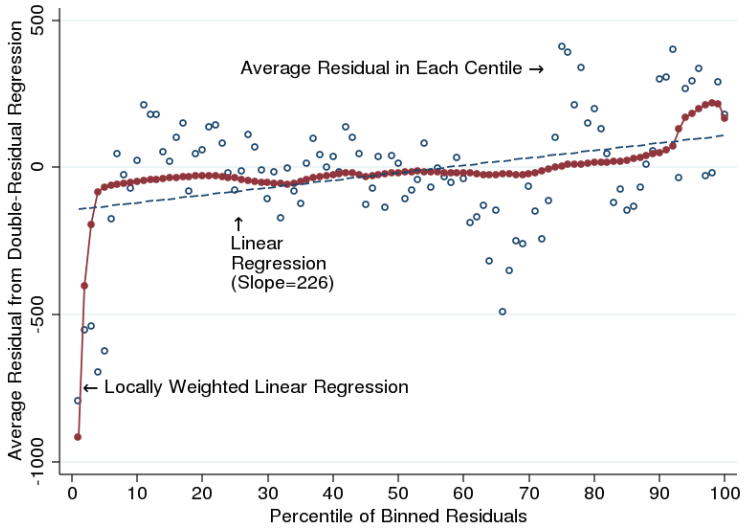


Fig. A.7. Double Residual Regression Reveals a Roughly Constant Effect

Notes: Data and sample identical to Figure 5. For double residual regression, two sets of residuals are created for each individual, averaged into centile bins, and plotted against each other. One set of residuals comes from the regression of government revenue (tax revenue minus public assistance) on the full set of controls (excluding $MaxEITC$); a second set of residuals comes from the regression of $MaxEITC$ on the full set of controls. Cleveland (1979) is a locally weighted non-parametric regression that is more computationally demanding that regular local polynomial regression as it down-weights observations with large residuals. A bandwidth of 0.8 is used, as is running-line least squares smoothing, and a tricube weighting function. The locally weighted regression shows relatively constant effects of $MaxEITC$ on government revenue, except for the endpoints, which are often noisy in this approach.

Appendix B: Mathematical Proofs

The following mathematical proofs use the optimal EITC first order condition in equation (10) and the implicit function theorem to show that the optimal EITC is: (1) larger as more and more of the funding for the EITC comes from newly working lower-skill workers, and (2) smaller as more and more of the funding for the EITC comes from increasing taxes on higher-skill workers

$$H \equiv \sum_{i=0}^{I} \frac{\partial h_i}{\partial T^E}\left[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\right] + \sum_{i=0}^{I} \frac{\partial T_i^E}{\partial T^E}(g_i - \lambda)h_i = 0,$$

we use the implicit function theorem to show:

$$\frac{\partial \sum_{i=1}^{i^3} T_i^E}{\partial\Big(\sum_{i=1}^{i^2} \frac{\partial h_i}{\partial T^E} T_i\Big)} = \frac{-\partial H \Big/ \partial\Big(\sum_{i=1}^{i^2} \frac{\partial h_i}{\partial T^E} T_i\Big)}{\partial H \Big/ \partial \sum_{i=1}^{i^3} T_i^E} = \frac{-\sum_{i=1}^{i^2}(g_i - \lambda)}{M}$$

where

$$\begin{aligned}
M &= \frac{\partial \sum_{i=1}^{i^3} \frac{\partial h_i}{\partial T^E}\left[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\right]}{\partial \sum_{i=1}^{i^3} T_i^E} + \frac{\partial \sum_{i=0}^{I} \frac{\partial T_i^E}{\partial T^E}(g_i - \lambda)h_i}{\partial \sum_{i=1}^{i^3} T_i^E} \\
&= \underbrace{\sum_{i=1}^{i^3} \frac{\partial h_i}{\partial T^E}(g_i - \lambda)}_{>0} + \underbrace{\sum_{i=1}^{i^3} \frac{\partial(\partial h_i / \partial T^E)}{\partial \sum_{i=1}^{i^3} T_i^E}\left[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\right]}_{<0} + \\
&\qquad \underbrace{\sum_{i=1}^{i^3} \frac{\partial T_i^E}{\partial T^E}(g_i - \lambda)\frac{\partial h_i}{\partial \sum_{i=1}^{i^3} T_i^E}}_{>0} + \underbrace{\sum_{i=1}^{i^3} \frac{\partial(\partial T_i^E / \partial T^E)}{\partial \sum_{i=1}^{i^3} T_i^E}(g_i - \lambda)h_i}_{=0 \text{ since } \partial T_i^E / \partial T^E = 1 \text{ for } i < i^E} \\
&= \underbrace{2\sum_{i=1}^{i^3} \frac{\partial h_i}{\partial T^E}(g_i - \lambda)}_{>0} + \underbrace{\sum_{i=1}^{i^3} \frac{\partial(\partial h_i / \partial T^E)}{\partial \sum_{i=1}^{i^3} T_i^E}\left[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\right]}_{<0}.
\end{aligned}$$

The second term is negative because of diminishing labor-supply returns to EITC expan-

sions.[87] Assuming that this term is larger than the first term, $M < 0$ and the overall comparative static is positive:

$$\frac{\partial \sum_{i=1}^{i^3} T_i^E}{\partial\Big(\sum_{i=1}^{i^2} \frac{\partial h_i}{\partial T^E} T_i\Big)} > 0$$

which means that the optimal EITC is larger as more and more of the funding for the EITC comes from newly working lower-skill workers.

We can also use the same approach to show that the optimal EITC is smaller as more and more of the funding for the EITC comes from increasing taxes on higher-skill workers:[88]

$$\frac{\partial \sum_{i=1}^{i^3} T_i^E}{\partial\Big(\sum_{i=i^3}^{I} \frac{\partial(-T_i^E)}{\partial T^E} h_i\Big)} = \frac{-\partial H \Big/ \partial\Big(\sum_{i=i^3}^{I} \frac{\partial(-T_i^E)}{\partial T^E} T_i\Big)}{\partial H \Big/ \partial \sum_{i=1}^{i^3} T_i^E} = \frac{-\sum_{i=1}^{i^2} -(g_i - \lambda)}{M < 0} < 0.$$

[87] Note also that $\frac{\partial h_i}{\partial T^E} \equiv \frac{\partial h_i}{\partial \sum_{i=0}^{I} T^E} = \frac{\partial h_i}{\partial \sum_{i=1}^{i^3} T^E}$ for $\forall i < i^E$ and that the government can freely choose T^E for each occupation $i < i^E$, so that $\partial T_i^E / \partial \sum_{i=1}^{i^3} T_i^E = 0$ for $\forall i, j < i^E$ and $i \neq j$, and the derivative equals one for $i = j$. (Recall that for the higher-skill types paying for the EITC and not receiving it, $\partial T_i^E / \partial \sum_{i=1}^{i^3} T_i^E \neq 0$.)

[88] The denominator M is the same as above. We include $-T_i^E$, since $T_i < 0$ for these skill types, to make the derivative more intuitive and answer the following question: if the density of the population in these occupations increases or if the taxes that they pay increases, how does this affect the optimal EITC?

Appendix C: Variable and Data Description

Payroll Taxes: Federal Insurance Contributions Act (FICA) payroll taxes are the Social Security and Medicare taxes that all U.S. workers pay on their gross pay (up to $127,200 in 2017). 13.4 of the 15.3 percent is the Social Security portion (known as Old Age, Survivors, and Disability program, or OASDI) and the other 2.9 percent is the Medicare portion. We calculate these using the Bakija tax calculator, assuming that workers bear the full incidence of this tax.

Sales Taxes: Table C.2 shows how we calculate sales taxes paid. Earnings are divided into 22 spending categories according to BLS estimates of the composition of spending by the lower two quintiles (https://www.bls.gov/cex/csxann12.pdf). We calculate sales taxes paid based on annual state sales tax rates, earnings and EITC benefits, and decomposing spending into taxable and nontaxable goods (some goods have a separate tax rate). Sales tax estimates would be slightly higher if we also considered local sales taxes paid.

States sales taxes source by year: 1946–2002 (https://www.bus.umich.edu/otpr/otpr/default.asp), 2003 (http://knowledgecenter.csg.org/kc/system/files/table_7.10_3.pdf), 2004 (http://knowledgecenter.csg.org/kc/content/bos-2004-chapter-7-state-finance-and-demographics), 2005 (http://knowledgecenter.csg.org/kc/content/bos-2005-chapter-7-state-finance-and-demographics), 2006 (http://knowledgecenter.csg.org/kc/content/bos-2006-chapter-7-state-finance), 2007 (http://knowledgecenter.csg.org/kc/content/bos-2007-chapter-7-state-finance-and-dem
2008 (http://knowledgecenter.csg.org/kc/content/bos-2008-chapter-7-state-finance-and-dem
2009 (http://heinonline.org/HOL/Page?handle=hein.taxfoundation/ffbjgxz0001&div=1&id=&page=&collection=taxfoundation), 2010 (http://heinonline.org/HOL/Page?handle=hein.taxfoundation/ffceaxz0001&div=1&id=&page=&collection=taxfoundation), 2011 (https://taxfoundation.org/state-and-local-sales-tax-rates-2011-2013/), 2012 (Source:https://taxfoundation.org/state-and-local-sales-taxes-2012/), 2013 (https://taxfoundation.org/state-and-local-sales-tax-rates-2013/), 2014 (https://taxfoundation.org/state-and-local-sales-tax-rates-2014/), 2015 (https://taxfoundation.org/state-and-local-sales-tax-rates-2015/), 2016 (https://taxfoundation.org/state-and-local-sales-tax-rates-2016/), and 2017 (https://taxfoundation.org/state-and-local-sales-tax-rates-in-2017/).

Additional data sources used in Table B1 include: alcoholic beverages (http://www.businessinsider.com/us-taxes-on-beer-wine-and-spirits-maps-2014-2), vehicles (https://www.marketwatch.com/story/states-where-youll-pay-the-lowest-property-and-vehicl
gasoline (https://www.api.org/oil-and-natural-gas/consumer-information/

motor-fuel-taxes/gasoline-tax), and cigarette (https://taxfoundation.org/state-cigarette-taxes/).

Unemployment Taxes: We calculate federal and state sales taxes paid based on earnings and the following information.

Since 1946 the federal wage base for unemployment insurance taxes has been increased three times, from $3,000 up to $4,200 in 1972, to $6,000 in 1978 and to $7,000 in 1983 (https://www.epionline.org/studies/r55/). Initially, the Federal tax was 1.0 percent (0.1 percent effective tax) of the total wages of a worker. By 1940 it had increased to 3.0 percent (0.3 percent effective tax) on wages up to $3,000. Since then, the rate has increased a number of times, occasionally on a temporary basis. In 1985, the Federal tax reached 6.2 percent (0.8 percent effective tax) on taxable wages. On July 1, 2011, the Federal tax was reduced to 6.0 percent. The taxable wage base increased to $4,200 in 1972, $6,000 in 1978, and $7,000 in 1983 (https://www.unemploymentinsurance.doleta.gov/unemploy/pdf/uilawcompar/2017/financing.pdf). In general, in recent years, employers pay a federal tax of 0.6 percent on the first $7,000 in annual earnings for every employee (i.e., $42). Employers who pay on time get a tax break at 5.4 percent. While technically employers pay both the federal and state taxes, economists generally regard the tax as falling on workers on the theory that the dollars employers pay in tax would otherwise go into workers' paychecks. This tax is regressive; because most workers earn more than $7,000 per year, they are effectively paying the same flat tax of $42 per year regardless of income. Technically, the gross tax rate is 6.0 percent, but states with UI programs approved by the Department of Labor and no delinquent loans from the federal trust fund receive a 5.4 percent credit, making the effective tax rate 0.6 percent. An additional 0.2 percent FUTA surtax was established in 1982 — raising the per-employee federal UI tax rate to 6.2 percent ($56 on the first $7,000 paid) — but Congress allowed it to lapse in July 2011 (https://www.cbpp.org/research/introduction-to-unemployment-insurance).

The state rate varies from around 1 to 4.3 percent, and the amount of earnings taxed varies from around $7,000 to $40,000, yielding annual tax revenue up to $1,000—and averaging $489—per worker in 2012 (less than 1.0 percent of total wages paid) (Stone and Chen, 2013). With such low upper bounds, newly working women would generate this tax revenue, whereas purely intensive margin responses among already-working women may not.

UI taxes data source: https://workforcesecurity.doleta.gov/unemploy/content/sigpros/.

AFDC/TANF Welfare: State and federal governments share the cost of welfare, with federal block grants reimbursing state welfare spending at a rate between 50 and 83 percent. Details here: https://fas.org/sgp/crs/misc/

RL32748.pdf and https://www.cbpp.org/research/family-income-support/how-states-use-federal-and-state-funds-under-the-tanf-block-grant. We divide self-reported welfare benefits between federal and state governments using these fractions.

Public Housing: Public housing is paid by the federal government. We use self-reported binary indicators and then assign a value to public housing based on average annual state value of housing assistance reported by U.S. Department of Housing and Urban Development (https://www.huduser.gov/portal/datasets/assthsg.html).

SNAP/Food Stamps: The federal government pays all of the program costs and nearly 50 percent of the administrative costs (http://www.frac.org/programs/supplemental-nutrition-assistance-program-snap). We use self-reported benefits.

Supplemental Security Income: SSI is paid for by the federal government using general tax revenues, not Social Security taxes. We use self-reported benefits. Sources for footnote 33 is https://www.ssa.gov/ssi/ and Table 8 shows monthly federal and state benefits. Sources for state SSI data: AL https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/al.html; AK http://dpaweb.hss.state.ak.us/POLICY/PDF/APA_Standards.pdf; AZ https://www.ssa.gov/ssi/text-benefits-ussi.htm; AR https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ar.html; CA https://www.ssa.gov/pubs/EN-05-11125.pdf; CO https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/co.html; CT https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ct.html; DE https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/de.html; FL https://www.dcf.state.fl.us/programs/access/docs/esspolicymanual/a_12.pdf; GA https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ga.html; HI https://www.ssa.gov/pubs/EN-05-11108.pdf; ID http://help.workworldapp.com/wwwebhelp/ssi_state_supplement_idaho.htm; IL https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/il.html; IN https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/in.html; IA https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ia.html; KS https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ks.html; KY https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ky.html; LA https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/la.html; ME https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/me.html; MD https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/md.html; MA https://www.mass.gov/massachusetts-state-supplement-program; MI https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/mi.html; MN

https://mn.db101.org/mn/programs/income_support/msa/program2a.htm; MO https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/mo.html; MT https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/mt.html; NE https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ne.html; NV https://www.ssa.gov/pubs/EN-05-11106.pdf; NH https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/nh.html; NJ https://www.ssa.gov/pubs/EN-05-11148.pdf; NM https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/nm.html; NY https://www.ssa.gov/pubs/EN-05-11146.pdf; NC https://www.ssa.gov/pubs/EN-05-11146.pdf; ND https://www.ssa.gov/ssi/text-benefits-ussi.htm; OH https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/oh.html; OK https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ok.html; OR http://help.workworldapp.com/wwwebhelp/ssi_state_supplement_oregon.htm; PA https://www.ssa.gov/pubs/EN-05-11150.pdf; RI https://www.ssa.gov/pubs/EN-05-11164.pdf; SC https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/sc.html; SD https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/sd.html; TN https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/tn.html; TX https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/tx.html; UT https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/ut.html; VT https://www.ssa.gov/pubs/EN-05-11128.pdf; VA https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/va.html; WA https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/wa.html; DC https://www.ssa.gov/pubs/EN-05-11162.pdf; WV https://www.ssa.gov/ssi/text-benefits-ussi.htm; WI https://www.dhs.wisconsin.gov/publications/p2/p23043.pdf; and WY https://www.ssa.gov/policy/docs/progdesc/ssi_st_asst/2011/wy.html.

Disability Insurance: DI is funded via payroll taxes and paid by the federal government. We use self-reported benefits.

Unemployment Insurance: UI benefits are collected and paid by federal and state governments. We use self-reported benefits. UI benefits have been taxed since 1987. UI taxes and benefits are very small compared to other taxes and benefits.

WIC: Although WIC is not a part of our main calculation, we mention it in footnote 39. WIC is self-reported as a binary. We impute its value as $61 per month per eligible child (Carlson et al., 2015). WIC requires family income below 185 percent of the poverty line ($58,000 in 2017 for a family of four) (Carlson et al., 2015). WIC has a fixed budget, so some women using less WIC will be replaced by other women that will participate in WIC. WIC data is only available after 2001. Finally, for WIC, the federal government provides most of the funding, though some states supplement their programs with their own funding.

See https://fas.org/sgp/crs/misc/R44115.pdf).

Price Deflator: We use the CPI to put all dollars in real 2016 dollars. Source: https://fred.stlouisfed.org/series/CPIAUCSL#0.

Identifying Tax-Filing Units in the CPS: As in Jones and Ziliak (2018), we use responses to household relationship questions in the ASEC to create tax units and assign dependents to filers. We construct our own markers for tax filers and potential dependents. First, we assign heads and spouses (if applicable) for each potential filing unit identified by a unique ID based on household sequence number, family sequence number, family position, and family type. Heads are defined for a primary family, a related subfamily, an unrelated subfamily, or a primary individual. Dependent filers are accounted for so that they are not inadvertently assigned as EITC eligible. We then construct a variable for the number of dependents based on age of each household child and relationship to head, including those between ages 18 and 24 who are full-time students (and thus can be claimed as dependents for the EITC) and foster children. ASEC observations are assigned as nonfilers if they are a dependent child, as single if they are unmarried and have no dependents, as head of household if they are unmarried and with dependents, and as joint filers if they are married with or without children.

Table C.1: Variable Definitions and Source

Variable	Source	Definition
MaxEITC	Federal and state policies	The maximum EITC possible based on tax year, state, famiy size
Federal EITC	Simulator	The actual federal EITC estimated for filer
State EITC	Simulator	The actual state EITC estimated for filer
Total EITC received	Simulator	The actual federal + state EITC estimated for filer
Demographic variables	CPS ASEC	Includes age, education, number of children, race, Hispanic origin
Welfare policy changes	State policies	Welfare generosity and time limit variables
Employed	CPS ASEC	Equals 1 when positive weeks worked reported
Annual weeks worked	CPS ASEC	Total weeks worked in the tax year preceding survey
Weekly hours worked	CPS ASEC	Average hours per week worked in the tax year preceding survey
Individual earnings	CPS ASEC/Form 1040	Wages reported for the tax year, replaced by 1040 W&S when available
Income	CPS ASEC/Form 1040	All income reported for CPS ASEC tax units, replaced by 1040 AGI when available
FICA/payroll taxes	Calculated	A percentage of SSA capped individual earnings
Sales taxes paid	Calculated	A percentage of earnings based on state and local sales taxes
UI taxes paid	Calculated	A percentage of earnings based on federal and state UI taxes
Total taxes paid	Calculated	Sum of payroll, sales, and UI taxes
Public assistance	CPS ASEC	Self-reported AFDC/TANF, public housing, Food Stamps/SNAP, disability and SSI payments, workers' and unemployment compensation receipt for family

Table C.2: Calculating Sales Taxes Paid As a Function of State, Year, Earnings, EITC

	Subject to Sales Tax?	Additional Tax Rate	Quintile 1		Quintile 2	
			$ Spent	% of Income	$ Spent	% of Income
Spending Category	(1)	(2)	(3)	(4)	(5)	(6)
Food at home	No*	0	2416	10.9%	2991	9.2%
Food away from home	Yes	0*	1086	4.9%	1533	4.7%
Alcoholic beverages	Yes	10%	152	0.7%	260	0.8%
Shelter (owned, rented, and other)	No	1.15%	5451	24.6%	7055	21.6%
Utilities, fuels, and public services	No	5%	2177	9.8%	2980	9.1%
Household	Yes	0	1207	5.5%	2224	6.8%
Apparel and services	Yes	0	759	3.4%	1132	3.5%
Vehicle purchase	Yes	0*	993	4.5%	1603	4.9%
Gasoline & Oil	No*	25%	1222	5.5%	2013	6.2%
Other vehicle expenses	Yes	0	1051	4.7%	1615	5.0%
Public and other transportation	No	0	181	0.8%	231	0.7%
Health Care	No**	0	1677	7.6%	2787	8.5%
Entertainment	Yes	0	989	4.5%	1603	4.9%
Personal care products and services	Yes	0	255	1.2%	407	1.3%
Reading	Yes	0	44	0.2%	69	0.2%
Education	No*	0	628	2.8%	431	1.3%
Tobacco and Smoking supplies	Yes	20%	301	1.4%	342	1.1%
Miscellaneous	Yes	0	376	1.7%	635	2.0%
Cash Contributions	No	0	698	3.2%	1109	3.4%
Personal Insurance and Pensions	No	0	489	2.2%	1612	4.9%
Life and other personal insurance	No	0	97	0.4%	139	0.4%
Pensions and Social Security	No	0	392	1.8%	1473	4.5%

Notes: For quintile 1, 38.1% and 40.6% of income is subject to sales taxes and other taxes. For quintile 2, the two fractions are 41.7% and 37.7%. EITC dollars are a lump sum and are spent differently: 8% spent on paying off debt (Jones and Michelmore, 2016), 15% spent on tax preparers (Jones, 2017), 2% on groceries, 2% on restaurants, 1% on electronics, 7% on general merchandise, 2% on other retail (Aladangady et al., 2018), and the other 75% is largely spent on taxable durable goods (Barrow and McGranahan, 2000; Goodman-Bacon and McGranahan, 2008). We average quintiles 1 and 2 and calculate sales taxes paid as 0.399 x earnings x state-year sales tax rate + 0.025 x earnings + 0.75 x EITC refund x state-year sales tax rate. * denotes that some states or cities do have additional taxes; ** denotes that prescription drugs are subject to sales taxes. Since we do not account for these, our estimates will underestimate taxes paid. Data sources for spending by quintile (https://www.bls.gov/cex/csxann12.pdf). Other data sources listed in Appendix C.

Table C.3: SSI Monthly Benefits: Federal and State Supplements

State (Data Year)	Individual Amount	Couple Amount	State (Data Year)	Individual Amount	Couple Amount
Federal (2018)	$750	$1,125	Montana (2011)	$0.00	$0.00
Alabama (2011)	$58.00	$116.00	Nebraska (2011)	$5.00	$0.00
Alaska (2018)	$362.00	$528.00	Nevada (2017)	$36.40	$693.42
Arizona (2018)	$0.00	$0.00	New Hampshire (2011)	$13.00	$20.00
Arkansas (2018)	$0.00	$0.00	New Jersey (2017)	$31.25	$25.36
California (2018)	$178.56	$407.14	New Mexico (2011)	$0.00	$0.00
Colorado (2011)	$25.00	$387.00	New York (2014)	$58.00	$61.00
Connecticut (2011)	$168.00	$274.00	North Carolina (2014)	$0.00	$0.00
Delaware (2011)	$0.00	$0.00	North Dakota (2018)	$0.00	$0.00
Florida (2017)	$78.40	$156.80	Ohio (2011)	$0.00	$0.00
Georgia (2011)	$0.00	$0.00	Oklahoma (2011)	$41.00	$82.00
Hawaii (2017)	$0.00	$0.00	Oregon (2011)	$0.00	$0.00
Idaho (2011)	$53.00	$20.00	Pennsylvania (2017)	$0.00	$0.00
Illinois (2011)	–	–	Rhode Island (2017)	$0.00	$0.00
Indiana (2011)	$0.00	$0.00	South Carolina (2011)	$0.00	$0.00
Iowa (2011)	$22.00	$24.00	South Dakota (2011)	$15.00	$15.00
Kansas (2011)	$0.00	$0.00	Tennessee (2011)	$0.00	$0.00
Kentucky (2011)	$0.00	$0.00	Texas (2011)	$0.00	$0.00
Louisiana (2011)	$0.00	$0.00	Utah (2011)	–	$4.60
Maine (2011)	$10.00	$15.00	Vermont (2011)	$52.04	$98.88
Maryland (2011)	$0.00	$0.00	Virginia (2011)	$0.00	$0.00
Massachusetts (2018)	$130.98	$175.76	Washington (2011)	$46.00	$92.00
Michigan (2011)	$14.00	$28.00	Washington, D.C.	$0.00	$0.00
Minnesota (2018)	$81.00	$111.00	West Virginia (2018)	$0.00	$0.00
Mississippi (2018)	$0.00	$0.00	Wisconsin (2018)	$83.78	$132.05
Missouri (2011)	$0.00	$0.00	Wyoming (2011)	$25.00	$55.60

Notes: Monthly benefits are for a single adult or couple living independently. Benefits are lower for those living in another household and are higher for those living in assisted care facilities, medicaid facilities, or adult foster care. Some states administer their own SSI and others do so through the federal government: https://www.ssa.gov/ssi/text-benefits-ussi.htm. See Appendix C for links to each state's SSI details.

Appendix D: PIK and Match Rates in the CPS

A probability match is used to place PIKs on the CPS ASEC. The match relies on comparison with a master reference file, which comprises records of addresses by name, date of birth, and SSN. Because much of the information in the reference files is relatively recent, applying PIKs to the CPS ASEC increases in difficulty as one goes back in time. For the current study, PIKs are applied for the full set of persons in the ASEC from 1999 forward, and for the subset of those with earnings previous to 1999. These latter matches were based off of a set of individuals who appeared in the SSAs Detailed Earnings Record (DER). The latter type of match should correspond reasonably well to the set of female (and in some cases, male and female) earners who form the basis of our sample.

Our first year of CPS ASEC data (1990) has very poor PIK placement, since this year of data was not part of the match to the DER. Researchers within the Center for Administrative Records Research and Applications (CARRA) used a probability match against an early version of the reference file, with the result that only 20 percent of the CPS ASEC observations received a PIK. This low application rate is a matter of concern, because our two "pre-period" years are crucial to assessing the EITC's impact on labor market behavior and subsequent cost-benefit assessments. In other words, if 1989 and 1994 suffer from a low PIK placement probability, we might not be able to separate impacts of the 1996 EITC reforms from simple measurement error. Table D.1 reports on the PIK rate over time, as well as the subsequent match rate to the 1040 data.

We address concerns about PIK placement in two ways. First, we use the survey data alone, and find that our estimated effects, while attenuated, are in line with the results from the linked data. Second, we reweight the regression models according the inverse probability that an observation receives a PIK. To calculate the inverse probability, we use a probit model predicting the receipt of a PIK based on all of the control variables in our full model. Reports of this exercise are in Table D.2 for our main labor market and cost-benefit variables.

The results of this analysis suggest that our results are not driven by time-varying PIK placement. While the values of the coefficients differ (sometimes smaller in value and sometimes larger), they are qualitatively similar and retain the same level of statistical significance.

Table D.1: PIK Match Rates by Year

Year	PIK percent	Mean 1040 filing	
		Single	Married
1989	0.2586	0.0340	0.5173
1994	0.6602	0.0745	0.4982
1995	0.8160	0.0358	0.5091
1998	0.6793	0.0385	0.4915
1999	0.6801	0.0377	0.5042
2000	0.6977	0.0262	0.5090
2001	0.7176	0.0276	0.5084
2002	0.6870	0.0255	0.5026
2003	0.6146	0.0277	0.4976
2004	0.5962	0.0247	0.4900
2005	0.8906	0.0629	0.4933
2006	0.8839	0.0602	0.4962
2007	0.8753	0.0547	0.5111
2008	0.8767	0.0573	0.4941
2009	0.8859	0.0549	0.4869
2010	0.9004	0.0414	0.4766
2011	0.8931	0.0421	0.4750
2012	0.8806	0.0460	0.4738
2013	0.8737	0.0434	0.4706
2014	0.8757	0.0487	0.4660
2015	0.8727	0.0458	0.4645
2016	0.8662	0.0565	0.4614

Notes: Authors' calculations.

Table D.2: Heterogeneous Effects of EITC on Maternal Labor Supply–IPW model

Panel A: Labor Supply						
	Weeks Worked		Hours Per Week		Binary Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
MaxEITC	0.69***		0.48***		.008**	
	(0.13)		(0.13)		(0.003)	
MaxEITC X Married		-0.14		-0.21		-0.01***
		(0.13)		(0.13)		(0.00)
MaxEITC X Single		2.98***		2.41***		0.06***
		(0.24)		(0.22)		(0.01)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.102	0.103	0.106	0.107	0.096	0.097
Observations	1,209,019		1,209,019		1,209,019	
Mean Dep. Var.	34.14		27.36		0.736	
Panel B: Earnings and EITC Benefits						
	Annual Earnings		EITC Benefits		Earnings with EITC	
	(7)	(8)	(9)	(10)	(11)	(12)
MaxEITC	521.60***		318.30***		839.80***	
	(121.70)		(9.68)		(119.80)	
MaxEITC X Married		475.70**		243.80***		719.50***
		(160.90)		(13.45)		(154.30)
MaxEITC X Single		648.70**		524.70***		1,173 ***
		(205.80)		(14.49)		(198.50)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.077	0.077	0.301	0.304	0.075	0.075
Observations	1,209,019		1,209,019		1,209,019	
Mean Dep. Var.	25,170		406.7		25,577	

Notes: Data, sample, and empirical approach is identical to Table 2 except observations are re-weighted using inverse propensity score weights, based on the probability that individuals do not have a PIK and are not linked from the CPS ASEC to the IRS tax data. Results look very similar to Table 2. *** p<0.01, ** p<0.05, * p<0.1.