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

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Abstract

This paper is one of the first comprehensive attempts to calculate a program's net cost by estimating effects on tax revenue and public assistance spending. The EITC increases labor supply and income, thereby increasing the taxes households pay and reducing the public assistance payments they receive. Using linked IRS–CPS data and several EITC policy changes, we find that the EITC's net cost is only 17 percent of the ($70 billion) budgetary cost. Although the EITC is one of the U.S.'s largest and most important public assistance programs, the EITC is actually one of the U.S.'s least expensive anti-poverty programs.

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There is a growing interest in economics in evaluating the net cost of public policies when causal effects on tax revenue and interactions with other policies are accounted for. The difference between a program's *budgetary cost* and *net cost* depends on behavioral responses to the program—e.g., fiscal externalities (Hendren, 2016)—and whether other programs are complements or substitutes. Understanding the net cost of public programs is important for policymakers—and the voting public—in deciding which programs to fund and to potentially expand. This paper is one of the first comprehensive attempts to calculate a program's net cost by estimating effects on several sources of tax revenue and public assistance spending.

The Earned Income Tax Credit (EITC) is one of the U.S.'s most important anti-poverty programs, helping 28 million families at a budgetary cost of $73 billion in 2017. Previous research shows that the EITC improves outcomes for lower-income mothers and their children (discussed in section I), but the program's net cost to government and taxpayers is unknown.

Previous research shows that the EITC has led many lower-income mothers to join the labor force (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001; Eissa et al., 2008; Bastian, 2018). If true, this response likely impacts government revenue. Whether the EITC's net cost is more or less than the $73-billion budgetary cost 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 using other public-assistance programs. If the EITC increases the employment of lower-income mothers, this would increase various sources of tax revenue, decrease public-assistance spending, and lower the EITC's net cost. However, if working mothers become eligible for public benefits that require a work history, such as unemployment and disability insurance benefits, this would increase the EITC's cost.

We estimate the EITC's impact on labor supply, taxes paid, and public assistance received with an identification strategy that exploits variation in EITC eligibility, generated from three decades of plausibly exogeneous EITC policy changes. One simple and transparent way to capture these policy changes is to use one EITC parameter at a time. For example, the maximum possible EITC benefits available to each household ($MaxEITC$), varies by year, state, and number and age of children (see Figures 1 and 2), and is independent of income and actual EITC eligibility. In addition to $MaxEITC$, we use other EITC parameters and a simulated instrument (SI) approach that implicitly captures all EITC parameters and policy changes. We use OLS, IV, and SI approaches to estimate shorter- and longer-run effects, using difference-in-differences and event-study approaches.

We use newly available administrative data that links individuals in the 1989–2016 Current Population Survey's Annual Social and Economic Supplement (CPS ASEC) to Internal Revenue Service (IRS) Form 1040 returns. Because lower-income households often misreport their income in survey data and income misreporting has steadily increased over time (Blank and Schoeni, 2003; Meyer and Sullivan, 2003; Meyer et al., 2018), it is important to have accurate administrative data to estimate the EITC's impact on earnings, tax credits, and taxes paid. These linked data contain demographic details and public assistance usage not available in tax data, as well as accurate income information, each of which is required to estimate the EITC's net cost. Our sample includes 1.2 million women, ages 19–64.

We first test whether the EITC 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 2016 dollars), EITC benefits by \$349, and employment by 0.6 percentage points, reflecting a participation elasticity of 0.33. Although previous studies have estimated the EITC's employment effects (see section I), 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 continued to increase labor supply.

Having found effects on labor supply, we turn to our main outcomes: taxes paid and public assistance received.[1] We find that a \$1,000 increase in $MaxEITC$ increases taxes paid (\$92) and reduces public assistance received (-\$243). Effects are concentrated among

[1] Labor supply changes may affect these outcomes since average and marginal tax rates for lower-income families are often over 50 percent when public assistance is accounted for (Mok, 2012; Kosar and Moffitt, 2017). We calculate effective tax rates on public benefits in Figures 3A and 3B (discussed in section II.B).

unmarried and lower-educated mothers and are robust to various sets of controls. For every $349 in EITC spending, government revenue increases by $290, a 83 percent self-financing rate. In other words, the EITC's net cost is only 17 percent of the budgetary cost. Our results imply that the 2017 EITC provided $73 billion to low-income families at a net cost of only $12 billion, costing the government less than the school lunch and breakfast programs.[2]

In addition to tax revenue and savings on public spending, previous research shows that the EITC improves health, decreases crime, and improves children's outcomes (see section I). Accounting for the social value of these outcomes—independent of the private value—provides even stronger evidence that the EITC "pays for itself" (see section V.F).

Our results contribute to a literature on how policies can help "pay for themselves," 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. These studies find that these policies increased earnings and income tax revenue.

Our hypothesis is that $MaxEITC$ is not associated with our outcomes of interest, except through increased labor supply. For example, if EITC expansions occur during economic expansions and appear to increase taxes paid, estimates may reflect not just EITC-led changes in labor supply, but also a strong economy. We account for these types of potential confounders by testing for pre-trends and by controlling for state time trends and state $\times$ year factors interacted with demographic traits and number of children.

Regarding potential EITC expansions today, our results show that (1) the EITC's net cost depends on the target population's labor-supply elasticity and current level of public assistance and (2) the EITC has largely paid for itself because low-income mothers are eligible for other (substitute) programs. An EITC expansion for adults without children would likely increase labor supply and taxes paid, but may have little impact on public assistance, since adults without children receive little welfare, food stamps, and public housing. However,

[2] This is not a perfect comparison since it compares the "net cost" of the EITC with a "budgetary cost." Effects on children's health, children's education, etc., would affect the school meals' "net cost."

there has been a steady increase in DI and SSI (Autor and Duggan, 2006; Milligan and Schirle, 2017), representing potential fiscal savings (discussed in section VI).[3]

Regarding social welfare, Hendren (2016) argues that a policy's impact on government revenue is a sufficient statistic (Chetty, 2009a) for social-welfare analysis. Hendren (2016) defines "marginal value of public funds" (MVPF) as the ratio of a policy's marginal benefits to marginal costs. In section VII, we calculate the EITC's MVPF to be $3.18–$4.23. Each $1 of EITC spending generates over $3 in social value. For reference, the MVPF for the top marginal income tax rate is $1.50–$2 and 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.

I. 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 mar 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 2017 EITC varies by family type.

The EITC began in 1975 as a 10 percent earnings subsidy, worth up to $1,700 (2016 dollars), that did not vary by state, marital status, or number of children.[4] In 1986, the phase-in rate rose to 14 percent. In 1990, higher 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 rose to 34 and 40 percent for households with 1

[3]Increased income may also improve health and decrease crime, drug-use, and mortality (see section VI).
[4]See Bastian (2018) for more about the 1975 EITC and its impact on working mothers.

and 2+ children (a difference worth up to $2,000). In 2002, the plateau region was extended for married couples. In 2009, higher benefits were made available to parents with 3+ children.

Figures 2 and A.1 show the time-series for $MaxEITC$ and the phase-in rate for households with 0, 1, 2, and 3+ children. Federal EITC benefits were worth up to $6,300 in 2017 (for households with 3+ children earning $14,000–$24,000). Households with 0, 1, and 2 children were eligible for up to $500, $3,500, and $5,500 in federal EITC benefits.

Previous research shows that the EITC has numerous benefits for lower-income families. Specifically, the EITC increases maternal employment (Hoffman and Seidman, 1990; Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001; Bastian, 2018), increases earnings (Dahl et al., 2009), improves health (Evans and Garthwaite, 2014), decreases poverty (Hoynes and Patel, 2015; Jones and Ziliak, 2019), 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). See Nichols and Rothstein (2016) and Hoynes and Rothstein (2016) for EITC literature reviews.

Most EITC research focuses on the large 1990s expansions. In section V.A, we provide some of the first evidence that the 2009 expansion continued to impact maternal labor supply.

Surprisingly, little is known about the EITC's impact on government budgets. If the EITC increases employment and income, households may pay more payroll and state-income taxes, and may receive less public assistance. Increased income for lower-income families—with high marginal propensity to consume—may pay more sales taxes. We account for these factors and estimate the EITC's shorter- and longer-run net cost.

II. Conceptual Framework and Empirical Strategy

Our goal is to estimate the effect of EITC expansions on the government's net budget. For a government budget (G) equal to tax revenue (T) minus spending on public assistance ($S^{Welfare}$), the EITC (S^{EITC}), and everything else (S^{Other}): $G = T - S^{Welfare} - S^{EITC} - S^{Other}$. With no balanced budget restrictions, an EITC expansion costs $\partial G/\partial S^{EITC}$. If taxes and all other spending are unaffected,[5] then $\partial G/\partial S^{EITC} = -1$. However, (1) families spending EITC benefits pay more sales taxes; (2) if the EITC increases labor supply and earnings, households may pay more sales, payroll, and state-income taxes, and become eligible for less in welfare benefits;[6] and (3) previous research (see section I) shows that the EITC improves health, decreases criminal recidivism, and improves children's long-run outcomes, likely reducing spending on public health and incarceration, and increasing future tax revenue and decreasing future public assistance spending. As a result, $\partial T/\partial S^{EITC} > 0$, $\partial S^{Welfare}/\partial S^{EITC} < 0$, and $\partial S^{Other}/\partial S^{EITC} < 0$. The more that the EITC "pays for itself," the closer that $\partial G/\partial S^{EITC}$ gets to zero (and potentially even becomes positive).

We directly estimate $\partial T/\partial S^{EITC}$ in section IV.B and $\partial S^{Welfare}/\partial S^{EITC}$ in section IV.C. We then discuss other EITC research related to $\partial S^{Other}/\partial S^{EITC}$ and calculate back-of-the-envelope values for these components in section V.F. The lower the EITC's net cost, the lower the amount of tax revenue required to fund an EITC, and the lower that a government's redistribution preferences would have to be in order to have or expand an EITC.

II.A. Defining the EITC Treatment Variables

We define $MaxEITC$ as the maximum possible federal EITC benefits that a family could receive, given the year and number and age of children.[7] $MaxEITC$ captures three decades of plausibly exogenous policy variation and is independent of income and actual EITC receipt,

[5] That is, $\partial T/\partial S^{EITC} = \partial S^{Welfare}/\partial S^{EITC} = \partial S^{Other}/\partial S^{EITC} = 0$

[6] $\partial S^{Welfare}/\partial S^{EITC}$ is a function of public assistance generosity and take-up rates, among other things.

[7] The R-squared statistics 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.

which are associated with socioeconomic status and our outcomes of interest. Previous studies have used $MaxEITC$ to estimate the EITC's effect on lower-income families (e.g., Hoynes et al. (2015), Hoynes and Patel (2015), Bastian and Michelmore (2018)). The mean and standard deviation of $MaxEITC$ are \$2,260 and \$2,156 (Table 1). Figures A.2 and A.3 show how the distribution of $MaxEITC$ varies by number of children and varies over time.

Figures 2 and A.1 show the time-series for $MaxEITC$ and the phase-in rate for households with 0, 1, 2, and 3+ children. Figure A.4 plots the residual variation from a regression of $MaxEITC$ on the full set of controls (see section III). Averaging residuals within each year $\times$ number-of-children bin reveals trends that resemble the unadjusted $MaxEITC$ trends in Figure 2, suggesting that $MaxEITC$ cannot be explained by trends in observed covariates.

The largest EITC policy changes occurred in the 1990s; many studies compare women with 0, 1, or 2+ children, before and after this EITC expansion, to identify various outcomes. Our empirical strategy of using $MaxEITC$ implicitly nests this approach.

In deciding whether to use state EITCs, we test the exogeneity of state EITCs and find some evidence that they are endogenous with other state policies and economic conditions (Appendix B). Although we do not use state EITCs in the main analysis, we find similar results when defining $MaxEITC$ by federal, state, or federal + state (Table A.1) and we do use state EITCs to estimate effects on aggregate state-level outcomes (section V.D).

If labor supply responses occur primarily on the extensive margin (as most evidence shows (Meyer, 2002)), $MaxEITC$—and the phase-in rate—will largely capture the EITC's work incentives. However, these parameters may not capture intensive margin incentives or some policy changes, such as extending the EITC plateau region for joint filers. To capture all EITC parameters and policy changes, we use a simulated-instrument approach.

II.B. Outcomes of Interest

Labor Supply: We test whether the EITC increases labor supply and earnings (as previous studies have found)[8] to motivate why the EITC may affect taxes and public assistance.

EITC Benefits: $MaxEITC$ is associated with higher EITC benefits since (1) increased employment may lead new workers to begin receiving the EITC and (2) those already working and receiving the EITC may receive more benefits. Without the IRS EITC recipient file, we do not observe actual EITC benefits, but Jones and Ziliak (2019) shows that matched IRS-CPS data—which we use—enables very accurate imputation of EITC benefits.

Taxes Paid: We look at payroll, sales, and unemployment insurance (UI) taxes. The payroll tax rate is 15.3 percent, split between employers and workers, with the incidence falling mostly on workers (Gruber, 1997; Deslauriers et al., 2018). We calculate payroll taxes using a tax simulator. Payroll taxes are often paid back as Social Security benefits, and we discuss their value in section V.E. We impute (1) sales taxes using state sales tax rates and decomposing spending into taxable and non-taxable bins (Table E.3) and (2) federal and state UI taxes from annual data. Details on these variables are in Appendix D.

Public Assistance Received: We look at welfare (i.e., AFDC or TANF), food stamps (SNAP), public housing,[9] disability (DI) and UI,[10] Supplemental Security Income (SSI), and workers' compensation (WC) benefits. Since public assistance is under-reported in survey data, these estimates may be attenuated (Meyer and Mittag, 2015).[11]

Figures 3A and 3B illustrate the relationship between public assistance benefits and household earnings. Each Panel B shows that average benefits for mothers with no household earnings is about $7,000 ($10,000 for unmarried mothers); average benefits fall by more than

[8] For example, Hoffman and Seidman (1990), Dickert et al. (1995), Eissa and Liebman (1996), Meyer and Rosenbaum (2001), Grogger (2003), Hotz and Scholz (2006), Eissa et al. (2008), and Bastian (2018).

[9] 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.

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

[11] 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.

\$1,000 for every \$5,000 in earnings, reaching about \$1,500 for households earning \$30,000 (corresponding to a full-time job at \$15 per hour).[12] Panel C shows the difference in benefit levels between households with various levels of earnings to those with no earnings, with and without the EITC. Finally, Panel D shows the implied effective tax rates on benefits, with and without the EITC. Households earning up to \$10,000, \$10,000–\$20,000, and over \$20,000 face marginal benefit tax rates of about 50, 25, and 10 percent (80, 30, and 10 percent for unmarried mothers).[13] However, with the EITC, tax rates are 15–20 percentage points *lower* for earnings below \$20,000 and 10–15 percentage points *higher* for earnings of \$20,000–\$50,000, due to the EITC's phase-in and phase-out regions (Figure 1).[14]

Although Figures 3A and 3B cannot be interpreted causally (i.e. for a given household's change in earnings), they provide an idea of how much benefits may change for a mother deciding whether or not to work. For example, not working versus working full time near the minimum wage and earning \$15,000 may result in about \$5,000 less non-EITC public assistance (\$7,000 for an unmarried mother).

II.C. Estimating Equations

We use equation (1) to estimate average treatment effects on the outcomes discussed above.

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

Equation (1) is a generalized difference in differences. $MaxEITC$ is in \$1,000 units (in CPI-adjusted 2016 dollars). α_1 measures the effect of an additional unit of $MaxEITC$ on each outcome Y_{ist}. State and year FE are denoted by γ_s^1 and γ_t^2. Demographic traits, annual state-level factors, state time trends, and numerous interactions are in X_{ist}. ϵ_{ist} is an idiosyncratic

[12] Panel A in Figures 3A and 3B decompose public assistance into EITC, AFDC/TANF, SNAP, public housing, and DI, SSI, Workers Compensation, and UI.

[13] Previous research also shows that lower-income families face high average and marginal tax rates when public assistance is accounted for (Mok, 2012; Kosar and Moffitt, 2017).

[14] Kaplow (2011) also points this out: "the EITC is equivalent to making the phase-out of other transfers more gradual."

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 similar if clustered at the level of treatment: year by number of children). We use CPS person weights.

We also test for heterogeneous effects with equations (2) and (3), since the EITC has larger effects on unmarried and lower-educated mothers (Eissa and Hoynes, 2006).

$$Y_{ist} = \beta_1 MaxEITC \times Married_{ist} + \beta_2 MaxEITC \times Unmarried_{ist} + \beta_3 X_{ist} + \gamma_s^1 + \gamma_t^2 + \epsilon_{ist} \quad (2)$$

$$Y_{ist} = \delta_1 MaxEITC \times LowerEd_{ist} + \delta_2 MaxEITC \times HigherEd_{ist} + \delta_3 X_{ist} + \gamma_s^1 + \gamma_t^2 + \epsilon_{ist} \quad (3)$$

III. Linked CPS-IRS Data and Tax Simulator

We link the 1990, 1995, 1996, and 1998–2017 CPS ASEC to IRS Form 1040 income tax returns, using an internal Census Bureau dataset containing a protected identification key (PIK).[15] 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 possible, which reduces measurement error.[16] 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 ASEC earnings. Since this may introduce measurement error, we also run household-level regressions where we do not split up earnings (Table A.9).

The sample consists of 1.2 million women 19–64 years old who are not child dependents,

[15]PIKs map to a unique Social Security Number (SSN). Tax data from 1991 to 1994 and 1997 are not available for linking at Census. In 2006, the CPS ASEC stopped collecting SSNs, and probabilistic matching (based on name, address, date of birth, etc.) is used to create PIKs (Layne et al., 2014). Data are compared against a master address file by name and date of birth, leading to PIK rates around 90 percent in most years of data. All personally identifying information is removed for research purposes. Appendix F shows PIK rates over time. Table F.2 shows the main estimates reweighted by the probability of not having a PIK.

[16]Table E.1 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.

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 (although keeping older women in the sample may attenuate some of the results, see footnote 18). We also run analysis using the sample of all households (section V.D) to capture potential spillover effects on men.

Tax Simulator: The Bakija tax simulator (Bakija, 2014) calculates various state and federal taxes paid and credits received—including EITC benefits—using dozens of input variables (e.g., income, number of children, filing status). We identify tax-filing units based on family traits reported in the CPS ASEC (details in Appendix E). 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 (2019) 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 alone).[17]

Summary Statistics: Table 1 shows summary statistics and Table E.2 describes the variables we use and whether they are derived from federal and state policy, the CPS ASEC, IRS Form 1040, or the tax simulator. Women in the sample average 41 years old; have 0.8 children; 41 percent have a high school degree or less; 56 percent are married; 20 percent are nonwhite; and 74 percent work and average 34 annual work weeks, 27 weekly work hours, and $26,000 and $58,000 in individual and household annual earnings (in 2016 dollars). Women receive $406 in EITC benefits; pay $3,716, $618, and $258 in payroll, sales, and UI taxes; and receive $1,110 in public assistance, broken down into welfare ($98), public housing ($205), SNAP ($306), DI ($96), SSI ($192), WC ($49), and UI ($168).

Control Variables: For each outcome, we show estimates are robust to various sets of controls. In Table A.2, columns 1–7 progressively add controls for number of children fixed effects (FE); year and state FE; education, race, marital status, age, and having a child

[17] The Bakija calculator produces similar estimates of tax liability and EITC benefits as NBER's TAXSIM (Jones and Ziliak, 2019). The choice of calculator was due to prohibitions on sending the CPS-IRS data outside of Census to run TAXSIM on an external server. Complete details on Bakija's simulator are here: `https://web.williams.edu/Economics/wp/BakijaIncTaxCalcDoc.pdf`.

under 5; interacting marital status and education, with year, state, and number of children FE; and state × year economic conditions and policies (from Appendix B) and state time trends. Column 7 contains our preferred set of controls and is used throughout the analysis. In columns 8–9, we show that results are robust to state × number of children FE and state × year policies interacted with maternal demographic traits.

IV. Results

In this section, we estimate short-run effects of the EITC on various outcomes. In section V.D we estimate longer-run effects.

IV.A. The EITC Increases Labor Supply and Income

Although previous research has found that the EITC increases maternal labor supply, our data allow us to test the accuracy of studies that rely on survey data or a single EITC policy change. As for parallel employment trends, previous work has shown parallel trends for the 1990s EITC expansion (Meyer and Rosenbaum, 2001; Hoynes et al., 2015) and we show parallel pretrends for the 2009 EITC expansion in Figures A.8A and A.8B. (We isolate the effects of the 2009 EITC expansion in section V.A.)

Table 2 columns 1, 3, 5, and 7 show that a \$1,000 increase in $MaxEITC$ increases average annual weeks worked (0.61), weekly work hours (0.50), employment (0.6 percentage points), and annual earnings (\$558).[18] Estimates imply a participation elasticity of 0.33 (0.14).[19] Results are robust to alternate sets of controls (Table A.2); defining $MaxEITC$ as federal, state, or federal plus state (Table A.1); and using the EITC's phase-in rate (Table A.1). We

[18] Results represent percent increases of 1.8, 1.8, 0.8, and 2.1. Estimates are smaller than EITC studies that focus on younger women (Hoynes et al., 2015; Bastian and Michelmore, 2018), since age is negatively associated with EITC response (Bastian, 2018, Table A.4). A log-log specification yields estimates of 0.22, 0.21, and 1.28 for weeks worked, hours worked, and earnings plus EITC benefits (Table A.8).

[19] 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)). Using estimates and means in Tables 2 and 3: [log(.736+.006)-log(.736)]/[log(25,170-4,544+1,111+444+ 349-243-110+558)-log(25,170-4,544+1,111+444)]=0.328. Similarly, we calculate an earnings elasticity of 0.6.

find that the EITC is responsible for a third of the 1990s increase in maternal employment.[20]

Table E.1 confirms that relying solely on self-reported earnings yields estimates that are attenuated by a third. Crosswalking the results from the public-use CPS data to the linked CPS-IRS administrative data, Table E.1 shows the two estimates are \$419 and \$558.[21]

Table 2 columns 2, 4, and 6 use equation (2) to test for—and find—large positive effects among unmarried mothers, and null or small negative effects among married mothers, consistent with previous research (Eissa and Hoynes, 2004; Yang, 2018). For married women, a \$1,000 increase in $MaxEITC$ decreases annual work weeks (-0.32), weekly work hours (-0.24), and employment (-1.4 percentage points). Because benefits are based on household earnings, the EITC discourages work for some secondary earners. For unmarried women, estimates are large and positive for weeks (2.75), hours (2.22), and employment (5.1 percentage points). Earnings estimates are also significantly larger for unmarried women (\$832 vs \$440). Among lower-educated unmarried women, we find even larger effects (Table A.3).[22] Although the EITC decreased labor supply among married mothers, the effect on unmarried mothers is sufficiently large to result in a positive average effect.

Results are similar using 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 data (the first year in our sample) and calculating the EITC benefits that households would be eligible for in each year between 1989 and 2016 using the actual annual EITC policy structure;[23] (2) collapsing average EITC benefits into (state × year × number of kids) bins, using CPS ASEC weights and federal or federal plus state EITCs; and (3) merging these SIs into the

[20] Calculated as: (estimate of 0.6) × (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.

[21] Table E.1 shows that administrative IRS measures of marital status and earnings are both important.

[22] Table A.3 shows (1) similar effects when the sample is restricted to unmarried women and (2) largest effects among lower-educated unmarried mothers: 3.13 weeks, 2.52 hours, and 0.063 employment.

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

main sample. In Table 5, we estimate equation (1), replacing $MaxEITC$ with a SI, and find that $1,000 in simulated EITC benefits increases weeks worked (1.40 to 1.46), work hours (1.65 to 1.76), employment (1.7 to 1.9 percentage points), and earnings ($1,675 to $1,754).

Finally, Table 2 columns 9–10 show that $1,000 in $MaxEITC$ increases average EITC benefits by $349, with larger effects on unmarried than married women ($527 vs. $272).[24] These may be over-estimates since we do not observe actual EITC benefits (see section III) and assume 100 percent take-up, while actual take-up is 75–80 percent (Jones, 2014).

EITC benefits increase for two reasons: those already working and receiving the EITC will receive more, and newly working women will start receiving the EITC. To disentangle inframarginal and marginal benefits, we use the SI approach discussed above. Using equation (1) and simulated EITC benefits as the outcome, we find that 72 percent of EITC benefits are mechanical ($252 of $349), leaving 28 percent due to behavioral labor supply responses ($97 of $349). To assess whether the latter estimate is consistent with the earnings estimate of $558, consider a few examples. Mothers with one and two children that began working and earning $20,000 (or $25,000) would be eligible for about $3,200 and $5,400 (or $2,400 and $4,400) in EITC benefits. These EITC-to-earnings ratios are 16 and 27 percent (or 10 and 18 percent), consistent with the 17 percent ratio of our estimates ($97/$558).

At a cost of $349 per woman, the EITC increased female employment by 0.6 percentage points and average annual earnings by $558.[25] Next, we examine how the EITC's per-woman cost of $349 changes when we account for changes in taxes paid and public assistance received.

[24] $MaxEITC$'s impact on EITC benefits depends on where in the EITC schedule households are. For those 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).

[25] There were about 95 million U.S. women 19–64 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).

IV.B. Does the EITC Increase Various Sources of Tax Revenue?

Increased employment may increase payroll and UI taxes paid; higher income and EITC benefits may increase consumption and sales taxes paid. Although many EITC recipients pay no federal income tax, they pay payroll, sales, and UI tax rates of 15.3, 1–8, and 1–2 percent. (Section V.E discusses whether payroll and UI taxes should be considered revenue.) We expect 20–30 percent of an EITC recipient's earnings to be paid in taxes. From the earnings and EITC estimates in Table 2 ($558 and $349), we expect $1,000 in $MaxEITC$ to increase taxes paid by around $100.

In Table 3 column 1, we use equation (1) and the sum of payroll, sales, and UI taxes paid as the outcome. We find that each $1,000 increase in $MaxEITC$ increases average taxes paid by $92 (or 2 percent), suggesting that a contemporaneous increase in taxes paid offsets 26 percent of the EITC's per-woman cost ($349) to government. Results are robust to alternate sets of controls (Table A.2). Decomposing the $92 shows payroll, sales, and UI taxes of $70, $26, and $0.2 (Table A.5).[26] We provide intuition for this tax estimate by plotting the residuals—averaged into year × number-of-children bins—from a regression of taxes paid on the full set of controls (excluding $MaxEITC$): Figure A.5 shows that the trends in residuals follow the time-series trend in $MaxEITC$ (Figure 2). In addition to estimating the reduced-form effect of $MaxEITC$ on taxes paid, we use (1) $MaxEITC$ as an IV for earnings and for EITC benefits and (2) a simulated instrument (SI) approach (discussed in section IV.A). OLS estimates the population average treatment effect, while an IV captures the local average treatment effect from compliers and will scale the OLS estimates. Table 4 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 $98 in taxes paid and a $1,000

[26] Estimates do not exactly add up to $92 since they come from separate regressions. A log-log specification shows an EITC-taxes-paid elasticity of 0.86 (Table A.8). 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. Our estimates imply that $14.6 billion in annual payroll taxes can be attributed to the EITC (=95 million women × average $MaxEITC$ of $2,200 in 2016 × $70) 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).

increase in EITC benefits leads to $267 in taxes paid (reflecting the labor-supply response associated with receiving the EITC). Using the EITC phase-in rate instead of $MaxEITC$ yields similar IV results (Table 4). For the SI, Table 5 shows that $1,000 in simulated EITC benefits increases taxes paid by $372–$392.

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 (2) in Table 3 column 2 and find that a $1,000 increase in $MaxEITC$ increases taxes paid by $157, compared to a statistically smaller $70 among married women. Tax revenue offsets 30 percent of the per-unmarried-woman's cost of the EITC ($527).

IV.C. Does the EITC Decrease Public Assistance Usage?

We now test whether the EITC is a complement or a substitute for other public assistance programs. In the context of the 1990s, Grogger (2003, 2004) show that the EITC reduced welfare usage and Hoynes and Patel (2015) shows that the EITC reduced welfare and food stamps usage. We expand on these studies by testing the EITC's effect on various types of public assistance and whether the effects continued after the 1990s. Based on the $558 earnings estimate in Table 2, we expect $1,000 in $MaxEITC$ to reduce public assistance benefits by $140–$280 since Figure 3A Panel C shows that for lower-income mothers, each $1 of household earnings reduces benefits by $0.25–$0.50.[27]

Table 3 columns 3–6 use public assistance benefits as the outcome. A $1,000 increase in $MaxEITC$ decreases average benefits by $243,[28] suggesting that a contemporaneous decrease in public assistance spending offsets 69 percent of the EITC's per-woman cost

[27]Another way to set expectations is to use the facts that each $1 earned by a low-income parent reduces TANF, SNAP, and public housing benefits by around $0.30 each (Nichols and Kassabian, 2012; Dean, 2017; Center on Budget and Policy Priorities, 2017) and that take-up rates for these programs are 50, 60, and 10–20 percent (Currie, 2004). $558 × [(.30 × .50) + (.30 × .60) + (.30 × .15)] = $209. However, working mothers may also become eligible for benefits that require a work history (e.g. UI and DI).

[28]Table A.6 shows the -$243 components: welfare (-$259), public housing (-$25), DI plus SSI (-$19), SNAP ($57), and UI ($1). The positive estimate on SNAP appears to conflate the 2009 EITC expansion and the 2009 increase in SNAP benefits and recipients during the Great Recession (Ganong and Liebman, 2018) since (1) the estimate changes to -$65 (s.e.=$10) when the sample is restricted to pre2009 and (2) Figures 4A and 4B show negative estimates (especially among unmarried mothers) before 2005.

($349). We provide intuition for this estimate by plotting the residuals from a regression of public assistance on the full set of controls (excluding $MaxEITC$). These trends in Figure A.6 follow the time-series trends in $MaxEITC$ in 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).[29] Results are robust to alternate controls (Table A.2); a log-log specification yields an estimated elasticity of -0.45 (Table A.8). Although our results are primarily driven by reductions in cash welfare (Table A.6), we could not have known that *ex ante*. Furthermore, effects on UI, DI, and SSI may become larger over time and merits further study.

In addition to estimating the reduced-form effect of $MaxEITC$ on public assistance received, we use (1) $MaxEITC$ as an IV for earnings and for EITC benefits and (2) a simulated instrument (SI) approach (discussed in section IV.A). Table 4 shows that a $1,000 increase in EITC-led earnings decreases public assistance by $189 and a $1,000 increase in EITC benefits decreases public assistance by $516 (reflecting the labor-supply response associated with receiving the EITC). Using the EITC phase-in rate instead of $MaxEITC$ yields similar IV results (Table 4). For the SI, Table 5 shows that $1,000 in simulated EITC benefits decreases public assistance received by $353.

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 3 columns 4 and 6 and find that a $1,000 increase in $MaxEITC$ decreases public assistance received by unmarried women by $850 and decreases the probability of receiving any public assistance by 3.1 percentage points (or 12 percent), compared to small *positive* effects among married women ($20 and 0.6 percentage point).[30] Less public assistance spending completely

[29] Table A.7 shows that $1,000 in $MaxEITC$ decreases the probability of receiving any welfare, public housing, SNAP, and DI or SSI, by 2.8, 0.3, 0.2, and 0.1 percentage points, but increases UI by 0.1 percentage points (we also find that $1,000 in $MaxEITC$ decreases WIC benefits by $5; results not shown). Results are consistent with Grogger (2003), who finds that a $1,000 increase in $MaxEITC$ reduce welfare use by 1.5 and 3.1 percentage points for among unmarried mothers whose youngest child is three and ten.

[30] Components of the $850 are: welfare (-$767), public housing (-$92), SNAP ($5), DI + SSI + WC (-$11), and UI ($11). Among married women, components of the $20 are -$39, $5, $79, -$22, and -$3. See Table A.6. Table A.7 shows the change in the probability of receiving any of each type of public assistance.

offsets the EITC's per-unmarried-woman cost ($527).[31] Although we do find an increase in UI, we find much larger decreases in other benefits.

Based on the $832 earnings estimate in Table 2, we expected $1,000 in $MaxEITC$ to reduce public assistance benefits by close to $700 since Figure 3B Panel C shows that for unmarried mothers, each $1 of earnings reduces benefits by up to $0.80. Although estimates for unmarried women are a bit larger than we expected, our magnitudes are comparable to Hoynes and Patel (2015), which finds that $1,000 of $MaxEITC$ reduces public assistance by about $1,000 among unmarried mothers ages 24–48 in the 1990s.[32]

V. Alternate Explanations and Interpreting Results

V.A. Disentangling Welfare Reform and the 2009 EITC Expansion

The largest EITC expansions occurred in the 1990s, around the time of welfare reform. Previous research disentangles these policy changes and shows that each policy had positive effects on female labor supply (Meyer and Rosenbaum, 2001; Grogger, 2003, 2004), although some recent work argues that the EITC receives too much credit (Mead, 2014, 2018; Kleven, 2019). If the EITC expanded while welfare was cut—and we do not sufficiently control for welfare reform—our estimated effects of the EITC on public assistance may reflect a mechanical relationship, instead of increases in labor supply.

We disentangle these two policies by (1) showing that results are robust to flexibly controlling for state × year × number-of-children measures of welfare reform interacted with maternal education and marital status (Table A.2 column 8)[33] and (2) providing some of the first estimates of the effects of the 2009 EITC expansion, which raised $MaxEITC$ from

[31] This large response does not necessarily require a behavioral interpretation, since unmarried women trade off these benefits with $1,359 in earnings and EITC benefits (Table 2).

[32] One reason our estimates are a bit smaller is that our sample includes women up to age 64, less likely to receive public assistance. Any potential attenuation in our public-assistance estimates will be similar for Hoynes and Patel (2015), who also use CPS data.

[33] These controls include maximum welfare with 1–4 children; when states introduced time limits; when time limits began to bind; and whether states had a time limit.

$5,400 to $6,300 for families with 3+ children (Figure 2).

Table 6 Panels A and B show that the EITC had positive effects on labor supply and government revenue before and after 2005.[34] Interacting $MaxEITC$ with years before and after 2005, effects are larger among unmarried women and, if anything, slightly larger after 2005. Figures 4A and 4B show the pre2005 and post2005 effect on each subcomponent of taxes and public assistance: the strongest effects are increases in payroll and sales taxes and decreases in welfare. Our results imply that the EITC is responsible for almost half of the 1990s decline in welfare.[35]

Focusing on 2004–2014, we show parallel pretrends leading up to the 2009 EITC expansion (Figures A.8A and A.8B) and use difference in differences to estimate the employment effect on mothers with 3+ children. Table A.4 uses various sets of controls and compares mothers with 3+ children to other groups of women, before and after 2009. Across specifications, we find a 1.0–1.7 percentage point increase in employment (2.1–2.3 among lower-educated mothers). That the 2009 EITC expansion had a positive effect on maternal employment is consistent with previous research showing that the EITC increased maternal employment in the 1970s (Bastian, 2018) and 1980s (Eissa and Liebman, 1996), in addition to the 1990s (Meyer and Rosenbaum, 2001; Hoynes et al., 2015).

V.B. Diminishing Returns? Effects Over Time

If recent EITC expansions had diminishing returns, then our finding that EITC expansions largely "pay for itself" may have been true in previous decades, but not hold for recent expansions or additional expansions today. We test for diminishing returns in three ways, one of which uses OLS to estimate the EITC's effect before and after 2005 (see section V.A).

[34] Each $1,000 of $MaxEITC$ before and after 2005 increased average annual weeks worked (0.65 and 0.86), weekly hours worked (0.49 and 0.70), employment (0.008 and 0.011), earnings ($310 and $812), taxes paid ($64 and $135), EITC benefits ($292 and $327), and decreased public assistance received (-$247 and -$241).

[35] Calculated by: (estimate of $217 in Figure 4A) × (average $MaxEITC$ increase of $1,500 among mothers) × (95 million women ages 19–64) × (49 percent of women have EITC-eligible children) = $15 billion out of the $30 billion decrease in 1990s welfare spending.

Second, we divide $MaxEITC$ into categorical quartile bins and estimate equation (4).[36]

$$Y_{ist} = \theta_0 + \sum_c \theta_1^c MaxEITC\ Quartile_{ist}^c + \theta_2 X_{ist} + \gamma_s^1 + \gamma_t^2 + \epsilon_{ist} \tag{4}$$

Figures A.9, A.10, and A.11 illustrate that each EITC expansion has increased work weeks, work hours, employment, earnings, EITC benefits, and government revenue. In general, we cannot rule out constant or diminishing marginal effects over time.

Third, we use a locally weighted, double-residual regression (Cleveland, 1979). Figures A.12 and A.13 show that the EITC's effect on taxes paid and public assistance received is fairly linear and that recent expansions have continued to affect these outcomes.

These approaches all suggest that recent EITC expansions have continued to have positive effects on labor supply and government revenue, perhaps suggesting that additional EITC expansions today would continue to have positive effects.

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

Results so far implicitly assume a unitary government, but tax revenue and public assistance spending can be decomposed into state and federal components. 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 benefits are paid by state and federal governments, and the federal government bears the cost of public housing, SNAP, SSI, DI, and WC (see Appendix D for program details).

Table 7 Panels A and B show how federal EITC expansions affect federal and state government budgets. A \$1,000 increase in $MaxEITC$ leads to \$349 in federal EITC spending and \$215 in federal revenue, a 61 percent self-financing rate.[37] For states, a \$1,000 increase

[36] Bins means are 0, 506, 3351, and 5524. Results are similar using 5 or 6 bins. Equation (4) is identical to equation (1) 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).

[37] \$215 components are \$70 in payroll tax revenue and -\$158 -\$25, \$57, and -\$19 in reduced welfare, public housing, SNAP (SNAP results discussed in footnote 28), and DI/SSI/WC. \$215 =\$70+\$158+\$25-\$57+\$19.

in $MaxEITC$ leads to \$21 in state EITC spending and \$127 in state revenue, a net gain of \$106. Of course, not all states have an EITC: Panel C shows that states that ever had an EITC net \$122 (columns 1–3), compared to \$73 for states without an EITC (columns 4–6).[38] States with EITCs gain more from the federal EITC, perhaps because state EITCs independently increase labor supply (shown in Table A.1 column 2) and raise awareness and increase federal EITC take-up (Neumark and Williams, 2016). We provide some of the first evidence that the EITC represents a transfer from federal to state governments.

V.D. Spillovers, the Longer-Run, and Aggregate Outcomes

The sign of the EITC's potential economic spillovers are theoretically ambiguous. On one hand, the EITC may have negative spillovers on lower-skill workers if firms respond to the EITC by reducing pre-tax wages (Leigh, 2010; Rothstein, 2010).[39] Most labor-demand-elasticity estimates are 0.1–0.3 (Card, 1990; Borjas, 2003), meaning that our estimates may be ignoring negative effects on the control group of EITC-ineligibles.[40] On the other hand, there could be positive labor-market spillovers if increased income and spending reverberate through the economy (Carrington, 1996; Moretti, 2004; Black et al., 2005; Bartik, 2017).[41]

We account for potential spillovers with household- and state-level analysis, using the sample of all adult men and women. Although men are eligible for the EITC, previous research finds little impact on their labor supply (Eissa and Hoynes, 2004; Bastian, 2018), implying that these estimates will average over positive responses by unmarried women,

[38] \$106 components are \$26 in sales tax revenue and \$101 in reduced welfare (\$106 =-\$21+\$26+\$101). \$122 components are \$37 in state EITC spending, \$31 in sales tax revenue, and \$128 in welfare savings (\$122=-\$37+\$31+\$128). \$73 comes from \$17 in sales taxes and \$56 in welfare.

[39] 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."

[40] 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, and 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.

[41] 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).

small negative responses by married women, and null responses by men. Household-level regressions are not able to detect spillovers on the control group of adults without children, but are able to detect intra-household spillovers (i.e. these estimates should be smaller than the effects on women if higher maternal labor supply is offset by lower spousal labor supply).[42] In contrast, aggregate state-level estimates reflect the EITC's impact on mothers, as well as any—positive or negative—spillovers on men and women without children.

For households, Table A.9 shows that \$1,000 in $MaxEITC$ increases earnings (\$1115), taxes paid (\$121), and EITC benefits (\$550), and decreases public assistance (\$221). Although only the latter two estimates are statistically significant, these results are consistent with results in Tables 2 and 3 and provide little evidence for negative spillovers.

To estimate the EITC's longer-run effect on aggregate state employment, tax revenue, tax filers, and welfare spending, we use equation (5) and—alternate data sources—state reports on these outcomes.[43] 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.[44]

$$Y_{sj} = \alpha_0 + \alpha_1 MaxEITC_{st} + \alpha_2 X_{st} + \gamma_s^1 + \gamma_t^2 + \epsilon_{st}, \quad \text{for} \quad j \in [-7, 7] \tag{5}$$

Figure 5 shows that a \$1,000 increase in $MaxEITC$ in year t has a contemporaneous effect on employment, tax revenue, tax filers, and welfare spending, and an increasingly large effect over 3–4 years that remains through year $t+7$.[45] Bastian (2018), 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. Estimates are robust to using logs and various sets of

[42]These regressions are actually at the taxfiler-unit level; households may contain more than one taxfiler.

[43]State employment data from BEA. State tax revenue data from Census. State welfare data from Health & Human Services. Tax filers from Tax Policy Center. Details and links to data in Figure 5 notes.

[44]Unlike previous regressions, $MaxEITC$ here only varies by state × year, not number of children. Year FE ensure that we identify only off of state EITC changes. In Appendix B we find some evidence that state EITCs may be endogenous with other state policies and economic conditions; although, flat pre-trends in Figure 5 suggest that state EITCs are not a result of strong economic conditions.

[45]A year after a \$1,000 increase in $MaxEITC$, state employment, tax revenue, and welfare spending change by 1.5, 5, and -9 percent. Effects on taxes and public assistance may also grow over time if these women continue working, gain work experience, and see earnings growth (Dahl et al., 2009), which may explain why tax revenue slowly increases after year $t+3$ and employment does not.

controls.[46] For each outcome, we test for—and fail to reject—parallel pre-trends. Figure 5 is consistent with Tables 2 and 3 and null or very small labor-market spillovers.[47]

V.E. Factors Which May Increase the EITC's Net Cost

Payroll Taxes: Tables 2 and 3 imply a self-financing rate of 96 percent, since every \$349 in per-woman EITC spending increases tax revenue by \$92 and decreases public assistance spending by \$243. However, payroll taxes—\$70 of the \$92 (Table A.5)—are generally paid back as Social Security (SS) benefits. One conservative approach is to assign a zero value to payroll taxes, which yields an EITC self-financing rate of 76 percent (=\$265/\$349). However, every \$1 of SS crowds out roughly \$1 in SSI benefits that marginal EITC recipients are likely to receive in old age (SSA, 2019b). In Appendix D we analyze the complex relationship between payroll taxes paid and SS and SSI benefits received, under various scenarios.[48] We find that each \$1 in payroll taxes has a present value of about \$0.35, reducing the taxes-paid estimate to \$47 and yielding a self-financing rate of 83 percent.[49]

EITC Payments: 20–25 percent of EITC payments are made in error (Jones, 2014). To the degree that these are overpayments, most overpayments go to lower-income households (Jones and Ziliak, 2019), which may still affect labor supply and sales tax revenue. However,

[46] Table A.10 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 $\times$ year FE. Columns 6–8 use the full set of controls, used in Figure 5. Columns 7–8 weight observations by state population. Column 8 uses state EITCs only. Across specifications, we find consistent evidence that the EITC affected each outcome, although results for tax filers are less significant.

[47] Figure 5 shows a 0.9 percent increase in contemporaneous employment, which maps to a 1.8 percent increase in working women since women are half of the labor force. Table 2 finds a 0.8 percent employment increase, with the top of the 95 percent confidence interval reflecting a (similar to 1.8) 1.7 percent increase. Our aggregate results may suggest a small positive employment spillover on men and women without children. In another approach, we interact $MaxEITC$ with state population (and drop state FE and population controls) and find that \$1,000 in $MaxEITC$ and a million population increase leads to 1,100 workers and \$15,000 in tax revenue. This \$15 per worker is roughly what would be expected from Table 7.

[48] We account for the fact that the SSI take-up rate is 45%–60% (Burkhauser and Daly, 2002). In 2018, a retired adult with little income was eligible for up to \$9,000 in annual federal SSI, plus most states top-up that amount (see Table E.4). Since little evidence exists on the EITC's long-run labor supply effects, we simulate the EITC's net cost over a woman's lifetime, under various assumptions (Appendix D).

[49] 0.83=(243+47)/349. The 95 percent confidence interval of government revenue (taxes paid minus public assistance received) is \$147–\$433 for a self-financing range of 42–124 percent.

we do not observe actual EITC benefits (see section III) and assume 100 percent take-up, while actual take-up is 75–80 percent (Jones, 2014). These two factors roughly cancel out.

Financing the EITC: Taxes—which lead to distortions—are levied to pay for the non-self-financing portion of the EITC. The size of this efficiency cost has long been debated: Harberger (1964), Slemrod and Yitzhaki (1996), and Feldstein (1999) argue that the overall cost of $1 in taxes is $1.09–$1.16, $1.20, and $1.30. However, Chetty (2009b) argues that the aggregate distortion is closer to $0 and the cost is closer to $1. With a non-self-financing rate of 17 percent, the 2017 EITC cost about $15 billion (=$73 billion × 0.17 × $1.20).

V.F. EITC's Positive Spillovers on Health, Crime, Children

In this section, we summarize evidence from other research to estimate the social value of the EITC's effects on health, crime, and children. Overall, the social value of these outcomes—independent of the private value—is much higher than the cost of the EITC.

Health: By increasing family resources, the EITC improves maternal mental and physical health (Evans and Garthwaite, 2014) and financial security (Mendenhall et al., 2012; Jones and Michelmore, 2016; Jones, 2017a); improves infant and child health (Cowan and Tefft, 2012; Averett and Wang, 2015; Hoynes et al., 2015); and reduces suicides among men and women (Dow et al., 2019).[50] The social value of these outcomes depends on how the public bears health costs and how health affects taxes paid and public assistance received.

Crime: Arresting, prosecuting, and jailing individuals is a cost shouldered by taxpayers. Agan and Makowsky (2018) finds that a state EITC worth $207–$362 a year would decrease female criminal recidivism (via parole violations) 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.[51]

[50] A 10 percent EITC increase reduces suicides among adults with ≤ 12 years of education by 5.5 percent.

[51] 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 × 0.016 × 1.3 + $1,100 × 0.016 = $683. Less incarceration also improves labor-market outcomes and decreases future recidivism and public assistance usage (Mueller-Smith, 2015).

Another cost of incarcerating mothers relates to the 150,000 kids with a mother in jail (Christian, 2009). Three 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).[52]

Intergenerational Education, Health, Crime: By increasing children's educational 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.[53] 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.[54]

Intergenerational Earnings, Taxes Paid, and Public Assistance Received: The intergenerational employment and earnings correlations are about 0.25 (Bastian and Michelmore, 2018) and 0.3–0.6 (Solon, 1992; Mazumder, 2005; Chetty et al., 2014). The earnings estimate of $558 (in Table 2) may increase children's annual earnings by $190–$375,[55] or $2,600–$5,140 in total discounted earnings and $520–$1025 in taxes paid.[56] Increased 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 use these

[52] 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.

[53] 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).

[54] 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).

[55] 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).

[56] 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.

programs.[57] The public assistance estimate of -$243 (in Table 3) may decrease children's annual public assistance usage by $60, for a total present discounted value of $830.[58]

Bottom Line: $1,000 in *MaxEITC* reduces public spending on maternal health and crime by around $800 and—in present value, over the lifetime of the next generation—increases taxes paid ($500), decreases public-assistance received ($800), and reduces health and crime costs ($2,000). Even if these numbers are inflated by an order of magnitude, they suggest that the EITC "pays for itself" (and that the EITC's net cost is less than zero).

VI. Potential EITC Expansions Today

Our results illustrate that the EITC's net cost depends on (1) the target population's labor-supply elasticity and (2) their level of public benefit use. The existing EITC largely pays for itself because lower-income mothers are eligible for several other (substitute) public programs, reflecting potential government-budget savings.

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). The maximum EITC for adults without children was $510 in 2017 and those earning over $15,000 are ineligible for the EITC (Figure 1). A pilot study (Paycheck Plus) expanded the EITC for workers without children and found that it increased employment, income, tax-filing, receiving the federal EITC, and decreased severe poverty (Miller et al., 2018).[59] Such an EITC expansion may help offset the steady decline in employment among young adults (Ross and Svajlenka, 2015) and have larger effects on older adults that are on the

[57] 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).

[58] 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.

[59] 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.

margin of retiring, have high labor-supply elasticities (Dustmann et al., 2017; Laun, 2017; Borgschulte et al., 2018), and lost various tax credits when their children grow up (Feldman et al., 2016; Moulton et al., 2016).

An EITC expansion for adults without children would likely increase employment and tax revenue. Although adults without children receive little welfare, food stamps, and public housing, there has been a rise in DI and SSI—especially among older men—since the 1990s (Autor and Duggan, 2006; Milligan and Schirle, 2017). DI and SSI cost $143 billion and $59 billion in 2017, reflecting potential government-budget savings.

Increasing the employment and income of lower-skill adults without children would also likely reduce crime (Gould et al., 2002), drug-use (Autor et al., 2013; Laird and Nielsen, 2016), and suicides (Dow et al., 2019); improve health (Case and Deaton, 2017; Chetty et al., 2016); and increase child-support payments (Nichols et al., 2012; Miller et al., 2018) and the number of "marriageable men" (Dorn et al., 2017). The social value of these benefits—in addition to tax revenue and public-assistance savings—would help offset the cost of this type of EITC expansion. EITC proposals (Treasury, 2016; Hoynes et al., 2017; AEI and Brookings, 2018) should take this fact into account when estimating budgetary costs.

VII. 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 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. However, 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.[60] We find that the EITC's FEx is -$0.83, 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 $5.88. However, not every dollar of EITC benefits is worth $1 to recipients, since many mothers (in particular) 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.[61] We calculate this ratio using two 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 (54 percent of the $349 estimate in Table 2) and the cost due to behavioral responses is about $160.[62] A second approach (discussed in section IV.A) uses a simulated instrument to show that 72 percent of EITC benefits are mechanical ($252 of $349). Using $MVPF = B/(1 + FEx)$ for $B \in \{0.54, 0.72\}$, yields MVPF estimates of $3.18 and $4.23, suggesting that each $1 of EITC spending generates over $3 in social value.[63]

Since the MVPF of the top marginal income tax rate is $1.50–$2 (Hendren, 2016), a

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

[61] Assuming that these women are indifferent between not working and working with the EITC. Below, we discuss why this approach may yield a lower-bound welfare estimate.

[62] 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.

[63] 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." He finds a MVPF of $0.88 for the EITC, but only considers EITC benefits, so that the FEx is positive, saying: "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."

social-welfare-maximizing government could increase the EITC—financed by increasing the top marginal income tax rate—up to the point where the MVPFs were identical for the EITC and for top marginal tax rates.[64] 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 $1.59–$2.82 for lower-income EITC recipients (requiring utility be convex in income or higher social-welfare weights on wealthy individuals).[65]

Although our point estimates suggests a FEx of -$0.83, the 95 percent confidence interval spans -$0.42 and negative infinity for the FEx and spans 1.29 (=0.54/0.42) and infinity for the MVPF (assuming that the numerator of the MVPF is measured without noise). Furthermore, accounting for the positive spillovers discussed in section V.F suggests an MVPF of infinity.

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 $3.18–$4.23 estimated above is a lower-bound estimate. Following this intuition, we calculate the EITC's impact on social welfare 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 $12.4 billion and increased after-tax-and-transfer income by $119.3 billion.[66] 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)

[64] 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).

[65] $2.10 and $2.80 is calculated as $4.2/2$ and $4.2/1.5$.

[66] Calculated as: 17 percent of the EITC's cost of $73 billion is $12.4 billion; and $558+$349-$92-$243 (estimates in Tables 2 and 3) $\times$ 2.2 (average $MaxEITC$ in 2017 is $2,200) $\times$ 95,000,000 women in 2017.

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.[67] (Quasi-linear utility will underestimate this increase in social welfare if individual utility is concave in income.)

VIII. Conclusion

We find that the EITC helps "pay for itself" through increases in tax revenue and decreases in public assistance. Average-treatment-effect estimates show that the EITC has a self-financing rate of 83 percent, so that each \$1 of EITC spending has a net budgetary cost to government of \$0.17.[68] Instead of costing \$73 billion, the 2017 EITC's net cost was about \$12 billion, costing taxpayers less than the school lunch and breakfast programs.[69] If anything, the EITC's net cost is even lower when longer-run and spillover effects are accounted for.[70]

We find that recent EITC expansions also 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 budgetary cost.

Every \$1 in EITC benefits is associated with a \$0.69 decrease in other public benefits (=243/349) and a researcher not accounting for decreased benefits would conclude that a \$1,000 increase in $MaxEITC$ increases family resources of \$908 (=\$558+\$349), instead of \$666 (=\$558+\$349-\$243). One possible reaction to these results is "so does the EITC not help families as much as we thought?" Many EITC papers implicitly account for this fact by using after-tax-and-transfer income (e.g., Dahl and Lochner (2012) and Hoynes and Patel (2015)). However, research not fully accounting for public assistance will (1) overstate the effect of the EITC on family resources and (2) *understate* the impact of income on outcomes

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

[68] The 95 percent confidence interval implies a self-financing range of 42–124 percent.

[69] This is not a perfect comparison since it compares the "net cost" of the EITC and the "budgetary cost" of the school meals programs. Accounting for effects on parental labor supply, children's health, children's education, etc., may affect the school meals' "net cost."

[70] 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).

for lower-income families and children by around 36 percent (=(908-666)/666).

Our results contribute to a newer literature on how policies can help "pay for themselves," 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 assistance is accounted for (Mok, 2012; Kosar and Moffitt, 2017).[71] The EITC acts as a tax cut on these lower-income households, decreasing these high tax rates by up to 45 percentage points.[72] 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 pays 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

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

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

AEI and Brookings. Work, skills, community: Restoring opportunity for the working class. 2018.

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

[71] Sammartino et al. (2002) finds that a single parent with two dependents faces average marginal tax rates of roughly 60%–70% when increasing earnings from 50 to 125 percent of the poverty line and over 100 percent when moving from 50 to 150 percent of the poverrty line.

[72] Kaplow (2011) also points this out: "the EITC is equivalent to making the phase-out of other transfers more gradual. For low levels of earnings, the phase-out may be reduced, say, from a rate of 100% to 60%."

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

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

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

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

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

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

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

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

J. Bakija. Documentation for a comprehensive historical us federal and state income tax calculator program. *Williams College*, 2014.

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

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

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

J. Bastian and K. Michelmore. 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, 2018.

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

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

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

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

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

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

G. J. Borjas. 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, 2003.

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

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

R. V. Burkhauser and M. C. Daly. Policy watch: Us disability policy in a changing environment. *Journal of Economic Perspectives*, 16(1):213–224, 2002.

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

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

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

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

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

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

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

R. Chetty. 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, 2009b.

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

R. Chetty, A. Guren, D. Manoli, and A. Weber. 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*, pages 1–56. University of Chicago Press, 2012.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

P. Diamond. Income Taxation with Fixed Hours of Work. *Journal of Public Economics*, 13(1): 101–110, 1980.

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

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

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

W. Dow, A. Godøy, C. Lowenstein, and M. Reich. Can economic policies reduce deaths of despair? Working Paper 25787, National Bureau of Economic Research, April 2019. URL http://www.

nber.org/papers/w25787.

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

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

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

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

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

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

N. Eissa, H. Kleven, and C. Kreiner. 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, 2008.

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

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

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

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

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

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

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

E. Gould, B. Weinberg, and D. Mustard. Crime Rates and Local Labor Market Opportunities in the United States: 1979—1997. *Review of Economics and statistics*, 84(1):45–61, 2002.

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

J. Grogger. 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, 2003.

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

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

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

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

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

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

S. Hoffman and L. Seidman. The earned income tax credit. *Upjohn Press*, 1990.

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

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

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

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

H. Hoynes, J. Rothstein, and K. Ruffini. Making work pay better through an expanded earned income tax credit. *Driving Growth through Women's Economic Participation. Washington, DC: The Hamilton Project, Brookings Institution*, pages 57–69, 2017.

P. Hunt, J. Anderson, and J. Saunders. 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, 2017.

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

K. Isaacs and S. Choudhury. Social security: Primary insurance amount. 2017. URL https://www.ssa.gov/oact/COLA/piaformula.html.

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

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

M. R. Jones. the eitc over the great recession: who benefited? *National Tax Journal*, 70(4):709–736, 2017a.

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

M. R. Jones and J. Ziliak. The Antipoverty Impact of the EITC: New Estimates from Survey and Administrative Tax Records. Technical report, US Census Bureau, 2019.

L. Kaplow. *The theory of taxation and public economics*. Princeton University Press, 2011.

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

H. Kleven. The eitc and the extensive margin: A reappraisal. *Working Paper*, 2019.

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

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

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

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

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

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

A. Leigh. 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, 2010.

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

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

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

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

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

B. Mazumder. 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, 2005.

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

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

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

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

B. Meyer and D. Rosenbaum. Welfare, the Earned Income Tax Credit, and the Labor Supply of

Single Mothers. *Quarterly Journal of Economics*, 116(3):1063–1114, 2001.

B. Meyer, V. Mooers, and D. Wu. The use and misuse of income data and the rarity of extreme poverty in the united states. 2018.

B. D. Meyer. Labor Supply at the Extensive and Intensive Margins: The EITC, Welfare, and Hours Worked. *American Economic Review*, 92(2):373–379, 2002.

B. D. Meyer and N. Mittag. Using Linked Survey and Administrative Data to Better Measure Income: Implications for Poverty, Program Effectiveness and Holes in the Safety Net. (21676), October 2015.

B. D. Meyer and J. X. Sullivan. Measuring the well-being of the poor using income and consumption. *Journal of Human Resources*, 38(4), 2003.

C. Michalopoulos. *Does making work pay still pay?: An update on the effects of four earnings supplement programs on employment, earnings, and income.* MDRC, 2005.

C. Michalopoulos, P. K. Robins, and D. Card. When financial work incentives pay for themselves: evidence from a randomized social experiment for welfare recipients. *Journal of public economics*, 89(1):5–29, 2005.

C. Miller, L. F. Katz, G. Azurdia, A. Isen, C. Schultz, and K. Aloisi. Boosting the eitc for singles: Final impact findings from the paycheck plus demonstration in new york city, 2018.

K. Milligan and T. Schirle. Push and pull: Disability insurance, regional labor markets, and benefit generosity in canada and the united states. (23405), May 2017. doi: 10.3386/w23405.

J. A. Mirrlees. An Exploration in the Theory of Optimum Income Taxation. *The review of economic studies*, 38(2):175–208, 1971.

S. Mok. *Effective Marginal Tax Rates for Low- and Moderate-Income Workers*, 2012.

E. Moretti. Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions. *American Economic Review*, 94(3):656–690, 2004.

J. Moulton, A. Graddy-Reed, and L. Lanahan. Beyond the eitc: the effect of reducing the earned income tax credit on labor force participation. *National Tax Journal*, 69(2):261–284, 2016.

M. Mueller-Smith. The Criminal and Labor Market Impacts of Incarceration. 2015.

National Council for Adoption. *Better Prospects, Lower Cost: The Case for Increasing Foster Care Adoption*, 2009.

D. Neumark and K. E. Williams. Do state eitcs increase participation in the federal eitc. 2016.

A. Nichols and D. Kassabian. TANF Recipients' Implicit Tax Rates from Earnings Disregard Policies. *Washington, DC: The Urban Institute*, 2012.

A. Nichols and J. Rothstein. The Earned Income Tax Credit. *Economics of Means-Tested Transfer Programs in the United States*, 1:137, 2016.

A. Nichols, E. Sorensen, and K. Lippold. The new york noncustodial parent eitc: Its impact on child support payments and employment. *Washington, DC: Urban Institute*, 2012.

N. Pilkauskas and K. Michelmore. The effect of income on housing instability and living arrangements: Evidence from the earned income tax credit. 2018.

M. Ross and N. Svajlenka. Worrying declines in teen and young adult employment. *Brookings*, 2015.

J. Rothstein. Is the EITC as Good as an NIT? Conditional Cash Transfers and Tax Incidence. *American Economic Journal: Economic Policy*, 2(1):177–208, 2010.

E. Saez. Optimal Income Transfer Programs: Intensive versus Extensive Labor Supply Responses. *Quarterly Journal of Economics*, 117(3):1039–1073, 2002.

F. Sammartino, E. Toder, and E. Maag. Providing federal assistance for lowincome families through the tax system: A. In *Center, Urban Institute*. Citeseer, 2002.

J. Slemrod and S. Yitzhaki. The costs of taxation and the marginal efficiency cost of funds. *Staff Papers*, 43(1):172–198, 1996.

G. Solon. Intergenerational Income Mobility in the United States. *The American Economic Review*, pages 393–408, 1992.

SSA. The growing gap in life expectancy by income: Recent evidence and implications for the social security retirement age. *Congressional Research Service*, 2019a.

SSA. Understanding supplemental security income ssi income. 2019b. URL https://www.ssa.gov/ssi/text-income-ussi.htm.

State of New Jersey Department of Corrections State Parole Board Juvenile Justice Commission. *Release Outcome 2013 A Three-Year Follow-Up*, 2013. http://www.state.nj.us/corrections/pdf/offender_statistics/2013_Release_Recidivism_Report.pdf accessed June 19, 2018.

C. Stone and W. Chen. Introduction to Unemployment Insurance. *Center on Budget and Policy Priorities*, 2013.

U. Treasury. General explanations of the administration's fiscal year 2017 revenue proposals. 2016.

M. Weinzierl. A Welfarist Role for Nonwelfarist Rules: An Example with Envy. 2017.

T.-T. Yang. Family Labor Supply and the Timing of Cash Transfers: Evidence from the Earned Income Tax Credit. *Journal of Human Resources*, 53(2):445–473, 2018.

Table 1: Summary Statistics (in Real 2016 Dollars)

Variable	Full sample Mean	Full sample Std. Dev.	Single sample Mean	Single sample Std. Dev.
Age	41.3	12.5	38.6	13.2
Less than HS education	0.41	0.49	0.44	0.50
Single or Head of HH filer	0.46	0.50	1.00	0
White	0.80	0.40	0.72	0.45
Black	0.14	0.34	0.22	0.41
Hispanic	0.06	0.25	0.06	0.23
Number of children	0.80	1.03	0.54	0.90
Children under 5	0.25	0.58	0.16	0.48
Employed	0.74	0.44	0.77	0.42
Annual Weeks Worked	34.3	22.9	35.7	22.1
Weekly Hours Worked	27.4	18.9	29.3	18.4
Individual Earnings	26,000	44,000	25,000	39,000
Households Earnings	58,000	82,000	27,000	42,000
FICA/Payroll Taxes	3,716	4,243	3,656	3,974
Sales Taxes Paid	618	1,122	604	969
Unemployment Taxes	258	239	269	231.0
Total Taxes Paid	4,576	5,198	4,506	4,829
Welfare (AFDC/TANF) benefits	98	900	179	1,194
Public Housing Benefits	205	1,303	376	1,740
Food Stamp/SNAP Benefits	306	1,230	509	1,543
Disability Benefits	96	1,616	116	1,747
SSI Benefits	192	1,381	334	1,791
Workers' Comp. Benefits	49	1,051	55	1,122
Unemployment Benefits	168	1,493	208	1,618
Total Public Assistance	1,110	3,849	1,771	4,632
Any Public Assistance	0.2	0.4	0.2	0.4
Max Federal EITC	2,260	2,156	1,713	1,927
Max State EITC	132.2	358.8	99.1	294.1
Federal EITC Benefits	389	1,118	501	1,229
State EITC Benefits	17	134	23	154
Total EITC Benefits	406	1,174	524	1,293
Observations	1,200,000		523,000	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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. Bakija tax calculator used to generate EITC eligible received. Numbers are rounded to comply with Census disclosure-avoidance guidelines. Census DRB release number CBDRB-FY19-389.

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 (in $1,000s of 2016 $)	0.61		0.50		.006	
	(0.13)		(0.13)		(.003)	
MaxEITC × Married		-0.32		-0.24		-.014
		(0.12)		(0.13)		(.003)
MaxEITC × Single		2.75		2.22		.051
		(0.22)		(0.19)		(.005)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.095	0.095	0.102	0.103	0.091	0.092
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Mean Dep. Var.	34.25		27.44		0.737	

Panel B: Earnings and EITC Benefits

	Annual Earnings		EITC Benefits		Earnings with EITC	
	(7)	(8)	(9)	(10)	(11)	(12)
MaxEITC (in $1,000s of 2016 $)	558		349		908	
	(129)		(10)		(128)	
MaxEITC × Married		440		272		712
		(131)		(10)		(130)
MaxEITC × Single		832		527		1359
		(246)		(15)		(240)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.072	0.072	0.302	0.303	0.070	0.070
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Mean Dep. Var.	26,000		405.9		26,000	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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.2 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 × number-of-children level). CPS ASEC weights used, though unweighted results are very similar. Numbers are rounded to comply with Census disclosure-avoidance guidelines. Census DRB release number CBDRB-FY19-389. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: 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 (in \$1,000s of 2016 \$)	92		-243		-.005	
	(22)		(36)		(.002)	
MaxEITC × Married		70		20		.006
		(26)		(19)		(.001)
MaxEITC × Single		157		-850		-.031
		(40)		(104)		(.004)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.139	0.129	0.087	0.087	0.144	0.144
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Mean Dep. Var.	5,418		1,110		0.160	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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. Individual tax and public assistance components shown in Tables A.5 and A.6. Table A.2 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 × number-of-children level). CPS ASEC weights used, though unweighted results are very similar. Numbers are rounded to comply with Census disclosure-avoidance guidelines. Census DRB release number CBDRB-FY19-389. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: 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 of 2016 $)	98		-189		79		-249	
	(12)		(31)		(19)		(47)	
EITC (in $1,000s of 2016 $)		267		-516		184		-576
		(76)		(96)		(82)		(104)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,200,000		1,200,000		1,200,000		1,209,000	
Kleibergen-Paap rk LM statistic	13.2	19.5	13.2	19.5	10.2	19.8	10.2	19.8
Kleibergen-Paap rk Wald F-statistic	36.6	776.7	36.6	776.7	21.03	939.2	21.03	939.2
First-Stage Estimate	0.803	0.295	0.803	.295	1.06	0.459	1.06	.459
	(.13)	(.010)	(.13)	(.010)	(.23)	(.01)	(.23)	(.01)

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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 × 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. Numbers are rounded to comply with Census disclosure-avoidance guidelines. Census DRB release number CBDRB-FY19-389. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Simulated-Instrument (SIV) Approach

	Federal EITC	Federal + State EITC
Simulated Instrument Bin =	State × Year ×	Number of Children
	(1)	(2)
Panel A: Annual Weeks Worked		
EITC (in 1000s of 2016 $)	1.46	1.40
	(0.36)	(0.35)
Panel B: Weekly Hours Worked		
EITC	1.76	1.65
	(0.35)	(0.34)
Panel C: Binary Employment		
EITC	0.019	0.017
	(0.01)	(0.01)
Panel D: Annual Wage and Salary Earnings		
EITC	1,754	1,675
	(538)	(490)
Panel E: Total Taxes Paid		
EITC	392	372
	(113)	(105)
Panel F: Total Public Assistance Received		
EITC	-353	-356
	(96)	(94)
Full controls	Yes	Yes
Observations	1,200,000	1,200,000
Mean SIV:	0.348	0.363

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64. To create each SIV, we use the 1989 CPS sample of households; we calculate the EITC benefits that each household would receive in in each between 1989 and 2016; we use the CPI to adjust 1989 income into 1990–2016 values; and finally, we collapse EITC benefits using CPS weights at the specified bin. These SIVs implicitly capture all EITC parameters and policy changes. We merge these SIVs into the main sample and run regressions using equation (1) except we replace $MaxEITC$ with the simulated instrument. CPS ASEC weights used. R-squareds in Panels A–F are: 0.096, 0.101, 0.090, 0.070, 0.139, and 0.089. Numbers are rounded to comply with Census disclosure-avoidance guidelines. Census DRB release number CBDRB-FY19-389. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Effects of the EITC Are Similar Before and After 2005

	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 Pre2005	.65	.49	.008	310	64	-247	292
	(.11)	(.10)	(.002)	(127)	(22)	(29)	(9)
MaxEITC Post2005	.86	.70	.011	812	135	-241	327
	(.12)	(.12)	(.003)	(141)	(25)	(33)	(9)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.096	0.102	0.093	0.071	0.131	0.088	0.304
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Panel B: Sample of Unmarried Women							
MaxEITC Pre2005	2.44	1.98	.048	913	185	-753	503
	(.19)	(.15)	(.004)	(164)	(33)	(90)	(12)
MaxEITC Post2005	2.65	2.11	.051	966	174	-759	507
	(.21)	(.17)	(.004)	(185)	(33)	(90)	(12)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.091	0.098	0.086	0.095	0.161	0.099	0.377
Observations	523,000	523,000	523,000	523,000	523,000	523,000	523,000

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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. $MaxEITC$ units are $1,000s of 2016 dollars. 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 × number-of-children level). CPS ASEC weights used, though unweighted results are very similar. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: The EITC's Effect on State and Federal Budgets

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Costs and Benefits for Federal Government (N=1,200,000)						
	Federal EITC Received	Payroll Taxes Paid	Welfare Received	Public Housing Received	Food Stamps Received	SSI and DI Received
MaxEITC (in $1,000s of 2016 $)	349	70	-158	-25	57	-19
	(10)	(19)	(21)	(8)	(9)	(10)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.302	0.142	0.09	0.055	0.162	0.014
Mean Dep. Var.	407	3,716	60	205	305	336
Panel B: Costs and Benefits for State Governments (N=1,200,000)						
	State EITC Received	Sales Taxes Paid	Welfare Received			
MaxEITC (in $1,000s of 2016 $)	21	26	-101			
	(7)	(3)	(17)			
Full controls	Yes	Yes	Yes			
R-squared	0.117	0.083	0.089			
Mean Dep. Var.	16.74	617.7	37.84			
Panel C: Costs and Benefits for States, With and Without a State EITC						
	Ever Had An EITC (N=699,000)			Never Had An EITC (N=501,000)		
	State EITC Received	Sales Taxes	Welfare Received Paid	State EITC	Sales Taxes	Welfare Received
MaxEITC (in $1,000s of 2016 $)	37	31	-128	0	17	-56
	(11)	(3)	(20)	(0)	(4)	(9)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.14	0.091	0.105	0	0.067	0.06
Mean Dep. Var.	28	647.9	49	0	572.8	20.98

Notes: Data, sample, and EITC described in Table 3. Tax calculator used to generate payroll taxes. Sales taxes computed by authors (see Table E.3) 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 × number-of-children level). CPS ASEC weights used, though unweighted results are very similar. In addition to these results, we also find suggestive evidence of increases in state income taxes paid: estimates of 32 (13), 32 (19), and 20 (16) for all states, states with an EITC, and states without an EITC. *** p<0.01, ** p<0.05, * p<0.1.

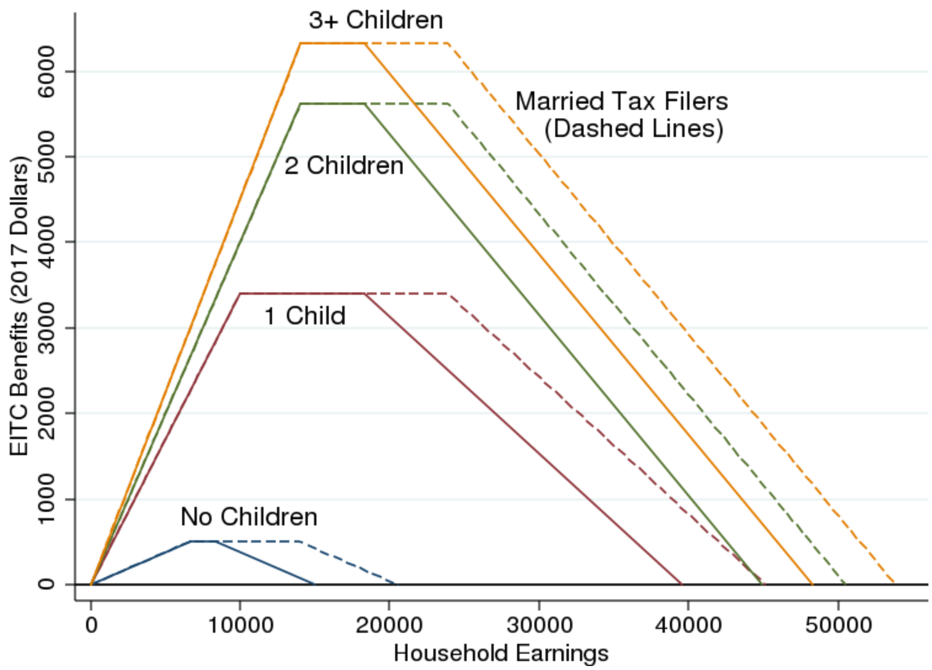

Fig. 1. Federal EITC Structure, 2017

Source: Authors' calculations from IRS data.

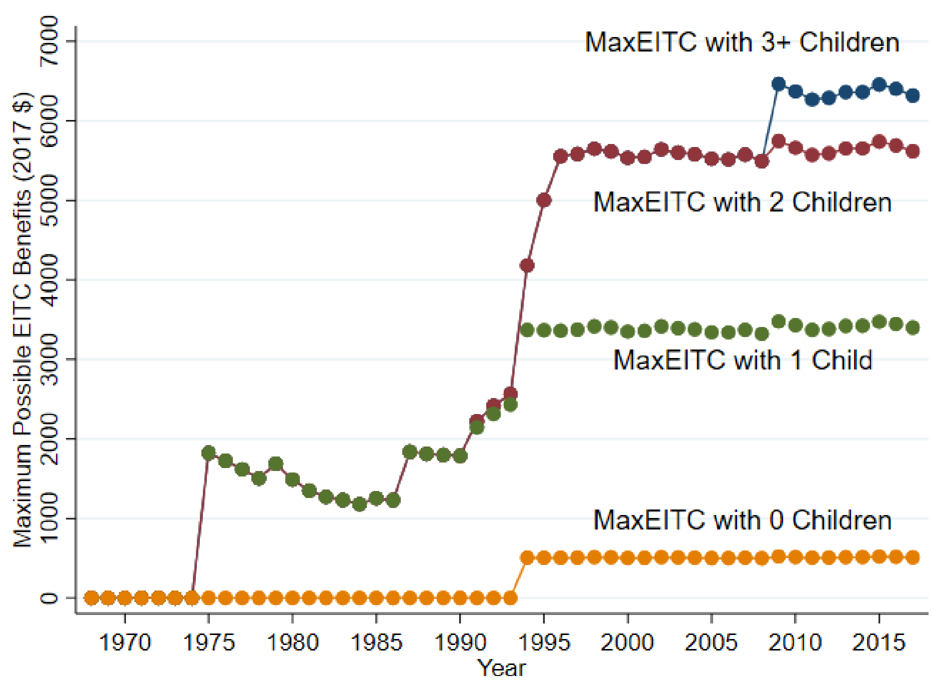

Fig. 2. Time-Series Variation in $MaxEITC$ by Number of Children

Source: Authors' calculations from IRS data.

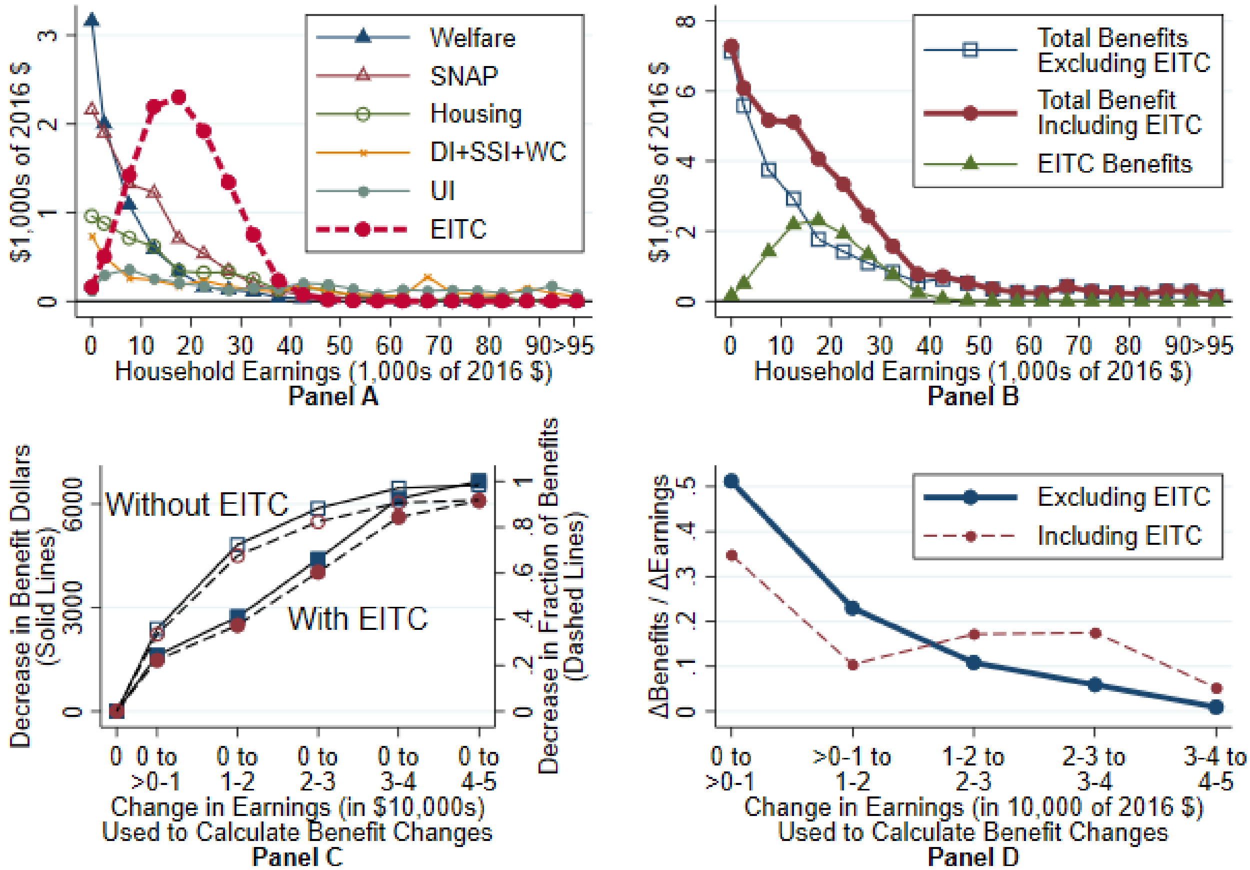

Fig. 3A. The Relationship Between Earnings and Public Assistance (Among All Mothers)

Source: 1990–2017 CPS ASEC. Public assistance benefits are self reported in the CPS ASEC. Panels A and B show average benefits (which are functions of take up rates and individual program eligibility rules) within $5,000 household earnings bins (in 2016 dollars). Specifically, these bins are $0; $1-$5,000; $5,001-$10,000; $10,001-$15,000; etc. Panels C and D use $10,000 household earnings bins for smoothing purposes. Panel C compares the benefits received by each earnings bin to the benefits received by households with zero earnings. This difference in benefit dollars is shown on the left axis and the difference as a fraction is shown on the right axis. Panel D shows the effective tax rate on benefits implied by Panel B, computed by comparing adjacent earnings bins and dividing the change in benefits by the change in average earnings. Average earnings in each bin are: $0, $4,514, $15,028, $24,934, $34,839, and $44,491. CPS weights are used. These figures illustrate the relationship between earnings and benefits; although they cannot be interpreted causally (i.e. if a given household changes earnings bins), they do provide a rough idea of how much public assistance benefits may decline for a mother deciding whether or not to work. For example, not working compared to working full time near the minimum wage of $7.50 per hour and earning $15,000 may result in about $5,000 less non-EITC public assistance (Panel D).

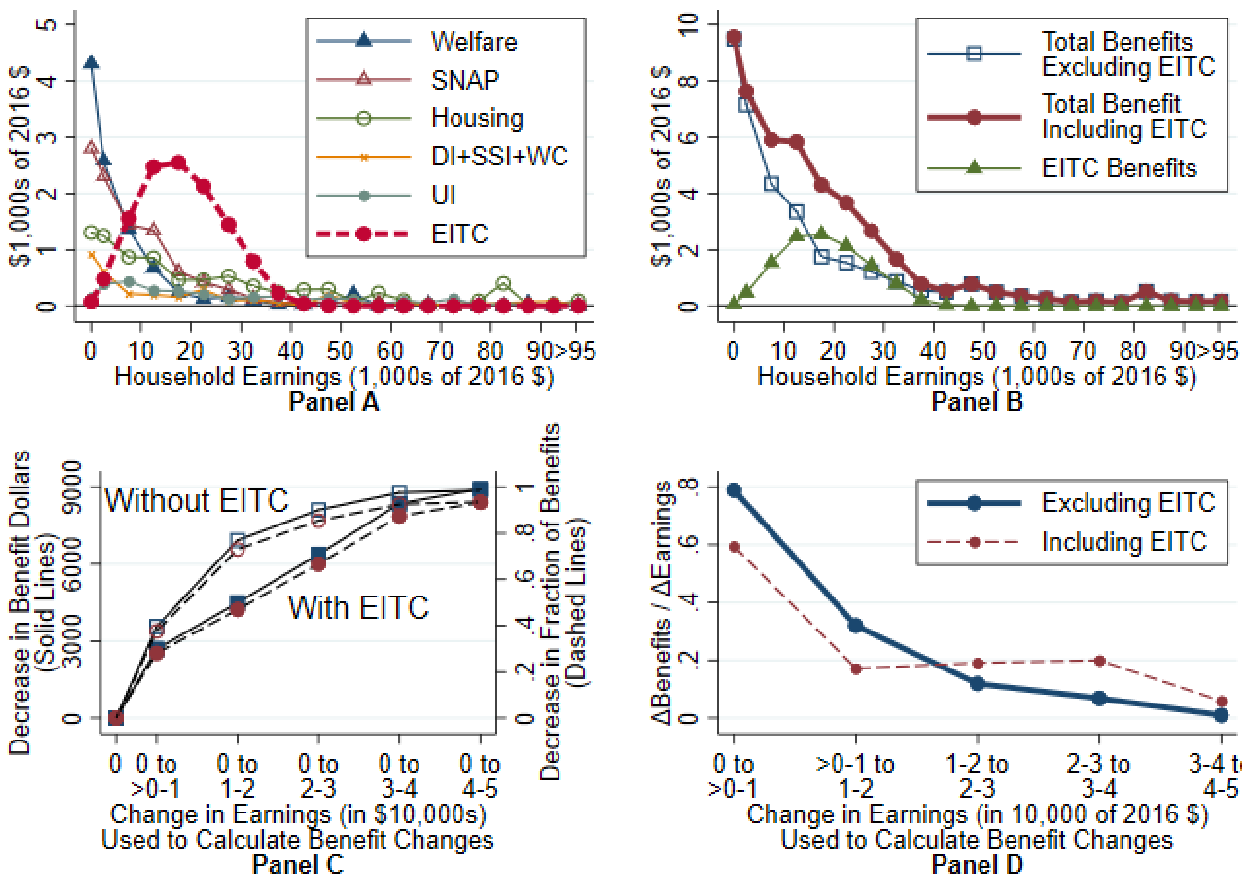

Fig. 3B. The Relationship Between Earnings and Public Assistance (Unmarried Mothers)

Source: See Figure 3A for data source and details. These four panels are identical to Figure 3A except the sample is restricted unmarried mothers. These figures illustrate the relationship between earnings and benefits; although they cannot be interpreted causally (i.e. if a given household changes earnings bins), they do provide a rough idea of how much public assistance benefits may decline for an unmarried mother deciding whether or not to work. For example, not working compared to working full time near the minimum wage of $7.50 per hour and earning $15,000 may result in about $7,000 less non-EITC public assistance (Panel D).

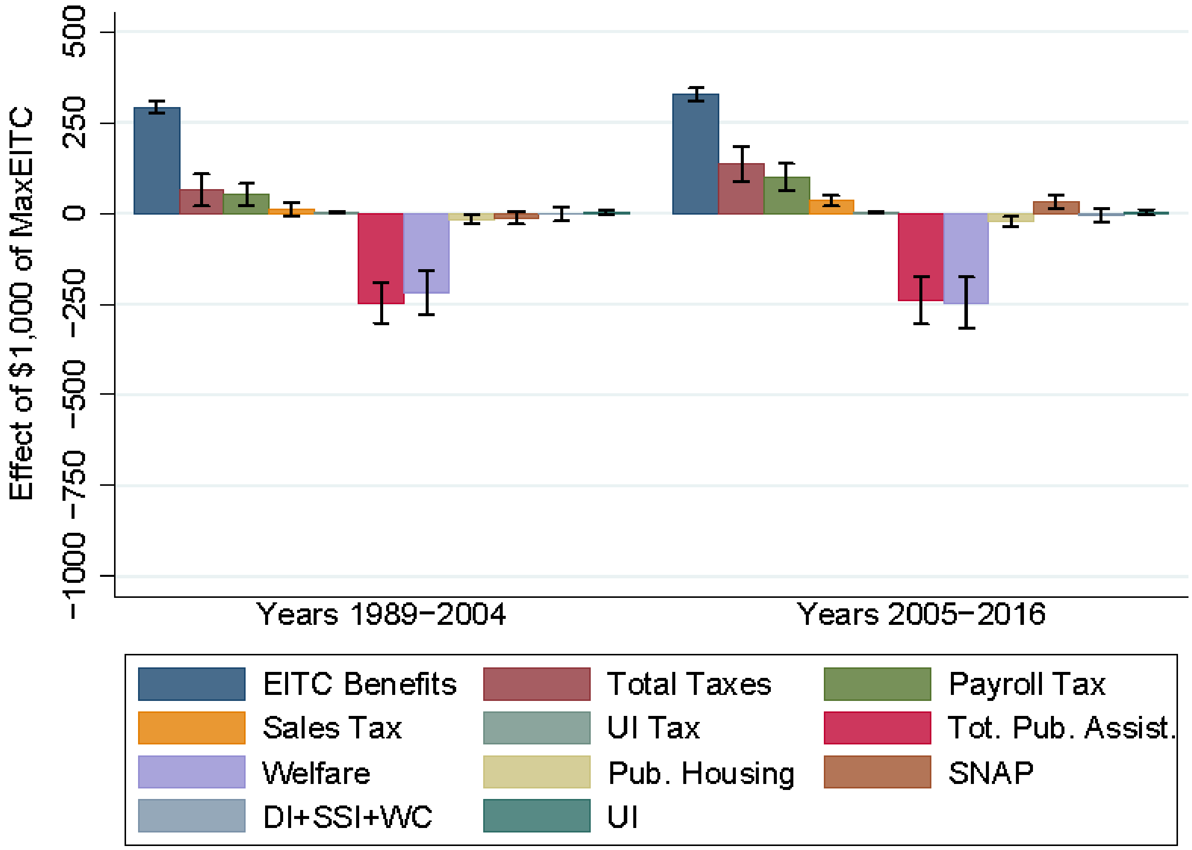

Fig. 4A. EITC, Taxes, and Public Assistance: Before and After 2005 (Full Sample)

Notes: Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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. 95 percentile confidence intervals shown. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year $\times$ number-of-children level). CPS ASEC weights used, though unweighted results are very similar. Individual estimates (from left to right) are: 292.3, 63.7, 50.7, 10.8, 2.7, -247, -217.7, -17.4, -12.9, -2.4, 2.8, 326.6, 135.3, 99.5, 34.7, 2.8, -240.6, -246.9, -23.5, 31.7, -5.6, and 2.7. See Table 6 for labor supply estimates before and after 2005.

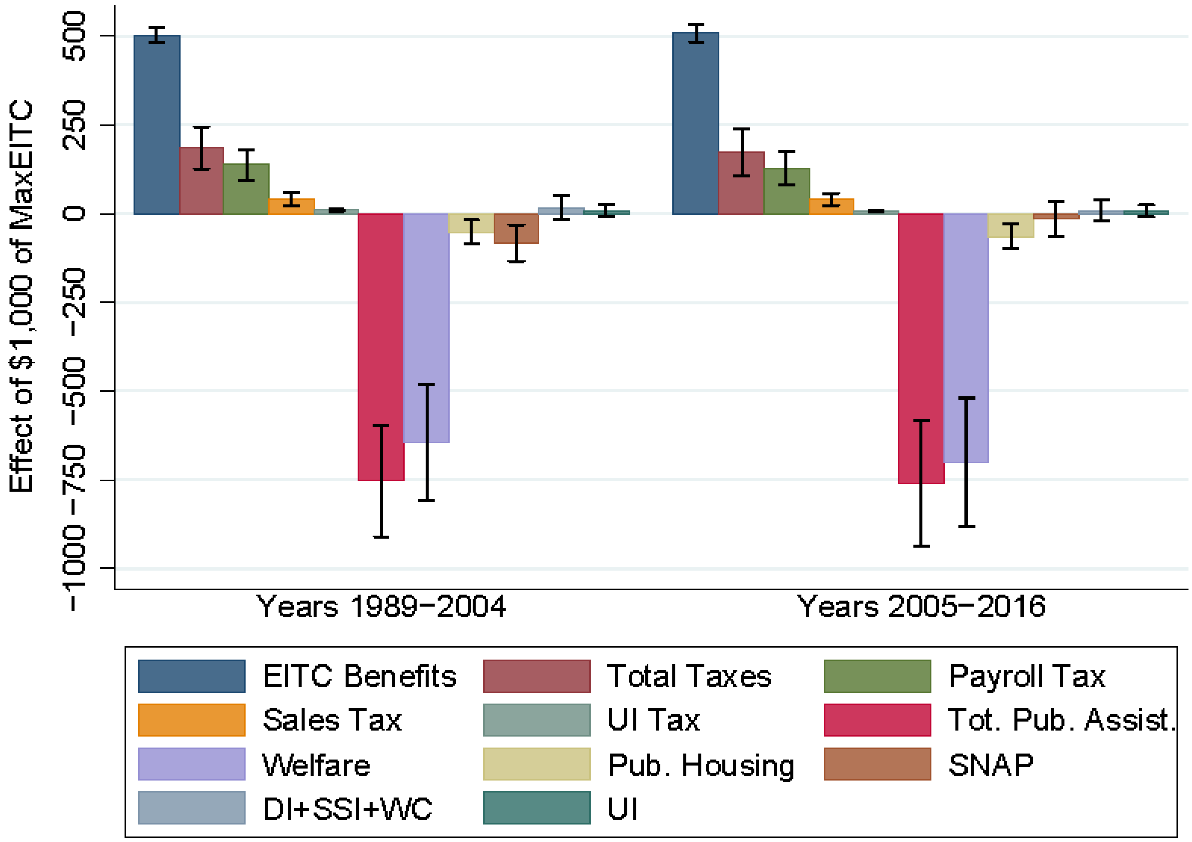

Fig. 4B. EITC, Taxes, and Public Assistance: Before and After 2005 (Unmarried Women)

Notes: See Figure 4A notes for details. Sample includes all unmarried women 19–64 years old, except for women who are dependents. 95 percentile confidence intervals shown. Individual estimates (from left to right) are: 502.7, 185.3, 137.2, 39.0, 9.1, -753.3, -645.7, -51.9, -83.5, 16.8, 8.7, 507.4, 173.7, 128, 39.2, 6.6, -759, -700.5, -64.1, -14.0, 8.6, and 8.2. See Table 6 for labor supply estimates before and after 2005.

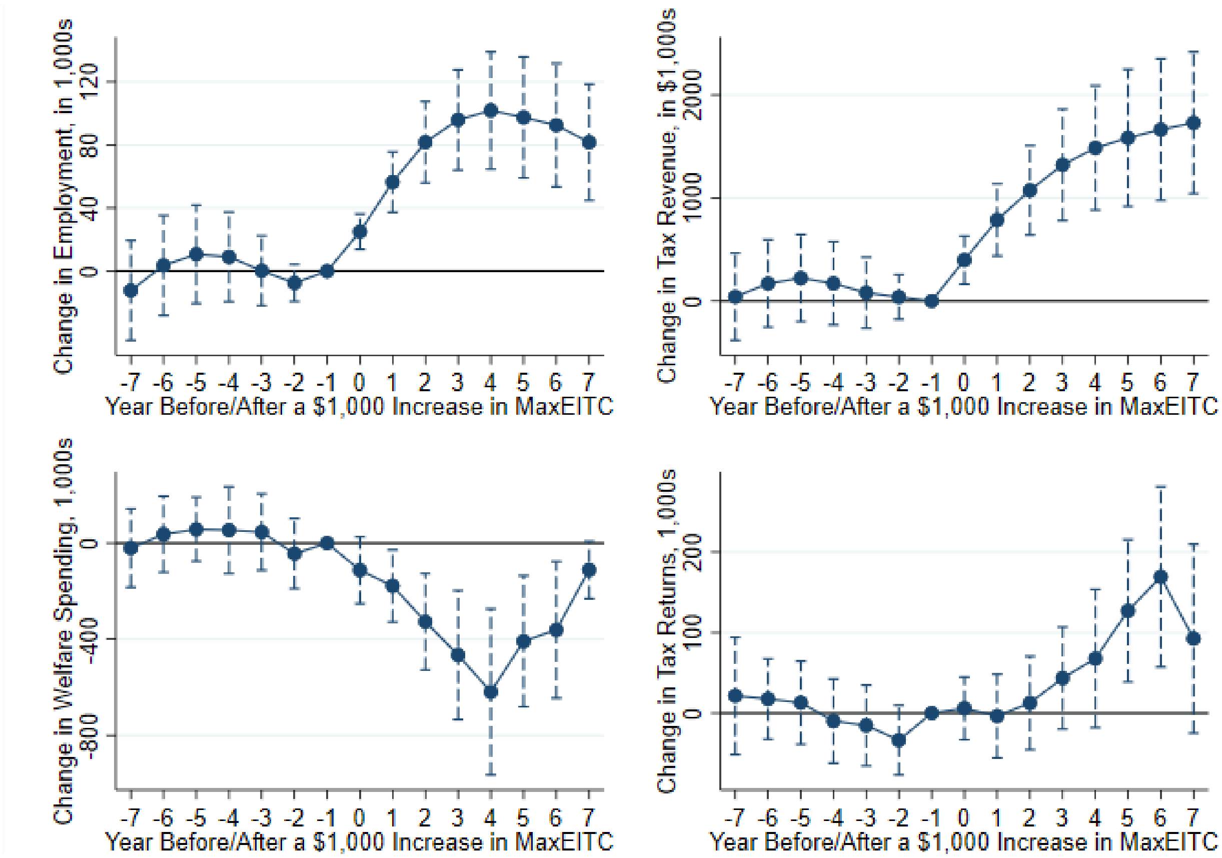

Fig. 5. Longer-Run Effects on Aggregate State-Level Outcomes

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). Estimates are robust to various sets of controls, shown in Table A.10. 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.

For Online Publication

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

Jacob E. Bastian and Maggie R. Jones[2]

List of Appendices:

Appendix A: Additional Tables and Figures

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Table A.1: 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
	(.11)	(.29)	(.09)	(.22)	(.16)
R-squared	0.132	0.132	0.132	0.132	0.132
Panel B: Weekly Hours Worked					
EITC	.49	.71	.44	.92	.77
	(.01)	(.29)	(.08)	(.18)	(.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
Panel E: Taxes Paid					
EITC	127	216	116	202	178
	(31)	(72)	(25)	(55)	(41)
R-squared	0.385	0.385	0.385	0.385	0.385
Panel F: Public Assistance Received					
EITC	-234	-234	-200	-435	-346
	(21)	(55)	(16)	(42)	(28)
R-squared	0.174	0.174	0.174	0.174	0.174
Full controls	Yes	Yes	Yes	Yes	Yes
Observations	1,563,990	1,563,990	1,563,990	1,563,990	1,563,990

Source: 1988–2016 CPS ASEC data. Sample includes all women 19–64, except for women who are dependents. $MaxEITC$ in column 1 is defined as maximum possible EITC benefits as a function of year and number of children; $MaxEITC$ in columns 2–3 is also a function of state. Columns 4–5 are the slope of the phase-in region of the EITC (see Figure 1) for the federal and federal + state EITCs. Results are from public data to be more easily replicable and are not identical to results based on linked IRS-CPS data. Mean dependent variable in Panels A–F are 33.3, 27.1, 0.74, 21,920, 9,963, and 1,149. CPS ASEC weights used. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2: Labor Supply, Taxes, and Public Assistance: Various Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Annual Weeks Worked									
MaxEITC	.81	1.05	.83	1.05	.79	.71	.61	.61	.60
	(.12)	(.13)	(.11)	(.12)	(.12)	(.13)	(.13)	(.13)	(.12)
R-squared	0.007	0.008	0.014	0.015	0.083	0.088	0.095	0.095	0.095
Panel B: Weekly Hours Worked									
MaxEITC	.35	.87	.35	.86	.66	.56	.50	.50	.49
	(.13)	(.12)	(.12)	(.12)	(.12)	(.14)	(.13)	(.13)	(.13)
R-squared	0.008	0.010	0.013	0.015	0.087	0.095	0.100	0.100	0.101
Panel C: Employment									
MaxEITC	0.001	.012	0.001	.012	.008	.007	.006	.006	.006
	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)
R-squared	0.005	0.007	0.012	0.014	0.077	0.085	0.091	0.091	0.092
Panel D: Annual Earnings									
MaxEITC	2665	1113	2688	1069	661	587	558	565	549
	(166)	(172)	(160)	(159)	(135)	(130)	(131)	(133)	(132)
R-squared	0.003	0.004	0.010	0.011	0.066	0.070	0.071	0.071	0.071
Panel E: Total Taxes Paid									
MaxEITC	525	194	528	183	105	100	92	94	90
	(36)	(31)	(34)	(29)	(24)	(24)	(24)	(24)	(24)
R-squared	0.006	0.008	0.022	0.023	0.121	0.130	0.130	0.131	0.131
Panel F: Total Public Assistance									
MaxEITC	-76	-199	-69	-197	-189	-255	-243	-242	-236
	(24)	(31)	(24)	(32)	(31)	(38)	(36)	(35)	(36)
R-squared	0.007	0.010	0.011	0.014	0.059	0.085	0.087	0.088	0.088
Observations	1,200,000			1,200,000	1,200,000		1,200,000		1,200,000
Controls									
# Children FE	X	X	X	X	X	X	X	X	X
Year FE		X		X	X	X	X	X	X
State FE			X	X	X	X	X	X	X
Education, Married, Age, Race, Child Under 5					X	X	X	X	X
(Married, Educ) × (Year, State, # Children) FE						X	X	X	X
Annual State Factors and Time Trends							X	X	X
7 Welfare Reform Variables × (Single, Education)								X	
State × # Children FE									X

Notes: Data, sample, EITC, standard errors, and CPS weights described in Tables 2 and 3. Labor supply variables defined (and means provided) in Table 2. Main set of controls is in column 7. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3: 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 (in $1,000s of 2016 $)	2.69		2.12		.051	
	(.22)		(.19)		(.005)	
MaxEITC × High Educ		1.98		1.47		.032
		(.26)		(.25)		(.005)
MaxEITC × Low Educ		3.13		2.52		.063
		(.28)		(.22)		(.006)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.090	0.090	0.097	0.097	0.085	0.085
Observations	523,000		523,000		523,000	
Mean Dep. Var.	35.7		29.3		0.77	
Panel B: Earnings and EITC Benefits						
	Annual Earnings		EITC Benefits		Earnings with EITC	
MaxEITC	766		512		1278	
	(208)		(14)		(203)	
MaxEITC × High Educ		840		426		1266
		(474)		(18)		(466)
MaxEITC × Low Educ		721		565		1285
		(121)		(15)		(125)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.094	0.094	0.377	0.377	0.093	0.093
Observations	523,000		523,000		523,000	
Mean Dep. Var.	25,000		524		25,000	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all unmarried women 19–64 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 × 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.4: The 2009 EITC Expansion and the Employment of Mothers with 3+ Children, Robust to Various Controls

Control Group	All Women with Less than 3+ Children						Mothers with 1 or 2 Children	Mothers with 2 Children
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
3+ Kids × Post2009	0.013	0.011	0.010	0.0098	0.010	0.017	0.019	0.022
	(0.0064)	(0.0059)	(0.0056)	(0.0057)	(0.0056)	(0.0095)	(0.0098)	(0.010)
R-squared	0.005	0.045	0.052	0.052	0.052	0.053	0.053	0.056
Observations	660,667	660,667	660,667	660,667	660,667	660,667	342,114	206,195
Mean	0.727	0.727	0.727	0.727	0.727	0.727	0.728	0.703
Controls								
Year FE, 3+ Kids, Age	X	X	X	X	X	X	X	X
Race, Educ, Married		X	X	X	X	X	X	X
State FE, State FE x (Married, Education)			X	X	X	X	X	X
State × Year Factors				X	X	X	X	X
State Time Trends					X	X	X	X
3+ Kids × (State FE, State × Year Factors)						X	X	X

Source: 2004–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. The difference-in-differences estimating equation is: $P(E_{ist}) = f(\beta_1(3+Kids)_{ist} + \beta_2(3+Kids) \times Post2009_{ist} + \delta_t^1 + \delta_s^2 + \beta_3 X_{ist} + \epsilon_{ist})$. Estimates of β_2 are shown. δ_t^1 and δ_s^2 are year and state FE. Individual demographic traits and state-by-year policies and economic conditions are controlled for (as in previous tables). Sample includes all women 19–64 years old, except for women who are dependents. The only change in $MaxEITC$ between 2004 and 2014 was in 2009 for adults with 3 or more children. These results corroborate the various labor supply results in Table 6. Employment defined as having positive weekly work hours. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year × 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.5: EITC's Effects on Various Forms of Taxes Paid

	(1)	(2)	(3)	(4)	(5)	(6)
	Payroll		Sales		UI	
MaxEITC (in $1,000s of 2016 $)	70		26		0.2	
	(19)		(3)		(1.0)	
MaxEITC × Married		53		18		-1.6
		(22)		(4)		(1.3)
MaxEITC × Single		108		45		4.3
		(31)		(7)		(1.8)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.142	0.142	0.083	0.083	0.286	0.286
Observations	1,200,000		1,200,000		1,200,000	
Mean Dep. Var.	3,716		618		258	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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 E.3) and are a function of earnings, EITC benefits, state, and year. Unemployment taxes computed by authors and described in Appendix E. Standard errors robust to heteroskedasticity and clustered at the state level (and are similar if clustered at the year × 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's Effect on the Amount of Various Types of Public Assistance Received

	(1)	(2)	(3)	(4)	(5)	(6)
	Cash Welfare		Public Housing		Food Stamps	
MaxEITC (in $1,000s of 2016 $)	-259		-25		57	
	(37)		(8)		(9)	
MaxEITC × Married		-39		5		79
		(11)		(4)		(6)
MaxEITC × Single		-767		-92		5
		(103)		(22)		(26)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.090	0.104	0.055	0.055	0.162	0.162
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Mean Dep. Var.	98		205		306	

	(7)	(8)	(9)	(10)
	DI + SSI + WC		Unemployment Insurance	
MaxEITC	-18.6		1.1	
	(10.0)		(3.9)	
MaxEITC × Married		-21.7		-3.3
		(10.7)		(4.4)
MaxEITC × Single		-11.2		11.4
		(15.4)		(9.3)
Full controls	Yes	Yes	Yes	Yes
R-squared	0.014	0.014	0.008	0.008
Observations	1,200,000	1,200,000	1,200,000	1,200,000
Mean Dep. Var.	337		168	

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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 × 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: EITC's Effect on Receiving Various Types of Public Assistance

	(1)	(2)	(3)	(4)	(5)	(6)
	Cash Welfare		Public Housing		Food Stamps	
MaxEITC (in $1,000s of 2016 $)	-0.028		-0.003		-0.002	
	(0.001)		(0.001)		(0.001)	
MaxEITC × Married		-0.004		0.001		0.008
		(0.001)		(0.001)		(0.001)
MaxEITC × Single		-0.084		-0.012		-0.026
		(0.004)		(0.003)		(0.004)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.096	0.102	0.054	0.054	0.158	0.158
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Mean Dep. Var.	0.021		0.026		0.097	
	DI + SSI + WC		Unemployment Insurance			
MaxEITC	-0.002		0.001			
	(0.001)		(0.001)			
MaxEITC × Married		-0.001		0.001		
		(0.001)		(0.001)		
MaxEITC × 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	1,200,000	1,200,000	1,200,000	1,200,000		
Mean Dep. Var.	0.038		0.032			

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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 × 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: Log-Log Specification

	Weeks Worked	Hours Worked	Annual Earnings and EITC	Total Taxes Paid	Public Assistance Received
	(1)	(2)	(3)	(4)	(5)
Log MaxEITC (in $1,000s of 2016 $)	0.22	0.21	1.28	0.86	-0.45
	(.06)	(.07)	(.20)	(.18)	(.10)
Full controls	Yes	Yes	Yes	Yes	Yes
R-squared	0.096	0.099	0.081	0.090	0.140
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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 × 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: Household-Level Regressions

	Household Earnings	EITC Benefits Received	Taxes Paid	Public Assistance Received
	(1)	(2)	(3)	(4)
MaxEITC (in $1,000s of 2016 $)	1115	550	121	-221
	(1370)	(35)	(158)	(68)
Full controls	Yes	Yes	Yes	Yes
Mean Dep. Var.	51,000	358	9,900	1,300
R-squared	0.112	0.132	0.243	0.032
Observations	1,402,000	1,402,000	1,402,000	1,402,000

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 × 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: 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*) units are $1,000s of 2016 dollars and 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.

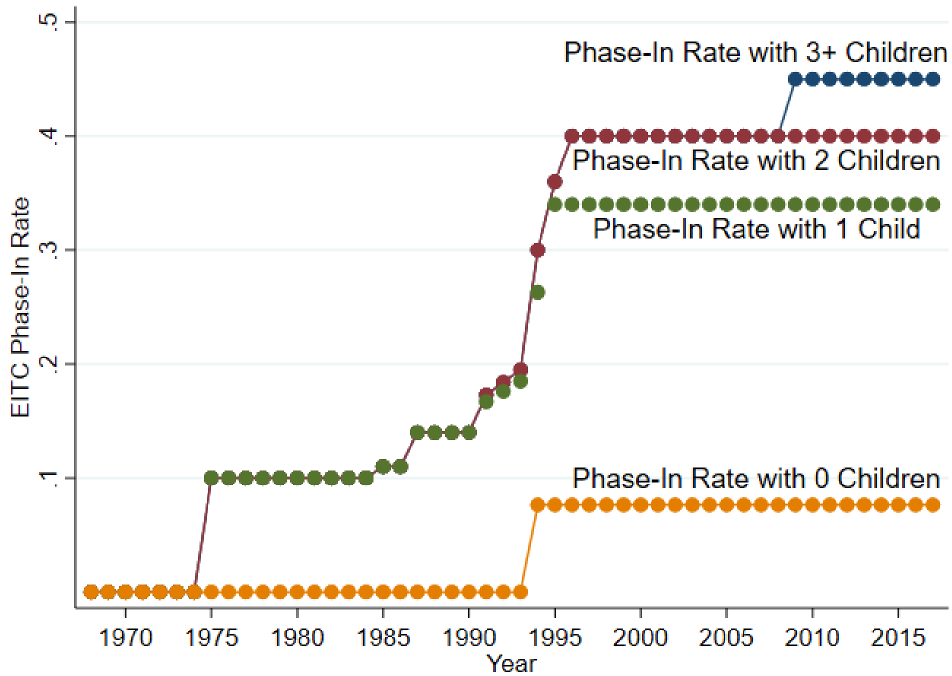

Fig. A.1. Time-Series Variation in Phase-In Rate by Number of Children

Notes: Authors' calculations from IRS data.

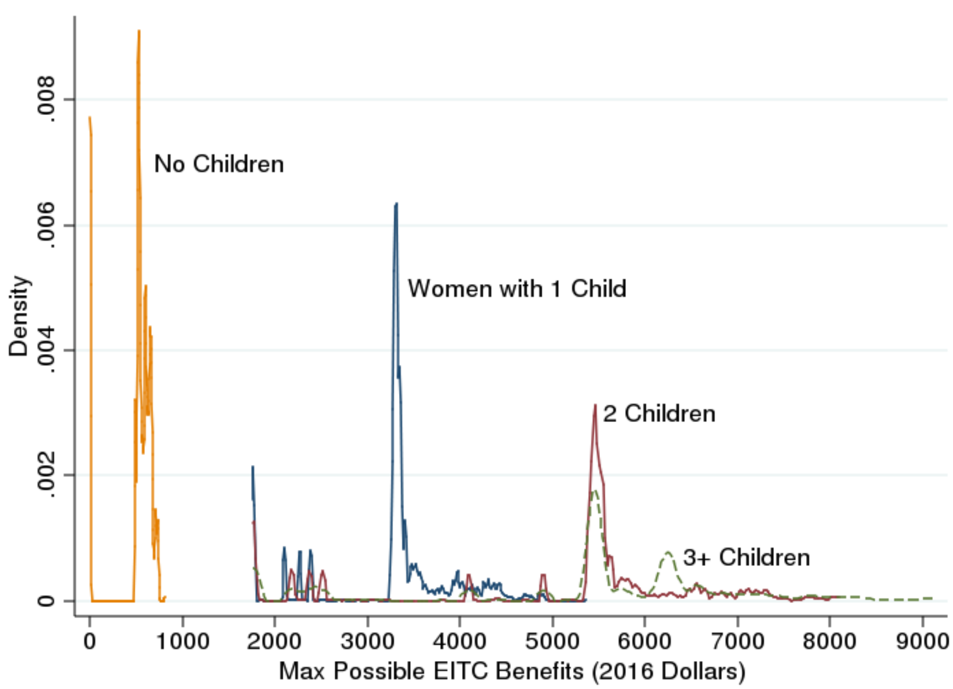

Fig. A.2. Distribution of $MaxEITC$ by Number of Children

Source: Authors' calculations from 1989–2017 CPS ASEC data.

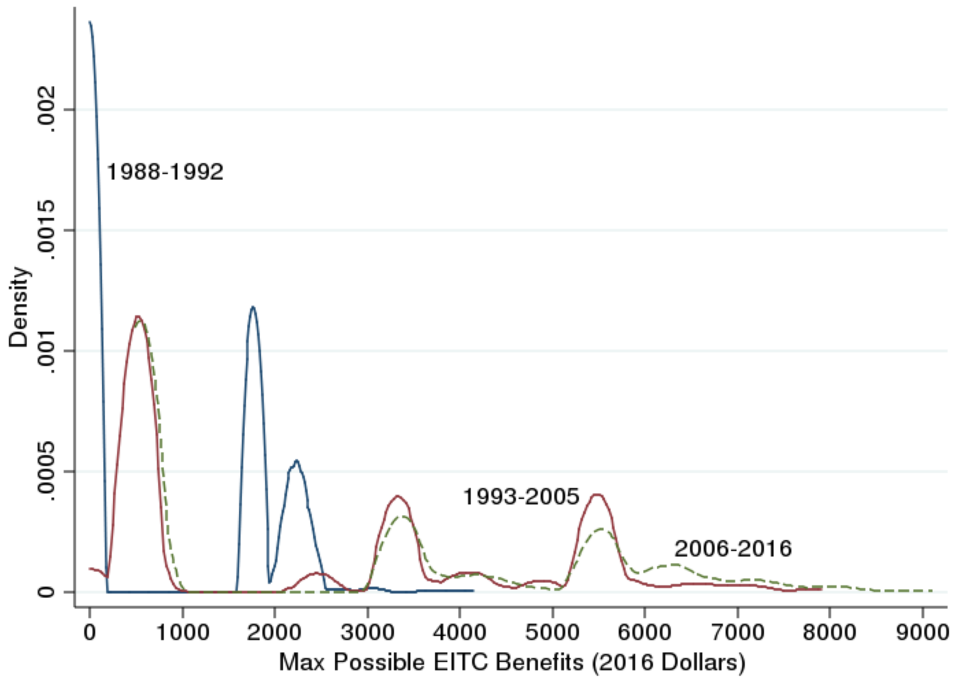

Fig. A.3. Distribution of $MaxEITC$ Over Time

Source: Authors' calculations from 1989–2017 CPS ASEC data.

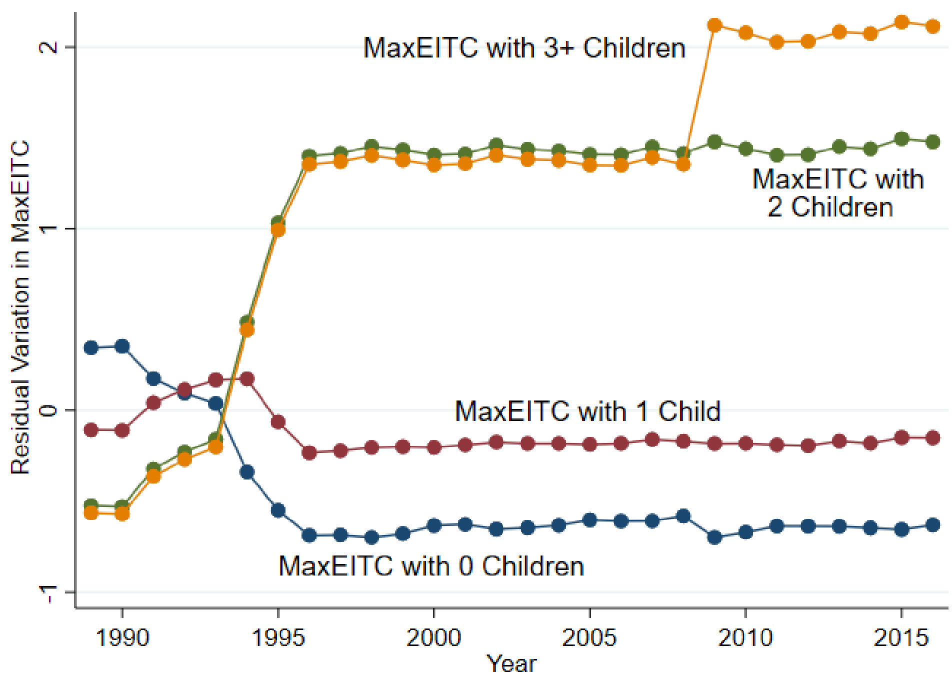

Fig. A.4. Trends in Residual Variation from Regressing $MaxEITC$ on Full Set of Controls

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 × number of children bins. Including state × year FE produces similar results. Units are $1,000 in real 2016 dollars. These trends look very similar to the unadjusted $MaxEITC$ trends in Figure 2.

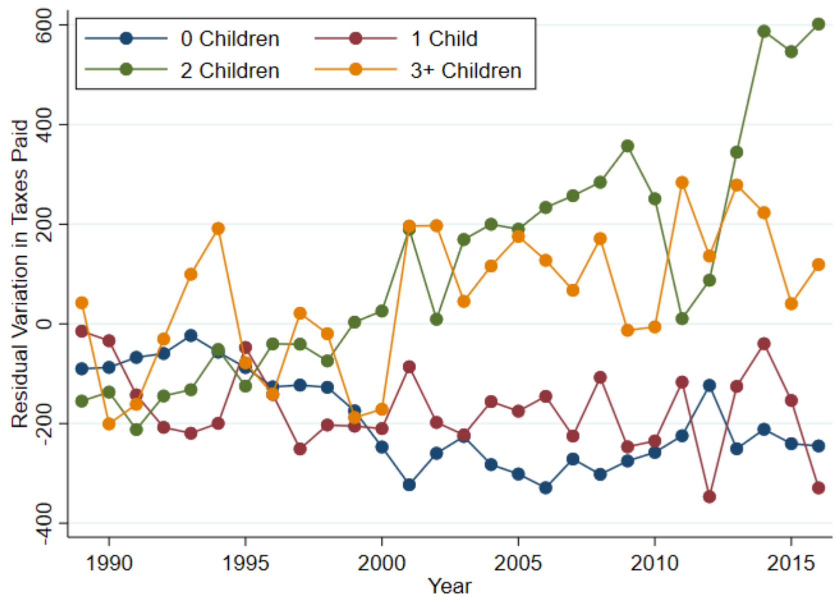

Fig. A.5. Residual Variation from Regressing Taxes Paid on Full Set of Controls

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 × number of children bins. Including state × year FE produces similar results. Units are real 2016 dollars. Comparing these trends with Figures 2 and A.4 provides the intuition behind the estimates in Table 3.

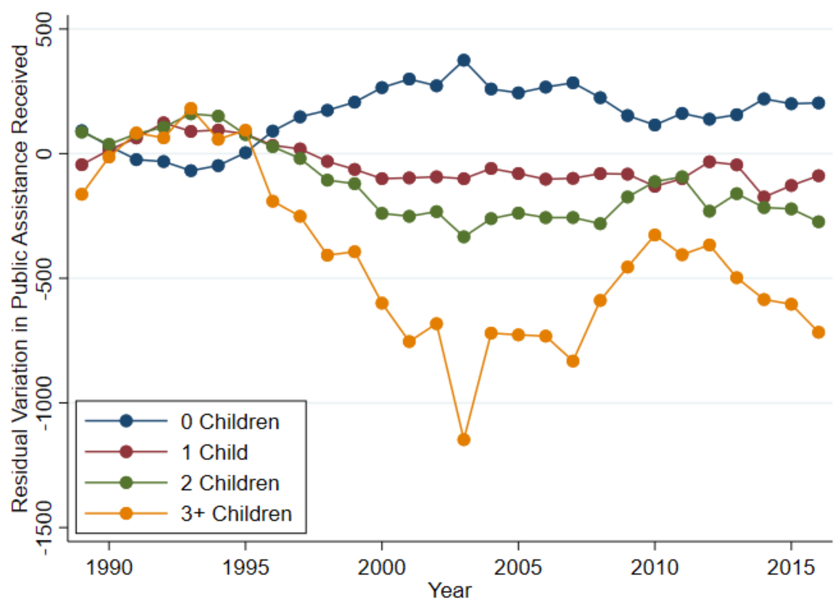

Fig. A.6. Residual Variation from Regressing Public Assistance on Full Set of Controls

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 A.4 provides the intuition behind the estimates in Table 3.

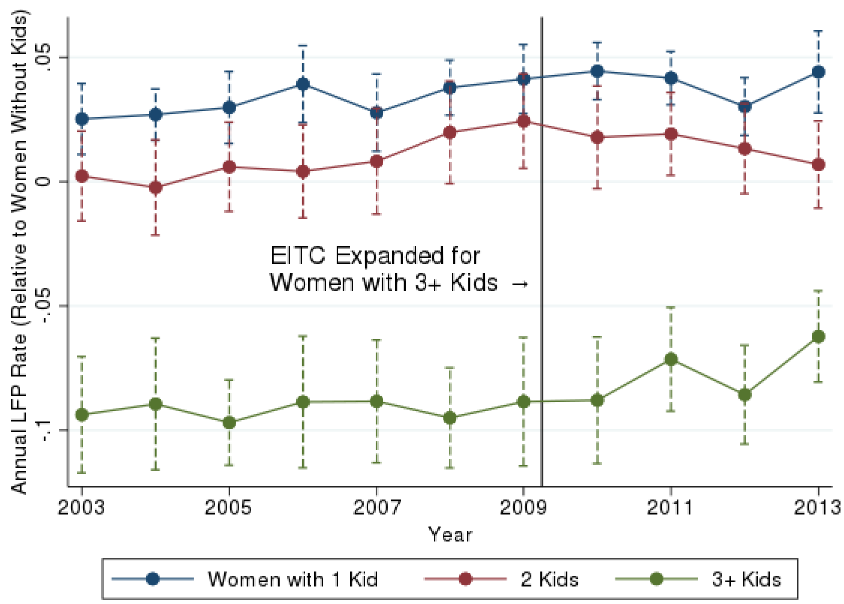

Fig. A.8A. Parallel Employment Trends: Mothers with 3+ Children

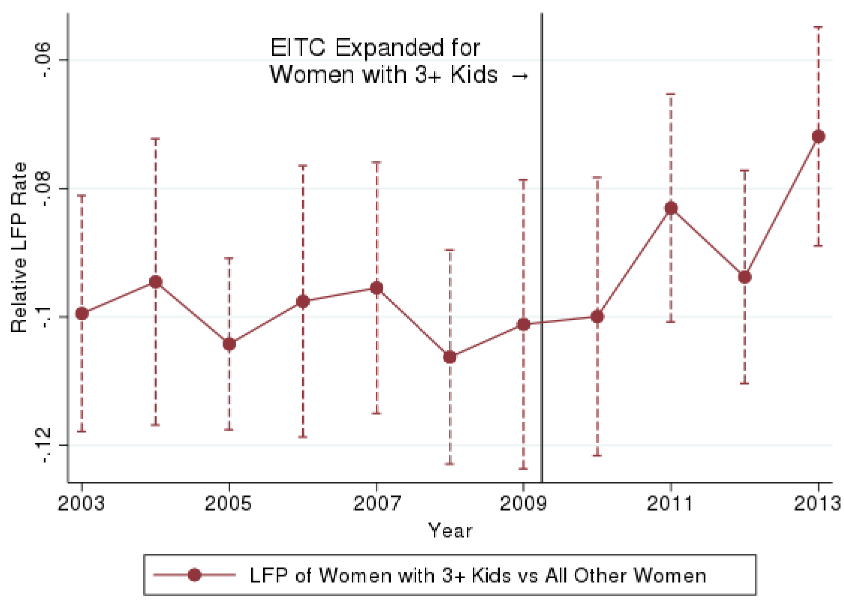

Fig. A.8B. Parallel Employment Trends: Mothers with 3+ Children vs. All Other Women

Notes: Figures A.8A and A.8B use 2004–2014 CPS ASEC and the sample contains all the women in the main sample for these years. Estimates in Figure A.8A come from a regression of working on year FE, year × having 1 child FE, year × having 2 children FE, and year × having 3+ children FE. Estimates in Figure A.8B come from a regression of working on year FE and year × having 3 or more children FE. Standard errors robust to heteroskedasticity and clustered at the state level. CPS ASEC weights used.

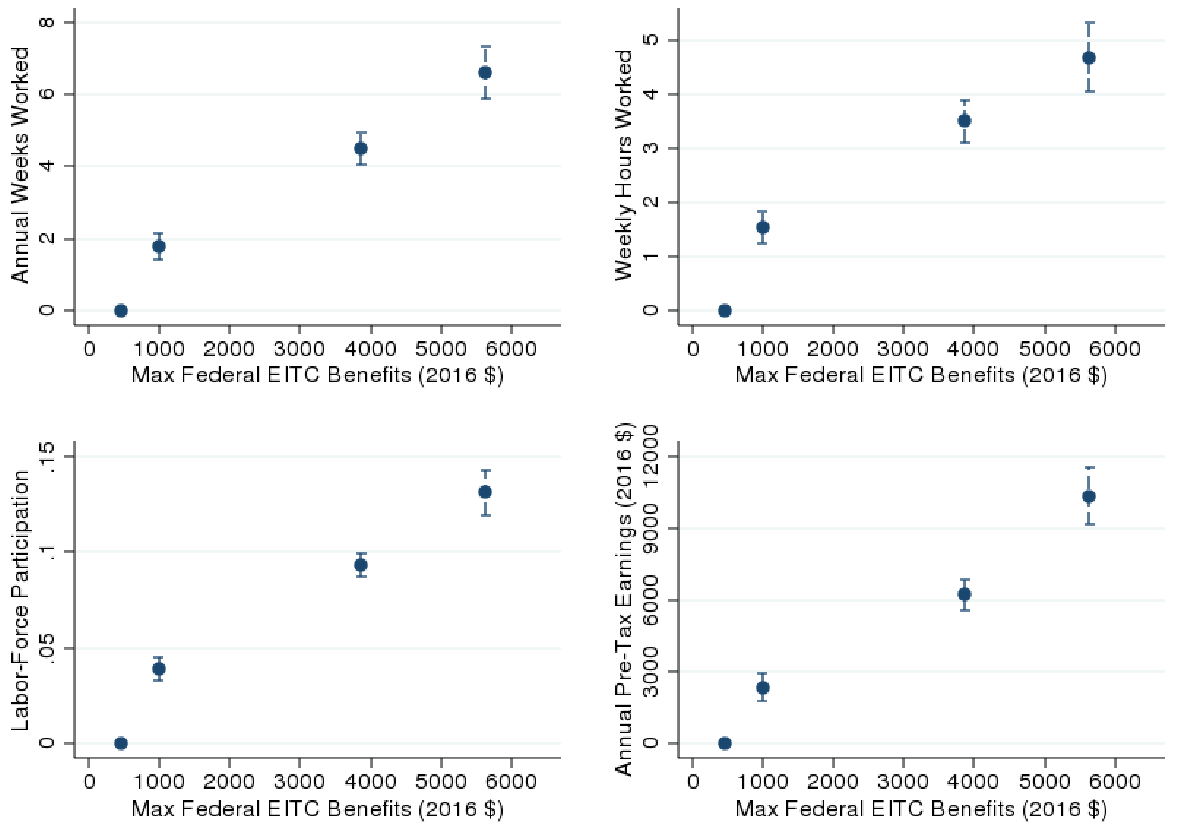

Fig. A.9. Categorical EITC Exposure and Positive Marginal Effects on Labor Supply

Source: 1990, 1995, 1996, 1998–2017 CPS ASEC data linked to IRS Form 1040 individual tax returns. Sample includes all women 19–64 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 (4) 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 × number-of-children level). CPS ASEC weights used, though unweighted results are very similar.

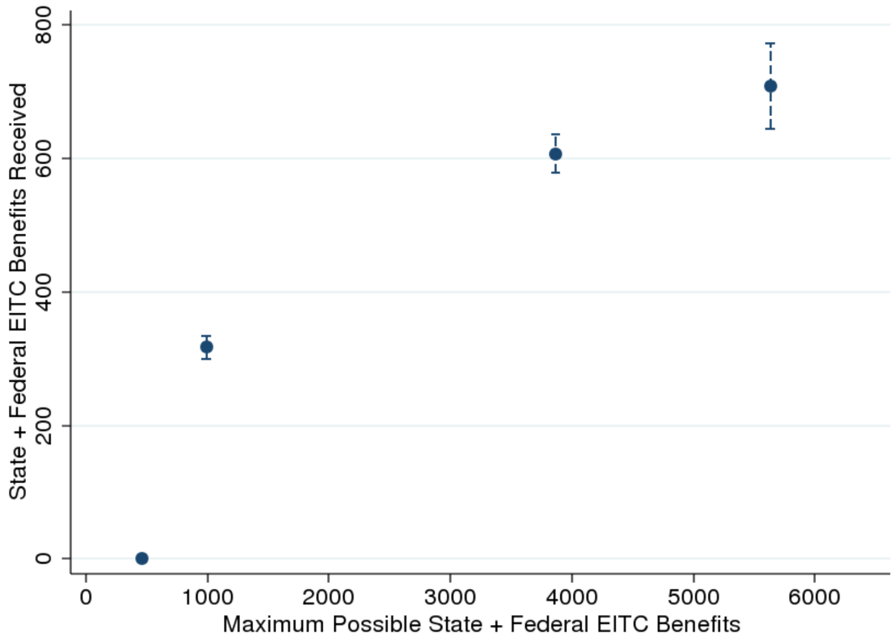

Fig. A.10. Categorical EITC Exposure and EITC Benefits Received

Source: Data, sample, and empirical approach is identical to Figure A.9, but with EITC benefits as the outcome.

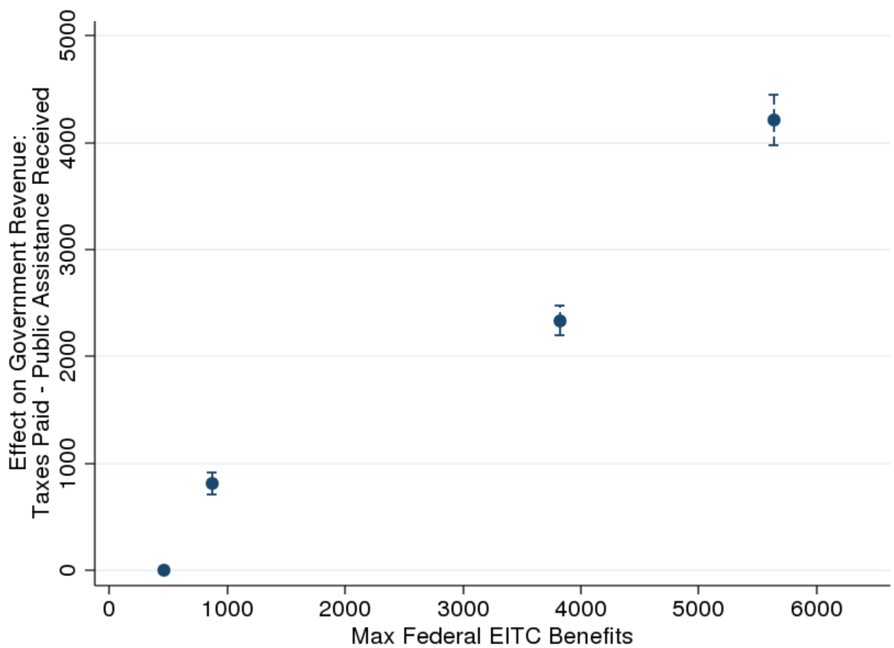

Fig. A.11. Categorical EITC Exposure and Net Effect on Government Revenue

Source: Data, sample, and empirical approach is identical to Figure A.9, but with government revenue (tax revenue minus public assistance) as the outcome.

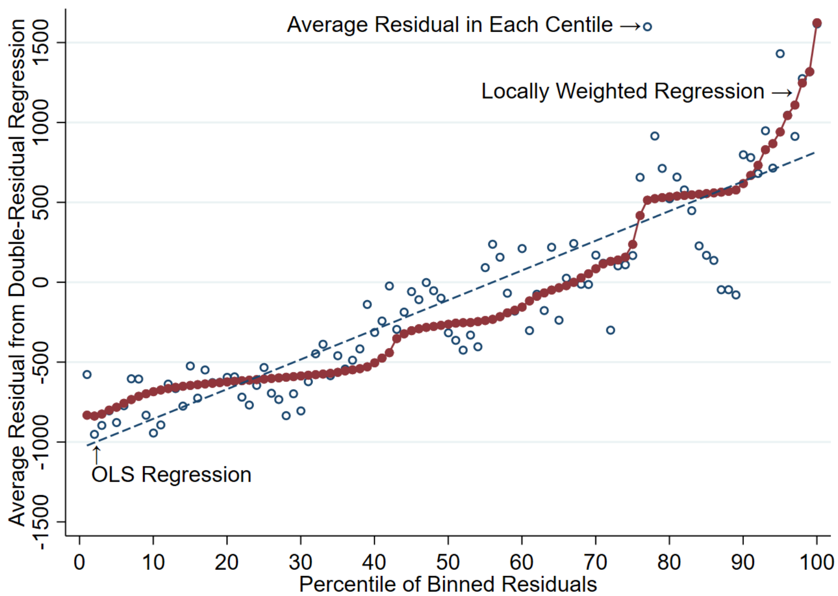

Fig. A.12. Double Residual Regression: $MaxEITC$'s Fairly Linear Effect on Taxes

Notes: Public use 1989–2016 CPS ASEC data. Sample includes all women 19–64. 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.

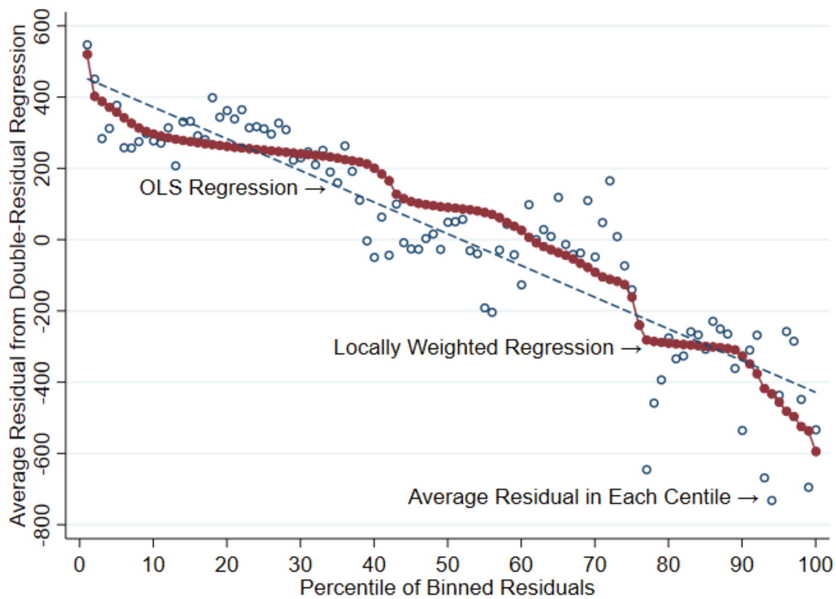

Fig. A.13. Double Resid. Regression: $MaxEITC$'s Fairly Linear Effect on Public Assistance

Notes: Same data, sample, and approach as Figure A.12.

Appendix B: State EITC Expansions

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 the country and have been enacted by both Democrats and Republicans, as encouraging work and helping the poor has wide appeal. Figure B.1 shows what years states introduced their EITC and the 2013 EITC rate. Figure B.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.

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.

VIII.A. 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 B.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 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.[3] 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.[4] Ultimately, this decision

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

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

may not make a big difference, since Table A.1 shows that federal, state, and federal plus state EITC expansions all appear to increase women's labor supply.

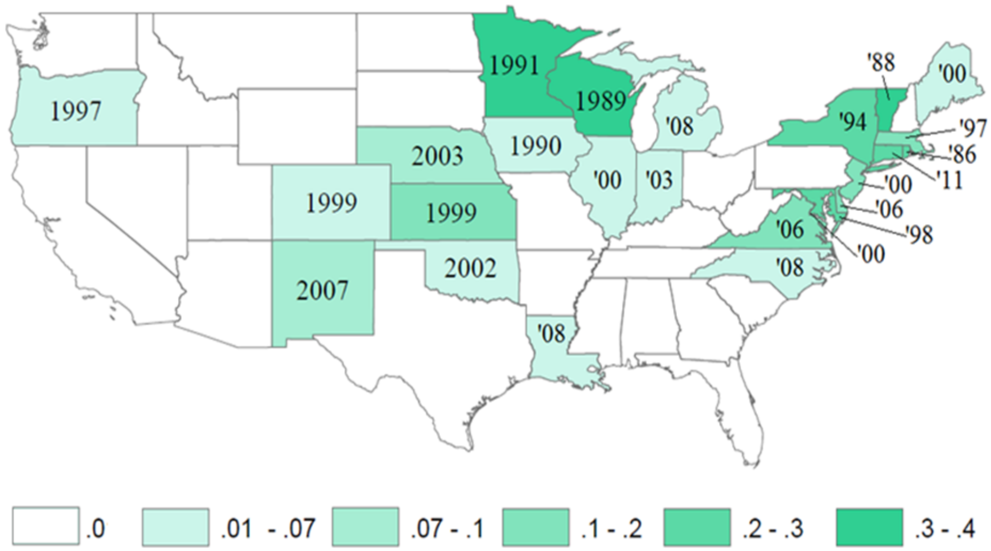

Fig. B.1. Year of State EITC Implementation and 2013 Rate

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

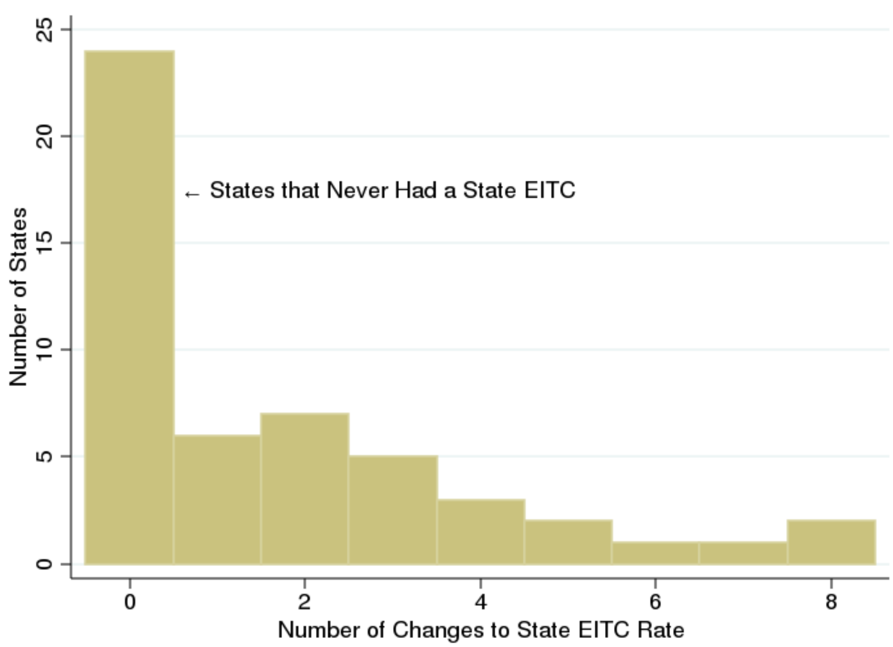

Fig. B.2. Histogram of State EITC Changes

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

Table B.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 E. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix C: Expanding the Theoretical Framework in 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 $c_i = w_i + T_i$,[1] 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 $\sum_{i=0}^{I} g_i h_i c_i$.[2]

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 $s > s^2$.[3]

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 $T_i^E \perp T_i$) on occupations above i^3.[4] 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 B.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: $0 - s^1$, $s^1 - s^2$, $s^2 - s^3$, $s^3 - s^4$, $s^4 - I$.

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

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

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

[4] 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.

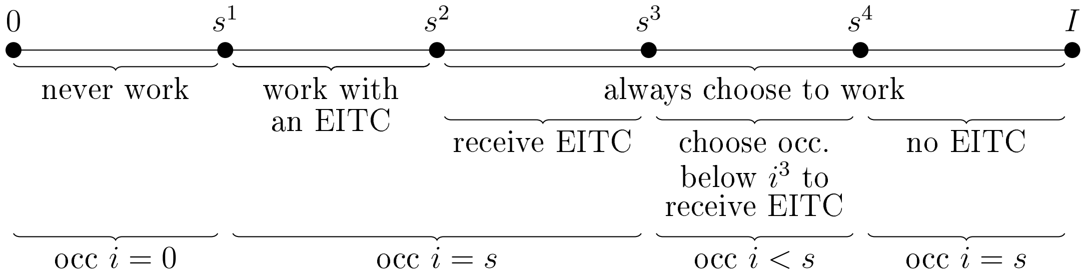

Fig. B.0. Illustrating How the EITC Affects Different Skill Types

The EITC affects social welfare by: (1) increasing the consumption of lower-skill workers;[5] (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.[6]

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 $h_i, T_i^E \not\perp T^E$):

$$\max_{T^E} \sum_{i=0}^{I} g_i h_i c_i = \sum_{i=0}^{I} g_i h_i (w_i + T_i + T_i^E) \ \text{ subject to } \ \sum_{i=0}^{I} h_i (T_i + T_i^E) = 0. \tag{1}$$

The budget constraint in equation (1) can be decomposed into five occupation categories shown in Figure B.0: $i = 0$, $i \in [1, i^2]$, $i \in [i^2, i^3]$, $i \in [i^3, i^4]$, and $i \in [i^4, I]$.

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

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 B.0.

If the government expands the EITC and maintains a balanced budget by not changing

[5]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).

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

T_i, and setting $\sum_{i=0}^{I} h_i T_i^E = 0$, this is how each component in equation (2) would be affected:

$$\frac{\partial \sum_{i=0}^{I} h_i(T_i + T_i^E)}{\partial T^E} = 0 =$$

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

Equation (3) 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.[7] In this paper, we are not able to estimate each component of equation (3), 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 $\frac{\partial \sum_{i=i^3}^{I} h_i c_i}{\partial T^E} \to 0$.[8]

From equation (1), the first order condition for the social-welfare-maximizing EITC is:

$$\sum_{i=0}^{I} \frac{\partial h_i}{\partial T^E}\left[g_i w_i + (g_i - \lambda)(T_i + T_i^E)\right] + \sum_{i=0}^{I} \frac{\partial T_i^E}{\partial T^E}(g_i - \lambda) h_i = 0 \quad (4)$$

and decomposing equation (4) into the five occupation categories from Figure B.0 yields:

[7] Equation (3) 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).

[8] Comparative statics using equation (3) 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.

$$
\underbrace{\frac{\partial h_0}{\partial T^E}(g_0-\lambda)T_0}_{(1)}+\underbrace{\sum_{i=i^3}^{i^4}\frac{\partial h_i}{\partial T^E}\Big[g_iw_i+(g_i-\lambda)(T_i)\Big]}_{(2)}+\underbrace{\sum_{i=i^3}^{I}\frac{\partial T_i^E}{\partial T^E}(g_i-\lambda)h_i}_{(3)}+
$$

$$
\underbrace{\sum_{i=1}^{i^2}\frac{\partial h_i}{\partial T^E}\Big[g_iw_i+(g_i-\lambda)(T_i+T_i^E)\Big]}_{(4)}+\underbrace{\sum_{i=1}^{i^3}\frac{\partial T_i^E}{\partial T^E}(g_i-\lambda)h_i}_{(5)}+ \tag{5}
$$

$$
\underbrace{\sum_{i=i^2}^{i^3}\frac{\partial h_i}{\partial T^E}\Big[g_iw_i+(g_i-\lambda)(T_i+T_i^E)\Big]}_{(6)}+\underbrace{\sum_{i=i^3}^{i^4}\frac{\partial h_i}{\partial T^E}\Big[(g_i-\lambda)(T_i^E)\Big]}_{(7)}=0.
$$

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))[9]; (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 (5) 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:

$$
\frac{\partial \sum_{i=1}^{i^3} T_i^E}{\partial\Big(\sum_{i=1}^{i^2}\frac{\partial h_i}{\partial T^E}T_i\Big)}>0 \quad\text{and}\quad \frac{\partial \sum_{i=1}^{i^3} T_i^E}{\partial\Big(\sum_{i=i^3}^{I}\frac{\partial(-T_i^E)}{\partial T^E}h_i\Big)}<0. \tag{6}
$$

See footnote 8 and the next section for proof.

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

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

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.[10]

Mathematical Proof

The following mathematical proofs use the optimal EITC first order condition in equation (4) 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:

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

where

[10] 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.

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

The second term is negative because of diminishing labor-supply returns to EITC expansions.[11] Assuming that this term is larger than the first term, $M < 0$ and the overall comparative static is positive:

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

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

[11]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, $\partial T_i^E / \partial \sum_{i=1}^{i^3} T_i^E \neq 0$.)

and more of the funding for the EITC comes from increasing taxes on higher-skill workers:[12]

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

[12]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 D: Payroll Taxes, SS and SSI Benefits, and 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 D.1, 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, 3, and A.6). 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 D.2, we take the annual estimates in Table D.1, 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;[13] (2) by valuing $1 of payroll taxes at $0 or $0.50 (see section IV.B); 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 3, 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.

Present Value of Payroll Taxes: Mapping payroll taxes to future Social Security (SS) benefits is not straightforward. This relationship depends on life expectancy, age at which one begins receiving SS benefits, and a complicated formula—that has changed over time—constructed by the Social Security Administration (Isaacs and Choudhury, 2017). Furthermore, every $1 in SS benefits crowds out $1 in SSI benefits (SSA, 2019b). For a single poor adult over age 65, federal SSI is worth up to about $750 per month and most states have SSI supplements (see Table E.4). For example, Alaska, Alabama, California, Massachussetts, Oklahoma, Wisconsin, and South Dakota have SSIs worth up to $362, $58, $179, $131, $41, $84, and $15 per month. About half of all states do not have a state SSI.

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

SS benefits, known as primary insurance amount (PIA), are a function of one's Average Indexed Monthly Earnings (AIME), which is basically the average monthly earnings from one's highest 35 years of earnings. In 2019, AIME was equal to the sum of (1) 90 percent of the first $926 of AIME, (2) 32 percent of AIME between $926 and $5,583, and (3) 15 percent of AIME over $5,583. Average life expectancy for lower-income mothers is around 80 (SSA, 2019a). To compare payroll taxes paid and lifetime SS benefits received, consider a few hypothetical mothers in our sample.

One mother earns $25,000 per year and works for 35 years. Bearing the full incidence of the payroll taxes means that she pays 14.4 percent or $3,600 per year, for a total of $126,000 over 35 years. If she begins collecting SS at 65, her PIA is about $1,200 or $14,400 per year. If she lives until 75 or 80 this would be worth $144,000 or $216,000. Since her PIA is greater than $770, she would not be eligible for SSI.

Another mother earns $25,000 per year and works for 25 years. Bearing the full incidence of the payroll taxes means that she pays 14.4 percent or $3,600 per year, for a total of $90,000 over 35 years. If she begins collecting SS at 65, her PIA is about $690 or $8,300 per year. If she lives until 75 or 80 this would be worth $83,000 or $124,500. She would also be eligible for about $100 of SSI per month.

If the last two mothers instead earned an average of $35,000, they would pay $176,400 and $126,000 in payroll taxes. If they lived to 75 they would have an AIME of $2,917 and $2,083 and receive $176,400 and $144,000. If they lived to 75 they would have an AIME of $2,917 and $2,083 and receive $264,600 and $216,000. Since their PIA is greater than $770, she would not be eligible for SSI.

Overall, mothers that were on the margin of working and began working because of the EITC, likely receive $1-$2 in SS benefits for every $1 in payroll taxes paid. However, every $1 of SS benefits crowds out $1 of federal SSI benefits plus perhaps $0.20 in state SSI benefits (Table E.4). SSI take-up rate is 45%–60% (Burkhauser and Daly, 2002). Together, these numbers suggest that each $1 in payroll taxes paid may be worth between $0.10 and $0.60 (for an average valuation of $0.35).

Table D.1: 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, 3, and A.6) 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 D.2: 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.

Appendix E: 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 E.3 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-demo 2008 (http://knowledgecenter.csg.org/kc/content/bos-2008-chapter-7-state-finance-and-demo 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 section V.E is https://www.ssa.gov/ssi/ and Table VIII.A, which 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 29. 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 (2019), 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.

Crosswalking Labor Supply Results Using CPS vs Using CPS-IRS Linked Data: The following table shows how the labor supply results change when we use the 1990-2017 public use data, then restrict to the years we are able to link to the IRS data, then substitute CPS marital status for IRS marital (i.e. filing) status or substitute CPS earnings for IRS earnings, and finally substituting both marital status and earnings.

Table E.1: Crosswalking CPS and Linked IRS-CPS Results

Years:	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	Tax Data	CPS	Tax Data
Data Source for Earnings:	CPS	CPS	Tax Data	Tax Data
	(1)	(2)	(3)	(4)
Panel A: Annual Weeks Worked				
MaxEITC (in $1,000s of 2016 $)	.27	.60	.64	.60
	(.08)	(.13)	(.12)	(.13)
R-squared	0.11	0.10	0.09	0.10
Panel B: Weekly Hours Worked				
MaxEITC	.16	.49	.54	.49
	(.07)	(.13)	(.12)	(.13)
R-squared	0.10	0.10	0.10	0.10
Panel C: Binary Employment				
MaxEITC	.002	.006*	.007*	.006*
	(.002)	(.003)	(.003)	(.003)
R-squared	0.09	0.09	0.09	0.09
Panel D: Annual Wage and Salary Earnings				
MaxEITC	419	791	569	558
	(140)	(165)	(127)	(129)
R-squared	0.10	0.09	0.07	0.07
Full controls	Yes	Yes	Yes	Yes
Observations	1,200,000	1,200,000	1,200,000	1,200,000

Source: Regressions crosswalk the results in Table A.1 to those using earnings and marital status in IRS tax data in Table 3. 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–C are 33.3, 27.1, 0.74. Panel D means are 25,137 and 26,000 (rounded) for CPS and IRS data. CPS ASEC weights used. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table E.2: 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 E.3: 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, 2017b), 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 $0.399 \times$ earnings $\times$ state-year sales tax rate $+ 0.025 \times$ earnings $+ 0.75 \times$ EITC refund $\times$ 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 E.

Table E.4: 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 E for links to each state's SSI details.

Appendix F: 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 F.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 F.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 F.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 F.2: EITC and Maternal Labor Supply (Reweighted by Prob. of Having a PIK)

Panel A: Labor Supply

	Weeks Worked		Hours Per Week		Binary Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
MaxEITC (in $1,000 of 2016 $)	.71		.50		.007	
	(.13)		(.13)		(.002)	
MaxEITC × Married		-.10		-.18		-.010
		(.13)		(.13)		(.004)
MaxEITC × Single		3.00		2.41		.057
		(.25)		(.22)		(.005)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.104	0.106	0.104	0.105	0.095	0.096
Observations	1,200,000		1,200,000		1,200,000	
Mean Dep. Var.	34		27		0.73	

Panel B: Earnings and EITC Benefits

	Annual Earnings		EITC Benefits		Earnings with EITC	
	(7)	(8)	(9)	(10)	(11)	(12)
MaxEITC	550		317		868	
	(124)		(10)		(122)	
MaxEITC × Married		495		244		740
		(164)		(13)		(157)
MaxEITC × Single		706		523		1229
		(194)		(14)		(187)
Full controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.076	0.076	0.303	0.305	0.074	0.074
Observations	1,200,000		1,200,000		1,200,000	
Mean Dep. Var.	25,000		370		25,000	

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.