The Impact and Efficiency of EITC Parameter Changes on Work

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Abstract:

Previous research has affirmed the efficacy of the Earned Income Tax Credit (EITC) as a tool for increasing work participation among low-income workers without creating excessive market distortion. This study moves beyond the general effectiveness of the EITC to examine the effect and efficiency of structural parameters on work participation and weeks worked. Quantitative estimates of the benefits associated with increases in the parameters are taken from probit and tobit models are used to calculate the efficiency of changes to each parameter. Results suggest that increases in the EITC increase employment, decrease weeks worked, and affect single individuals more than married individuals. This study has significant policy impacts for lawmakers responsible for adjusting the EITC and for credit recipients.

Introduction:

A traditional belief in the value of work is embedded in the political culture of the United States. Except for two noticeable shifts, The Great Society and The New Deal, the US government has been reluctant to provide the poor with unearned goods, services, and income. The Earned Income Tax Credit (EITC) was established in 1975 to relieve poor families of their social security tax, as part of a return to these traditional values following the Great Society (Holt 2006). It continued as a modest program until 1986 when the government increased the credit and extended its benefits. Following several other increases in the early 1990's, the EITC grew to be 1.7 times as large as all Aid to Families with Dependent Children (AFDC) payments in 1996, and distributed over $34 billion to 19.2 million families in 2003 (Ways and Means 2004).

This paper seeks to measure the effect of changes in the parameters of the EITC on work participation and weeks worked. The behaviors of individuals who are eligible for the EITC are analyzed against behaviors of similar individuals who are not eligible

for the credit. By studying changes in each parameter, this paper is able to calculate a benefit specific to each individual, which allows more accurate estimation of the incentives produced by the EITC. Using the estimated effect of changes in parameters, this paper calculates the parameter changes most efficient at increasing labor supply. The results suggest that the EITC does increase work participation among all eligible groups, and that the EITC has a variable effect on weeks worked depending on an individual's income and demographic status. Additionally, the results suggest that policy makers should focus on increasing employment by increasing the maximum credit and by increasing the level of income at which the EITC is completely phased out.

The EITC and Economic Theory:

The goal of the EITC is to "make work pay" for low-income workers so that entering the labor force is more attractive than remaining on welfare. The current EITC includes a different level of benefits for low-income workers with no children, low-income workers with one child, and low-income workers with two or more children. These benefits are usually received as a lump sum payment in the year following the work on which the credit is based. To qualify for the credit one must have positive income, adjusted gross income below a certain level, and investment wealth below a certain level (Ways and Means 2004). In addition, for a child to qualify as a dependent, he or she must live with the worker at least half the year, be younger than 19, or younger than 24 if a full time student, or be permanently disabled.

Since 1975 the EITC has been increased in 1986, 1990, 1993, and 2001, and has generally enjoyed bipartisan support. However some Republicans see the growth of the EITC as an extension of the welfare state (Holt 2006).

In 2007, the credit for a low-income worker with two children increased at a rate of 40% of income to $11,790. The credit then remained constant at $4,716 until income reached $15,399. Then the credit decreased at a rate of 21.06% for additional income to $37,782 at which point the credit was $0. The general structure of the credit is the same for each group and can be seen in Table 1.

Table 1: Size and Structure of the Credit in 2007

Earned income (x)	**Stage**	**Credit (2+ children)**
$0-$11,790	phase in	40% * x
$11,791-$15,399	plateau	$4,716
$15,400-$37,782	phase out	$4,716 - 21.06% * (x - $15,399)
>= $37,783	no credit	$0
Earned income (x)	**Stage**	**Credit (1 child)**
$0-$8,391	phase in	34% * x
$8,392-$15,399	plateau	$2,853
$15,400-$33,240	phase out	$2,853 - 15.98% * (x - $15,399)
>= $33,241	no credit	$0
Earned income (x)	**Stage**	**Credit (no children)**
$0-$5,595	phase in	7.65% * x
$5,596-$6,999	plateau	$428
$7,000-$12,589	phase out	$428 - 7.65% * (x - $6,999)
>= $12,590	no credit	$0

Since the EITC unambiguously increases earned wages within the applicable range, the EITC also increases the utility associated with working at every level of earned wages. Therefore, if the decision to join the workforce is based on the utility associated

with working compared to the utility associated with staying outside of the workforce, the EITC will increase the probability of working at every level of earned wages. That is, the EITC should increase the probability that an individual decides to enter the workforce and earn income from a job.

For those already in the work force though, the impact of the EITC is less clear. By changing the effective wage rate, the EITC changes the relative price of labor and leisure. If a worker is in the "phase-in" region where the credit is increasing, the substitution effect predicts increased hours worked, as additional leisure becomes more costly relative to labor than it was before the credit. However, the income effect predicts that hours worked will decrease, because as income rises with the credit leisure, assumed to be a normal good, will become more desirable. For a worker in the "plateau" region where the credit is constant, hours worked will only be subject to the income effect. Again, since the credit increases income and leisure is a normal good, weeks worked should decrease for a worker in the plateau region. Lastly, for a worker in the "phase-out" region where the credit is decreasing, the credit will decrease the cost of leisure relative to labor so the substitution effect predicts that weeks worked will decrease. Since the credit still increases income for an individual in the phase-out region, the income effect predicts a decrease in weeks worked. It is even possible that the credit will induce some workers earning just beyond the credits phase-out region to reduce their hours worked so that they can receive the credit (Eissa and Liebman 1996).

Even though the credit may provide incentives to reduce weeks worked for individuals already in the workforce, people have far less control over their hours or weeks worked than their decision to work since an employer usually specifies the former.

Previous research by Heckman provides empirical evidence for this conjecture; he shows that work participation is much more sensitive than hours worked to tax code changes (1993). In general, low income workers have even less control over their hours than higher income workers.

It is also important to note that since the EITC uses household income to determine payments, it may create structural distortions at the household level. For example, if marriage increases household income into or beyond the phase-out region of the EITC there will be incentives for one of the individuals to either reduce work hours, or to leave the workforce. Besides these two options, the couple may forgo marriage to avoid the loss of EITC benefits. However, if a low-income individual without children marries another low-income individual with children, the total EITC benefit may increase. For recent credits, marriage penalties outnumber marriage bonuses 2 to 1 (Hoffman and Siedman 2003), and the average marriage penalty was $2089 while average marriage bonus was $865 (Holt 2006).

The mixed incentives of the EITC distort market incentives less than other government redistribution programs such as AFDC, Temporary Assistance to Needy Families (TANF), Food stamps, and Medicaid. These means-tested programs create disincentives for earning additional income which decrease both work participation and work hours for all low-income groups. For example, prior to the welfare reform of the late 1980's and early '90's a single mother of two faced a marginal tax rate of 81% for earning income of $10,000 through employment and would also lose Medicaid coverage for herself and her children (Ellwood 2000).

Literature Review:

A large body of research examines the effects of the EITC over time by comparing groups of similar individuals and their changes in work participation. These studies have found that the EITC is successful at increasing work participation among single parents, however it is not necessarily successful at increasing hours worked and income among recipients, or work participation among married recipients.

A common methodology used throughout this research is quasi or natural experiments. A natural experiment uses a treatment and a control group to study a difference between the two groups over time. In the case of the EITC, the treatment group is a set of EITC eligible recipients and the control group is a set of individuals similar to the treatment group except that they are not EITC eligible. If $Participation\%_{t1}$ is the work participation rate of the treatment group at time 1, $Participation\%_{c1}$ is the work participation rate of the control group at time 1, then the effect of the EITC on the treatment group between time periods 1 and 2 would be equal to the difference between the observed effect of the EITC at time 1, and the same effect observed at time 2, or:

$$(Participation\%_{t1} - Participation\%_{c1}) - (Participation\%_{t2} - Participation\%_{c2})$$

A natural experiment is useful in the social sciences because the control group accounts for immeasurable changes over time. For instance, as the economy changes, both the control group and the treatment group will be affected, so the difference between the two groups should remain constant if the groups are similar enough. Therefore, any change in the difference between the two groups can be attributed to the treatment.

Eissa and Liebman (1996), Meyer and Rosenbaum (2001), and Ellwood (2000) all use natural experiment methodology to analyze the impact of the increases in the EITC in the years 1986, 1990, and 1993 on work participation and hours worked. Using data from the CPS they found that the EITC increased work participation for single women from 2.8-23% depending on the time period used and the control group. Eissa and Liebman use as controls single mothers with incomes to large to qualify for the EITC and single non-parents with incomes which would qualify for the EITC (non-parents were not eligible for the credit for the time periods examined). Ellwood created an artificial control group with a linear regression that had similar characteristics to the treatment group. In general, the longer the time period analyzed, the larger the increase in work participation attributable to the EITC because a longer time period captures more growth in the credit.

Using similar methods and time periods, Ellwood (2000) and Eissa and Hoynes (2004) analyze the work participation of married individuals. Eissa and Hoynes find that the growth in the EITC from ’84 to ’96 decreased work participation 1.1% for women and increased work participation for men 0.2%. Ellwood found that work participation decreased for married women 3-5% from 1986 to 1999. Eissa and Liebman (1996) also used a natural experiment to study the effect of the EITC on hours worked and found that the increase in the EITC did not significantly change hours worked by single women from 1984-1990.

Structural probit models are another common way to measure the effect of the EITC. Meyer and Rosenbaum (2001) used this model and estimated from their results that the EITC increased weekly employment by single women 4.4% and annual

employment 7.2% from 1992 to 1996. Their results were robust to using data from both the CPS and Outgoing Rotation Group Data (ORG). In addition, Meyer and Rosenbaum assume that the wages available to a woman not in workforce are taken from random distribution and are unknown to everyone.

Lastly, Eissa and Hoynes used a structural probit model to measure the sensitivity of work participation of married males and females to increases in wages and income. They found that a one dollar increase in effective wages increases participation in the workforce 2.7% and .3% for females and males respectively. They also found that work participation decreases .1% and .5% for females and males respectively for a $1,000 increase in unearned income.

Nearly every study notes the problems in estimating the effect of the EITC due to concurrent welfare reform. While EITC benefits were increasing, AFDC and TANF were putting limits on their benefits and encouraging work. Since both welfare reform and increases in the EITC have the same directional effect on employment, the estimated effects of the EITC may be biased upwards. However, the use of control groups similar to EITC recipients and the inclusion of variables which account for welfare reform can limit this bias so that the estimates of the EITC are reasonably accurate.

Data Analysis:

The data for this analysis were obtained from the Integrated Public Use Microdata Series (IPUMS) which combines and recodes data from both the Untied States Censuses and the American Community Surveys (ACS). Observations reflect information gathered from a nationally representative sample, however only individuals aged 18-65, not attending school, and with incomes which place them in the poorest 40% of households were used for this analysis. Even with these restrictions, there is still complete demographic data for 300,349 individuals from 1984 through 2007. This set does not follow individuals through time, rather it takes information from a nationally representative sample each year. Therefore, the set contains panel data with 24 panels.

Table 2 highlights changes in employment and annual weeks worked between 1984 and 2007 for several demographic groups in the sample. Between 1984 and 2007 the EITC grew significantly and could explain a significant portion of the differences in employment between 1984 and 2007 for the EITC eligible population, defined as individuals whose household income put them below the income at which the credit is phased-out for their given household status in a given year. For example, a single mother of two children is EITC eligible in 2007 if her income was below $37,783. However a mother with one child would be eligible in 2007 only if her income fell below $33,241. The EITC eligible population was adjusted for each year in the sample period based on the parameters for the given year. However, the changes across time for various demographic groups show that there are variables besides the EITC affecting employment and weeks worked.

The groups of interest are those eligible for the EITC. Those eligible for the EITC are split into four groups: single parents with one child, single parents with two or more children, married parents with one child, and married parents with two or more children. This paper does not address low income individuals without children who became eligible for the credit in 1994. For single parents, and married parents with two or more children, employment increased between 9 and 34% between 1984 and 2007, while employment decreased 2% for married individuals with one child. Employment changed little for EITC eligible individuals from 1984 to 2007, while single individuals made impressive gains in employment over the same time period. Every EITC eligible subgroup significantly increased their weeks worked between 23 and 38%. Single individuals in the EITC eligible population made much larger gains in weeks worked than similar married individuals. There are few differences in changes over time between those who have one child and those who have two or more children.

Table 2: Descriptive Statistics highlighting changes in employment and weeks worked across time

		1984	2007		1984	2007
		Percent in workforce during year			avg. annual weeks worked(if employed)	
EITC eligible population						
	single with one child	56%	69%		30	43
	married with one child	61%	60%		32	42
	single with 2+ children	44%	70%		26	42
	married with 2+ children	59%	65%		32	43
Not EITC eligible						
	single with one child	84%	XXX		45	48
	married with one child	68%	73%		38	46
	single with 2+ children	76%	XXX		35	48
	married with 2+ children	69%	87%		39	45
Race						
	White	65%	64%		37	43
	Black	60%	60%		33	41
	Asian	52%	60%		32	40
Sex						
	Male	78%	70%		36	43
	Female	53%	57%		37	41
Education						
	Not High school grad	51%	53%		34	40
	High school grad	70%	65%		37	42
	College Grad	80%	69%		40	43

The population in the sample not eligible for the EITC made similar gains in employment and weeks worked, however this group started at generally higher levels of each. By 2007 the sample of ineligible individuals in the poorest 40% of households is very limited for those with two or more children because the EITC increased so drastically; there are only 16 observations in this group for married with two or more children and only 3 for single with two or more children. Therefore, these figures have

been omitted as they are not reliable averages that could be extended to a larger population.

For other demographic groups, the greatest gains in employment from 1984 to 2007 came from women, from individuals without a bachelor's degree, and from Asians who increased employment 7, 4, and 13% respectively. Employment decreased for men by 10%, for high-school graduates by 7% and for college graduates by 14% over the same time period. Weeks worked increased across all demographic groups, however the largest increases were seen for blacks, Asians, and males.

As a preliminary data examination, a natural experiment was used to compare the four EITC eligible subgroups: single with one child, married with one child, single with two or more children, married with two or more children, to two comparison groups each; a group with the same income and marital status but without children (Compare group 1), and a group with the same marital status and number of children but with slightly higher income (Compare group 2). The differences are calculated between years 1988 and 1994 when some of the most radical expansions of the EITC occurred. By looking at these years, one would expect to see a significant effect attributable to the EITC. The results can be seen in Table 3 below.

The experiment shows that the increases in the EITC had varied effects. Single individuals with two or more children were the only group to respond non-negatively in their work participation, showing either no effect from the EITC against comparison group 1 or a 2% increase in employment against comparison group 2. Married individuals with one child responded non-positively to the EITC. Against comparison group 1 their employment remains constant, and against comparison group 2 their

employment decreases 1%. The effect on weeks worked is generally positive, with the effect of the EITC on weeks worked ranging from a .18 week decrease to a 1.3 week increase. While these results are inconclusive with respect to the impact of the EITC on labor force participation; they point to the necessity of a more rigorous analysis.

Table 3: Measured impact of the EITC between 1988 and 1994 given from:

Effect on work participation:

$$(\text{Participation}\%_{t1} - \text{Participation}\%_{c1}) - (\text{Participation}\%_{t2} - \text{Participation}\%_{c2})$$

Effect on weeks worked:

$$(\text{Wkswork}_{t1} - \text{Wkswork}_{c1}) - (\text{Wkswork}_{t2} - \text{Wkswork}_{c2})$$

	Effect on Employment			Effect on Hours worked	
	Difference with Childless Peers in Same Income Category	Difference with higher income peers with same family structure and members.		Difference with Childless Peers in Same Income Category	Difference with higher income peers with same family structure and members.
Single, 1 child	-0.01	0.03		-0.18	0.72
Married, 1 child	0	-0.01		1.21	0.96
Single, 2 or more children	0	0.02		0.49	0.79
Married, 2 or more children	0.01	-0.01		1.3	0.47

Theoretical Analysis:

This paper employed two models to determine the effect of EITC parameters on labor supply and weeks worked. First, a probit model was used to estimate the probability of working given the size of the EITC credit, macroeconomic variables, and demographic variables. A similar model is used by Eissa and Liebman (1996). Four different probit equations were fit, one each to estimate the effect of the EITC on single

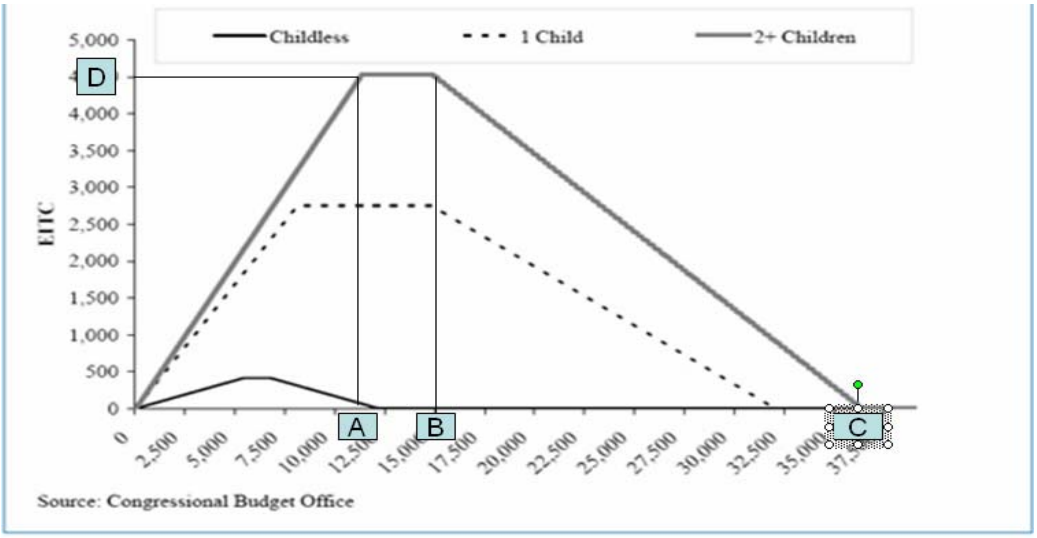
parents with one child, single parents with two or more children, married parents with one child, and married parents with two or more children because the size of the EITC is different for individuals with one child vs. individuals with two children, and the EITC may have different effects on married individuals than on single individuals. The estimation sample for each of these models will be restricted to its respective demographic, and limited to individuals in households in the lowest 40% of income. so that the indicator variables not EITC eligible with incomes in the lowest 40%. By restricting the sample to the bottom two quintiles, the indicator variables can measure the effect of the EITC on the eligible population by comparing individuals who are EITC eligible to similar individuals with low incomes rather than to a broader sample with higher incomes less similar to the EITC eligible population.

The model includes dummy variables for three subgroups within the EITC eligible population. There are low-income claimants whose incomes place them in the phase-in region of the EITC, there are middle-income claimants whose incomes place them in the plateau region of the EITC, and there are high-income claimants whose incomes places them in the phase-out region of the EITC. The suppressed dummy variable represents the individuals whose incomes places them beyond the range of the EITC and within the lowest 40% of household income. These dummies account for differences in employment that cannot be attributed to the EITC.

The model also includes the size of the credit for which an individual is eligible as a linear variable. The credit amount is calculated for each individual in the sample using four parameters of the EITC which can be seen in Figure 1: the income level at which the credit reaches its maximum (A), the income level at which EITC benefits begin to be

phased out (B), the income level at which EITC benefits are totally phased out (C), and the maximum level of EITC subsidy (D). For individuals with income less than A, the low-income claimants, the EITC payout is equal to (D/A)*(household income). For individuals with earned income between A and B, the mid-income claimants, the EITC is equal to D. Eligible individuals with earned income greater than B, or high-income claimants, receive an EITC payment of (D/(C-B))*(C-household income). The variables A, B, C, and D differ over time and with the number of children and the marital status of the EITC claimant. In the model, the linear payout variable is interacted with the low-income, mid-income, and high-income claimant dummies because it is supposed that the same level of payout would have a different, likely larger effect, on a low-income claimant than on a high or mid-income claimant.

Figure 1: EITC Parameters



A vector of macroeconomic variables (π) such as unemployment rate, GDP, and percentage of the population on welfare, and a vector of demographic variables (Ω)

unique to the individual such as age, race, education, and number and age of children are included. The percentage of the population on welfare controls for the impact of welfare reform. Lastly, a variable for the year is included to account for changes over time.

The model is of the form:

$P(\text{Employed}=1))=f(\pi, \Omega, \text{EITC payment, EITC subgroup, year})$

An estimate of the effect of the EITC on each household type will be drawn from the coefficient on the EITC amount paid to each claimant. Based on economic theory and previous research, the coefficients should be unambiguously positive, as the EITC increases the level of wages at every level of wages at which the EITC applies.

Because the behavior of individuals in the three EITC income earning groups (low-income, middle-income, and high income claimants) is compared to that of individuals with nearly identical demographic characteristics but with slightly higher incomes, this model uses the best parts of natural experiment model in a probit regression. By comparing the treatment group to these controls, broad changes in the economy, tastes, and sentiments that are not captured elsewhere in the model are accounted for.

While this model can account for differences between the control and treatment groups with additional explanatory variables, its structure can be limiting. First, it assumes the value of $1 from the EITC is equivalent to all other income and second it assumes that individuals make their work decisions based on complete information

regarding the impact of EITC on earned income, even though the EITC refund is received the spring after the work has been provided to the market (Ellwood 2000).

The second model used is a tobit regression to estimate the effect of the EITC on weeks worked in a year. The tobit was used because weeks worked is truncated on either side; it is limited to 0 on the left and to 52 on the right. Four regressions were fit for the four EITC household types: single parents with one child, single parents with two or more children, married parents with one child, and married parents with two or more children. The estimation sample for each regression also included all individuals with the same demographic description and income which puts them in the poorest 40% of households. In addition, the sample only includes those who are employed.

The new variable in this model is the EITC phase-in and phase-out rate, or the change in EITC payout associated with an additional dollar of earned income. The phase-in and phase-out rates are important because the decision to work more weeks is made at the margin, so a change in the phase-in or phase-out rate affects the marginal benefit of working another week and making more income. To isolate the effect of the rates, they are included as interaction terms with the level of claimant dummies because only the lowest income claimants are affected by the phase-in rate and only the highest income claimants are affected by the phase out rate.

The tobit model was of the form:

Weeks worked=f(π, Ω, EITC payment, EITC phase-in rate, EITC phase-out rate, EITC claimant income group, year)

This model also captures the best aspects of a natural experiment, by comparing the treatment groups to similar groups with slightly higher incomes. The effect of the EITC on weeks worked is estimated for each household type, and is taken both from the coefficients on the amount of the EITC and the phase-in and phase-out rates.

A final step of analysis will be done to determine the budgetary and employment impacts of changes in each of the parameters. Assuming an equal distribution of EITC recipients at all levels of income eligible for the EITC, one can estimate changes in the costs of EITC associated with changes in any of the four structural parameters (A, B, C and D from Figure 1), and compare that with the estimated impact of a change in an EITC parameter on both work participation and weeks worked estimated from the probit and tobit models described above. By finding the cost per unit benefit, one can then determine which alterations to the 2007 EITC parameters would be most efficient.

Empirical Results:

The results from the probit analysis on the impact of the EITC on workforce participation show that increases in the EITC amount increases employment for low, mid, and high-income claimants in each of the four EITC eligible subgroups: single parent with one child, married parent with one child, single parent with two or more children, and married parent with two or more children. A $1000 increase in the EITC amount increases the work participation rate by 64% for lowest-income claimants in households composed of single parents with more than two children and by 16% for middle income claimants in households composed of married parents with one child. In general, the EITC increases probability of being employed for single individuals more than for

married individuals. There is no discernible trend in the effect of the EITC amount across the eligible income groups. Demographic and macroeconomic variables had predictable effects on workforce participation.

Table 4: Probit Regression, Probability of being employed as dependent variable

	Sing., 1 Child	p-val	Mar., 1 Child	p-val	Sing., 2+ Children	p-val	Mar., 2+ Children	p-val
EITC payment to Low-Income Claimants	0.001112	0	0.000426	0	0.001315	0	0.000666	0
EITC payment to Mid-Income Claimants	0.000808	0	0.000339	0	0.001291	0.74	0.000453	0
EITC payment to High-Income Claimants	0.00131	0.02	0.000473	0	0.000967	0.64	0.000466	0
Member of Low Income Claimant Group	-3.369777	0	-2.912885	0	-3.430878	0	-3.223303	0
Member of Mid-Income Claimant Group	-1.738957	0	-1.759351	0	-1.070097	0.7	-1.93311	0
Member of High-Income Claimant Group	-0.568231	0.05	-0.695934	0	0.11112	0.91	-0.53622	0
Wages if Unemployed	-0.000965	0	-0.000469	0	-0.001453	0	-0.000482	0
Age	-0.013507	0	-0.011408	0	-0.020938	0	-0.015429	0
Male	0.57596	0	0.665169	0	0.848611	0	0.777366	0
White	0.125285	0.16	0.278337	0	0.159552	0.11	0.258896	0
Black	0.078699	0.39	0.156969	0.03	0.188106	0.07	0.176739	0
College Degree	0.392512	0	0.202827	0	0.275702	0.02	0.230514	0
High school Degree	0.156311	0	0.209476	0	0.179254	0	0.316093	0
Divorced	0.101269	0.03	XXX	XXX	0.03791	0.45	XXX	XXX
Number of Children	XXX	XXX	XXX	XXX	XXX	XXX	-0.031327	0.02
Age of Young Child	XXX	XXX	XXX	XXX	0.017008	0.01	0.008898	0.03
Age of Oldest Child	XXX	XXX	XXX	XXX	0.015627	0.01	0.010462	0.01
Age of Child	0.004044	0.3	0.001219	0.68	XXX	XXX	XXX	XXX
GDP	-0.000146	0.01	-0.000133	0.01	-0.000244	0	-0.000234	0
Unemployment Rate	0.025604	0.35	-0.039413	0.09	0.052592	0.07	-0.017515	0.31
Welfare pop.	-0.007653	1	5.289654	0.05	-4.384744	0.2	1.812665	0.38
Year	0.025762	0.24	0.050983	0.01	0.060212	0.01	0.068743	0
Constant	-46.67207	0.28	-97.6467	0.01	-114.5696	0.01	-132.3712	0
McFadden R-sq.	0.936557		0.930609		0.945753		0.923551	

Four tobit models were also fit for each of the household types. The results of this regression can be seen in Table 5. The regression shows that a 1% increase in the phase-in rate results in a decrease in annual weeks worked of between .28 weeks for single parent, single child households in the low-income group to .72 weeks per year for a married individual with more than two children in the low-income claimant group. The effect of changes in the phase-out rate differs with the number of children in the household. Both single-parent and married couple households with only one child decrease their work effort as the phase-out rate is decreased, while households with two or more children increase their work effort with decreases in the phase-out payment.

While family structure seems to influence the response to changes in the phase-out rate, earned income influences the response to changes in the actual EITC payment. For households in the low- and middle-income level claimant groups, increases in the EITC increase the number of weeks worked per year, while the opposite effect is observed among claimants in the high-income, EITC-recipient group. By combining both the effects of changes in the phase-in and phase-out rates with the effect of the EITC payment amount, one can see that the EITC generally decreases weeks worked, which follows from theory and suggests that the substitution effect for the low-income claimants is not large enough to outweigh the income effect.

Table 5: Tobit regression, dependent variable "weeks worked annually"

	Sing, 1 Child	p-val	Mar, 1 Child	p-val	Sing, 2+ Children	p-val	Mar, 2+ Children	p-val
Phase-in rate on Low income Claimants	-27.52477	0	-45.90854	0	-43.00573	0	-71.66874	0
Phase-out rate on High-income claimants	6.738234	0.29	17.61858	0	-6.190403	0.24	-30.06681	0.02
EITC payment to low-income claimants	0.006013	0	-0.001801	0	0.006989	0	0.003487	0
EITC payment to mid-income claimants	0.000307	0.36	-0.001776	0	0.000514	0.02	-0.002311	0
EITC payment to high income claimants	-0.001717	0	-0.002444	0	-0.001097	0	-0.003157	0
Member of Low-income claimants	-24.56309	0	-4.728913	0	-26.78629	0	-4.359968	0.02
Member of Mid-income claimants	-9.302673	0	-6.365139	0	-13.2701	0	-9.706972	0
Member of High-income Claimants	-1.362775	0.13	-3.852202	0	-2.071524	0.01	-1.051589	0.56
Age	0.135074	0	0.151699	0	0.089783	0	-0.792716	0
Male	-1.059835	0	6.914144	0	0.721973	0.02	20.07965	0
White	1.822279	0	1.642522	0	2.015167	0	3.018103	0
Black	1.226225	0	0.27617	0.55	2.019701	0	4.496835	0
College Degree	0.849859	0	-0.023456	0.19	0.911663	0.04	9.545545	0
High school Degree	-0.024187	0.15	-0.305103	0.37	2.585479	0	7.652516	0
Divorced …	1.885154	0	XXX	XXX	1.061393	0	XXX	XXX
Number of Children	XXX	XXX	XXX	XXX	-1.452819	0	-0.451116	0.13
Age of Young Child	XXX	XXX	XXX	XXX	0.086659	0	0.057056	0.53
Age of Oldest Child	XXX	XXX	XXX	XXX	0.050122	0.11	-0.088049	0.3
Age of Child	2.367699	0	0.398651	0.05	XXX	XXX	XXX	XXX
GDP	-0.000608	0.01	-0.001484	0	-0.002392	0	-0.004108	0
Unemployment Rate	-0.366728	0	-0.894015	0	-0.627517	0	-1.60394	0
Welfare Percent	21.7233	0.09	100.6822	0	-6.730955	0.64	24.58268	0.56
Year	0.433686	0	1.073315	0	1.377608	0	1.85132	0
Constant	-820.957	0	-2095.227	0	-2683.067	0	-3656.869	0
Adjusted R-squared	0.238162		0.10977		0.293273		0.040124	

The effect of a $285 increase in each of the EITC structural parameters (A, B, C, or D in Figure 1) on the probability that an individual will join the workforce ($285 is ten percent of the maximum credit for individuals with one child) is shown in Table 6 below. The effects were calculated using the 2007 EITC parameters (full calculations can be found in Appendices A and B). As the table clearly shows, increases in parameters that increase the size of the EITC credit increase employment across demographic groups. The effect of an increase to A is negative because an increase in parameter A (the income level at which maximum benefits are reached) actually decreases the size of the overall benefit paid to individual claimants in the low-income recipient group. An increase in the EITC maximum benefit, D, has the largest effect on employment because it increases EITC benefits most dramatically. In addition, parameter D (the maximum benefit) affects the work choices of every recipient group (low- middle- and high-income) within the EITC eligible population.

The effect of parameter changes on weeks worked, seen in Table 7, can be interpreted as the change in annual weeks worked for a $285 increase in each of the EITC structural parameters. The effects were quite varied due to the competing income and substitution effects for low-income claimants, because weeks worked is not as responsive to tax code changes as work participation, and because the interaction between parameters and the phase-in and phase-out rates. For example, an increase in the income level at which the phase-out begins (B), will increase the phase-out rate and increase the overall EITC benefit high-income claimant. Increases in the phase-out rate should increase weeks worked for high-income recipients. However, increases in the payout should decrease weeks worked for high-income recipients.

Table 6: The effect of a $285 increase in an EITC parameter on probability of working

		A	B	C	D
Single One Child					
	low-income claimant	-0.0243	XXX	XXX	0.074
	mid-income claimant	XXX	XXX	XXX	0.1075
	high-income claimant	XXX	0.0146	0.0137	0.0871
Again, change the names.					
Married One Child					
	low-income claimant	-0.0096	XXX	XXX	0.0291
	mid-income claimant	XXX	XXX	XXX	0.0462
	high-income claimant	XXX	0.0054	0.0051	0.0323
Single two or more children					
	low-income claimant	-0.0354	XXX	XXX	0.0906
	mid-income claimant	XXX	XXX	XXX	0.1779
	high-income claimant	XXX	0.0142	0.0139	0.0666
Married two or more children					
	low-income claimant	-0.0176	XXX	XXX	0.045
	mid-income claimant	XXX	XXX	XXX	0.0612
	high-income claimant	XXX	0.0067	0.0066	0.0315

Table 7: The Effect of a $285 increase in an EITC parameter on weeks worked

		A	B	C	D
Single One Child					
	low-income claimant	0.0265	XXX	XXX	-0.0789
	mid-income claimant	XXX	XXX	XXX	0.0875
	high-income claimant	XXX	-0.021	-0.0553	-0.1369
Married One Child					
	low-income claimant	0.5986	XXX	XXX	-1.8175
	mid-income claimant	XXX	XXX	XXX	-0.5062
	high-income claimant	XXX	-0.009	0.0108	-0.0664
Single two or more children					
	low-income claimant	0.0153	XXX	XXX	-0.0448
	mid-income claimant	XXX	XXX	XXX	0.1462
	high-income claimant	XXX	-0.0492	0.0009	-0.2349
Married two or more children					
	low-income claimant	0.4796	XXX	XXX	-1.2375
	mid-income claimant	XXX	XXX	XXX	-0.6586
	high-income claimant	XXX	-0.1748	0.0689	-0.8317

Assuming that EITC recipients are equally distributed across all EITC-eligible incomes, one can weight the benefits and costs of various parameter changes (see Appendix C for full calculations). Since just over 50% of the individuals eligible for EITC are within the high-income group range (B to C), a change in a parameter that affects high income recipients will have a greater effect than a change to a parameter which affects the low-income recipient group, which has just 25.2% of the eligible incomes. The benefits are understood to be increases in work participation or increases

in weeks worked, while the costs are increases in the amount the government pays out to EITC recipients. It is important to note that this is a limited view of benefits and costs and does not include any of the benefits to the local community or government from the EITC. Also, since the costs of changes to the parameters are proxies for the actual cost and should be interpreted relative to each other, the cost benefit estimates must also be interpreted relative to one another rather than as estimates with interpretable units. This is a limitation; however the estimates are still useful in establishing the relative efficiency of changing the EITC parameters. Tables 8 and 9 show the total effect of each of the parameters, the weighted effect under an equal distribution assumption, and the cost per unit of benefit for both work participation and weeks worked.

Table 8: Cost Benefit estimates on work participation for increases Parameters

		Cost of $285 Increase in Structural Parameter	Effect of $285 increase in the Structural Paramenter on Probability of working	Weighted Effect	Relative cost of increase in work participation
Single, One Child					
	A	-406552.5	-0.0243	-0.0061	66647950.82
	B	406552.5	0.0146	0.0031	131145967.70
	C	406552.5	0.0137	0.0074	54939527.03
	D	5734200	0.2686	0.0881	65087400.68
Married, One Child					
	A	-406552.5	-0.0096	-0.0024	169396875
	B	406552.5	0.0054	0.0029	140190517.2
	C	406552.5	0.0051	0.0027	150575000
	D	5734200	0.1076	0.0344	166691860.5
Single, 2+ Children					
	A	-672030	-0.0354	-0.011	61093636.36
	B	672030	0.0142	0.0084	80003571.43
	C	672030	0.0139	0.0082	81954878.05
	D	5896935	0.3351	0.0845	69786213.02
Married, 2+ Children					
	A	-672030	-0.0176	-0.0055	122187272.7
	B	672030	0.0067	0.004	168007500
	C	672030	0.0066	0.0039	172315384.6
	D	5896935	0.1377	0.0385	153167142.9

Table 9: Cost Benefit estimates on weeks worked for increases in the parameters

		Cost of $285 increase in structural parameter	Effect of $285 increase in parameter on Probability of working	Weighted Effect	Relative cost of increase in weeks worked
Single, One Child					
Structural Parameter:	A	-406552.5	0.0265	0.0067	-60679477.61
	B	406552.5	-0.021	-0.0113	-35978097.35
	C	406552.5	-0.0553	-0.0297	-13688636.36
	D	5734200	-0.1283	-0.0749	-76558077.44
Married, One Child					
	A	-406552.5	0.5986	0.1508	-2695971.485
	B	406552.5	-0.009	-0.0048	-84698437.5
	C	406552.5	0.0108	0.0058	70095258.62
	D	5734200	-2.3901	-0.6005	-9549042.465
Single, 2+ Children					
	A	-672030	0.0153	0.0047	-142985106.4
	B	672030	-0.0492	-0.0292	-23014726.03
	C	672030	0.0009	0.0005	1344060000
	D	5896935	-0.1335	-0.1392	-42363038.79
Married, 2+ Children					
	A	-672030	0.4796	0.1487	-4519367.855
	B	672030	-0.1748	-0.1036	-6486776.062
	C	672030	0.0689	0.0408	16471323.53
	D	5896935	-2.7278	-0.9393	-6278010.22

The magnitude of the cost per unit benefit is useful in determining the relative efficacy of changes to these structural parameters as tools to increase labor force participation or weeks worked. The larger the cost per unit benefit estimate, the more it would cost to achieve gains in the probability of employment or gains in weeks worked. All cost per unit benefit estimates are positive for work participation because work participation increases as the amount of the credit received increases. For weeks worked, most of the cost per benefit estimates are negative, suggesting that reductions in the expenditures on the EITC would increase weeks worked.

The results show that changes to the structural parameters for single individuals are most efficient at increasing work participation. In fact, the five most effective parameter increases are found either for single individuals with one child, or single individuals with two or more children. Additionally, increasing the maximum benefit and decreasing the income level at which the maximum benefit level is reached seems to be the most efficient way to increase work participation. An increase in every parameter but the income level at which the EITC is totally phased-out decreases weeks worked. However, the effects on weeks worked are highly varied across demographic groups.

Conclusion and Policy Implications:

As the first study to examine the effect of the EITC parameters on work participation and weeks worked, it is appropriate to discuss the policy implications of these results. The EITC has been considered a successful program at increasing employment even while having a variable effect on hours or weeks worked. Studies have shown that the EITC has successfully met its original goal of reducing payroll taxes and work disincentives faced by low-income individuals and its expanded goal to move people off welfare. However, the structural parameters of the EITC have received very little attention. Without proper awareness of these parameters, lawmakers are blindly altering the EITC unsure of how such provisions such as the maximum credit, or the level of income at which the phase-out begins affects employment or weeks worked.

Since increases in the EITC produce desired changes in employment, but undesired changes in weeks worked, policy makers must give value to each result and choose their course of action based on their values. If they wish to increase employment,

a clear course of action would be to increase parameters that increase the EITC, especially the level of income at which the maximum benefit is reached and the maximum benefit. Additionally, focusing the tax credit on single individuals because they are much more sensitive to changes in parameters than married individuals would increase efficiency. To increase weeks worked, a policy maker would logically change parameters to decrease the size of the credit, with the exception of the level at which EITC benefits reach zero, which increases weeks worked when increased. However, it is the viewpoint of this author that changes in weeks worked are subject to many factors besides the tax code, so efforts to change an individuals weeks worked will likely be less efficient than an effort to change an individuals work participation.

The EITC will continue to be an important part of government transfer programs into the foreseeable future due to its effectiveness at moving people from welfare to work. A more effective and efficient EITC could be designed if proper attention was paid to its parameters. This study provides an initial examination of those parameters and provides a basis for further research on the credit's structure.

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Appendix A: Estimated Impact of Parameter Changes on Employment

- Based on 2007 parameters
- Based on an individual with mean income within a group; group 1 individual has A/2 income, group 2 individual has (B+A)/2 income, and group 3 individual has (C+B)/2 income
- Where α is the coefficient estimate for the EITC on group 1, β is the coefficient estimate for the effect of the EITC on group 2, and γ is the coefficient estimate for the effect of the EITC on group 3 all from the probit models
- Each of these effects must be calculated using a separate coefficient estimate and standard error for each of the demographic groups (single with one child, married with one child, single with two or more children, and married with two or more children)

The effect of a $285 increase in A on employment

On Group 1: i) Δ credit= (income)*(D/(A+285) – D/A)
ii) effect = SE(employment) * α * (Δ credit)
On Group 2: No effect
On Group 3: No effect

The effect of a $285 increase in B on employment

On Group 1: No effect
On Group 2: No effect
On Group 3: i) Δ credit = (C- (income) * (D/(C-(B+285)) – D/(C-B))
ii) effect = SE(employment) * γ * (Δ credit)

The effect of a $285 increase in C on employment

On Group 1: No effect
On Group 2: No effect
On Group 3: i) Δ credit = [D-(income - B) * (D/((C+285) – B))] – [D-(income - B) * (D/(C – B))]
ii) effect = SE(employment) * γ * (Δ credit)

The effect of a $285 increase in D on employment

On Group 1: i) Δ credit = (income) * ((D+285)/A – D/A)
ii) effect = SE(employment) * α * (Δ credit)
On Group 2: i) Δ credit = (D+285) – D
ii) effect = SE(employment) * β * (Δ credit)
On Group 3: i) Δ credit = (C – income) * ((D+285)/(C-B) – D/(C-B))
ii) effect = SE(employment) * γ * (Δ credit)

Appendix B: Estimated Impact of parameters on Weeks Worked

- Based on 2007 parameters
- Based on an individual with mean income within a group; group 1 individual has A/2 income, group 2 individual has (B+A)/2 income, and group 3 individual has (C+B)/2 income
- Where α is the coefficient estimate for the EITC on group 1, β is the coefficient estimate for the effect of the EITC on group 2, γ is the coefficient estimate for the effect of the EITC on group 3, δ is the coefficient estimate for the effect of the phase in, and ε is the coefficient estimate for the effect of the phase out, all from the tobit models
- Each of these effects must be calculated using a separate coefficient estimate for each of the demographic groups (single with one child, married with one child, single with two or more children, and married with two or more children)

The Effect of a $285 increase in A on weeks worked

On Group 1: i) Δ credit= (income)*(D/(A+285) – D/A)
ii) Δ phase-in = D/(A+285) – D/A
iii) effect = α * (Δ credit) + δ*(Δ phase-in)
On Group 2: No effect
On Group 3: No effect

The effect of a $285 increase in B on weeks worked

On Group 1: No effect
On Group 2: No effect
On Group 3: i) Δ credit = (C- (income) * (D/(C-(B+285)) – D/(C-B))
ii) Δ phase-out = D/(C-(B+285)) – D/(C-B)
iii) effect = γ * (Δ credit) + ε*(Δ phase-out)

The effect of a $285 increase in C on weeks worked

On Group 1: No effect
On Group 2: No effect
On Group 3: i) Δ credit = [D-(income - B) * (D/((C+285) – B))] – [D-(income - B) * (D/(C – B))]
ii) Δ phase-out = D/((C+285)-B) – D/(C-B)
iii) effect = γ * (Δ credit) + ε*(Δ phase-out)

The effect of a $285 increase in D on weeks worked

On Group 1: i) Δ credit = (income) * ((D+285)/A – D/A)
ii) Δ phase-in = (D+285)/A – D/A

iii) effect = α * (Δ credit) + δ*(Δ phase-in)

On Group 2: i) Δ credit = (D+285) – D

ii) effect = β * (Δ credit)

On Group 3: i) Δ credit = (C – income) * ((D+285)/(C-B) – D/(C-B))

ii) Δ phase-out = (D+285)/(C-B) – D/(C-B)

iii) effect = γ * (Δ credit) + ε*(Δ phase-out)

Appendix C: Weightings given to the effect based on group size

Weighting for Group 1 = A/C
Weighting for Group 2 = (B-A)/C
Weighting for Group 3 = (C-B)/C

Weighted effect of parameter = (effect on group1) * (A/C) + (effect on group 2) * (B-A)/C + (effect on group 3) * (C-B)/C

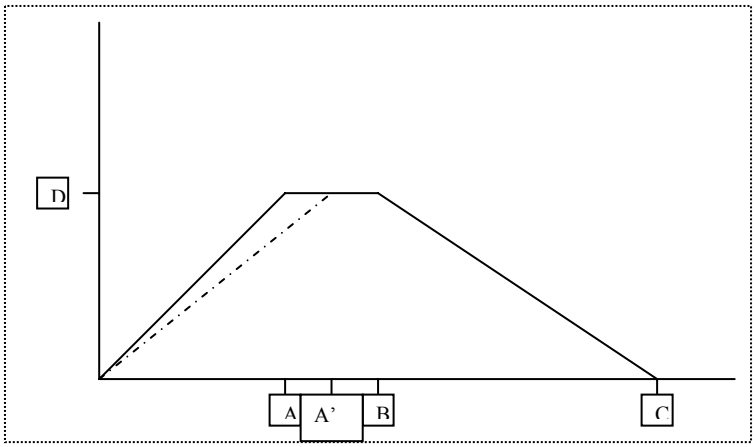
Appendix D: Cost estimates

- Assume equal distribution of individuals across EITC eligible income
- Using 2007 parameters, find area under EITC to estimate cost
- Must use different parameters depending on demographic group
- Area under EITC given by D*(.5B + .5C - .5 A) or the sum of two triangles and a rectangle created by the EITC

Estimated cost of a $1 increase in parameter A

D*(.5B + .5C - .5 (A+1)) - D*(.5B + .5C - .5 A)

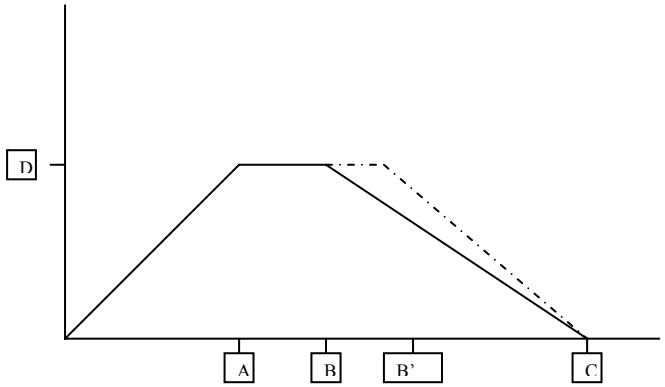
Graphical interpretation: the difference in areas of the figure with solid lines and the figure made with a dashed line



Estimated cost of a $1 increase in parameter B

D*(.5(B+1) + .5C - .5 A) - D*(.5B + .5C - .5 A)

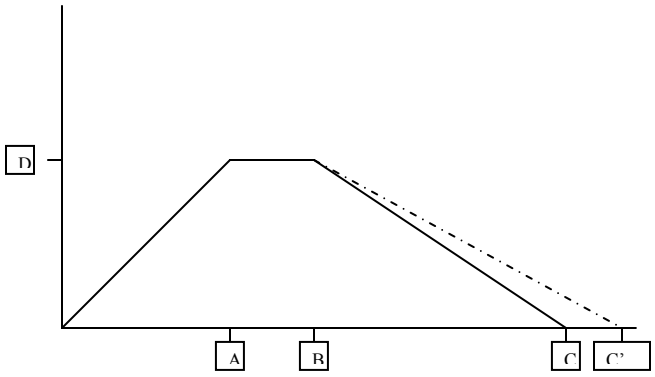
Graphical interpretation: the difference in areas of the figure with solid lines and the figure made with a dashed line



Estimated cost of a $1 increase in parameter C

D*(.5B + .5(C+1) - .5 A) - D*(.5B + .5C - .5 A)

Graphical interpretation: the difference in areas of the figure with solid lines and the figure made with a dashed line



Estimated cost of a $1 increase in parameter D

(D+285)*(.5B + .5C - .5 A) - D*(.5B + .5C - .5 A)

Graphical interpretation: the difference in areas of the figure with solid lines and the figure made with a dashed line