# The Optimal Design of the Earned Income Tax Credit

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**Abstract**

This paper uses a microsimulation model calibrated to microdata from the 1999 Current Population Survey (CPS) to illustrate the tradeoffs that arise in designing an Earned Income Tax Credit, focusing in particular on the choice of a maximum credit, a phase-in rate, and a phase-out rate. The paper has two basic results. First, in contrast to the findings of Browning (1995), I find that the overall efficiency cost of transferring income through the EITC is fairly low. While Browning found that it cost $4.03 to provide one dollar's worth of utility gain to recipients in the phase-out region and almost $2.00 to provide one dollar's worth of utility to recipients in the phase-in and constant region, I find that it typically costs less than $2.00. An important reason for my lower results is that I take into account the impact of the EITC on the labor force participation of single parents. When the savings from reduced welfare spending are taken into account, the EITC appears to be a much more efficient way to accomplish income redistribution than when they are ignored. In addition, a significant portion of the labor supply responsiveness of married couples is likely to be due to secondary earners leaving the labor force. My simulations indicate that much of this responsiveness is due to the income effect of the EITC rather than the substitution effect. Therefore, for these households, the EITC is close to a lump-sum transfer.

Second, the optimal structure of the EITC depends heavily on society's taste for redistribution, something that is difficult if not impossible to observe. For the current structure of the EITC to be optimal, taxpayers must value one dollar's worth of utility gain for an EITC recipient receiving the maximum credit at roughly 2.5 times a dollar in the hands of the typical non-EITC taxpayer. If society places a relative welfare weight on EITC recipients of 3 or more, then the credit should be expanded substantially. In contrast, if society places a relative weight below 2 on EITC recipients, then the EITC should be reduced or eliminated.

The Earned Income Tax Credit (EITC) is unusual among U.S. cash transfer programs for several reasons: only taxpayers who work are eligible for the credit; payments initially rise with income; and the credit phases out gradually as a taxpayer's income rises. In contrast, typical transfer programs such as Temporary Assistance for Needy Families (TANF) and Supplemental Security Income (SSI) provide their highest payments to households with no other income and then reduce benefits rapidly as a household's income rises.

The EITC's distinctive budget constraint causes 75 percent of its dollars to be transferred to workers with annual earnings between $9,000 and $31,000 (the median recipient has earnings of around $15,400) – a much higher income range than in traditional transfer programs.[1] In addition, the budget constraint alters incentives, subsidizing work as the credit is phased in and taxing it as the credit is phased out.

A fundamental issue for any transfer program is whether it increases the well-being of its recipients by enough to outweigh the reduction in well-being that it causes for the higher-income taxpayers from whom the revenue for the program is raised. It general, the cost of providing one dollar's worth of utility gain to a transfer recipient can be substantially more than one dollar. This disparity occurs for two reasons. First, raising the revenue for the program involves deadweight loss; therefore, taxpayers lose more than a dollar's worth of utility for every dollar raised. Second, because the program alters the incentives facing recipients, the value of the transfer to recipients is less than if the same transfer were paid as a lump sum; therefore, beneficiaries gain less than a dollar's worth of utility for every dollar they receive.

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[1]These numbers come from calculations using the 1995 IRS Statistics of Income public use data file, inflated into 1999 dollars using the growth rate of personal income.

These two sources of leakage imply that society may have to value a dollar given to a transfer recipient at several times the value of a dollar in the hands of the typical taxpayer in order to justify using distortionary tax and transfer systems to redistribute income. These values may be acceptable when a program's benefits are narrowly targeted on a population that is particularly needy or deserving. However, as a program is expanded, either by increasing benefits to a fixed population or by widening the eligible population, the marginal social welfare value of additional transfers to beneficiaries will typically decline until it no longer exceeds the marginal cost to taxpayers. Thus the optimal design for a transfer program depends on both the degree of distortion created by the incentive effects of the program and on the weights with which society trades off dollars in the hands of different households.

While this basic logic applies to the EITC, the design of the EITC provides several exceptions to these general principles that make it interesting to study. First, it is not always the case that a dollar spent on the EITC produces less than a dollar's worth of utility gain to beneficiaries. Because the credit is available only to workers, the EITC offsets some of the distortions created by the rest of the welfare and tax systems, and taxpayers who leave welfare to claim the EITC can increase their well-being at the same time as government expenditures decline. Therefore, for some beneficiaries, the cost of providing a dollar's worth of utility is actually less than a dollar. Moreover, for some two-earner couples and for some EITC recipients receiving the maximum credit, the EITC is effectively a lump-sum transfer that does not produce any deadweight loss.

Because of these theoretical peculiarities and because even the more conventional features of the EITC apply to a very thick portion of the income distribution, choices about the structure of the EITC create important policy tradeoffs. This paper uses a microsimulation model calibrated to microdata from the 1999 Current Population Survey (CPS) to illustrate the tradeoffs that arise in designing an Earned Income Tax Credit, focusing in particular on the choice of a maximum credit, a phase-in rate, and a phase-out rate.

The paper has two basic results. First, in contrast to the findings of Browning (1995), I find that the overall efficiency cost of transferring income through the EITC is fairly low. While Browning found that it cost $4.03 to provide one dollar's worth of utility gain to recipients in the phase-out region and almost $2.00 to provide one dollar's worth of utility to recipients in the phase-in and constant region, I find that it typically costs less than $2.00. An important reason for my lower results is that I take into account the impact of the EITC on the labor force participation of single parents. Recent research by Eissa and Liebman (1996), Meyer and Rosenbaum (1999, 2000), and Ellwood (2000) suggests that the EITC causes a large number of welfare recipients to enter the labor force. When the savings from reduced welfare spending are taken into account, the EITC appears to be a much more efficient way to accomplish income redistribution than when they are ignored.[2] In addition, a significant portion of the labor supply responsiveness of married couples is likely to be due to secondary earners leaving the labor force. My simulations indicate that much of this responsiveness is due to the income effect of the EITC rather than the substitution effect. Therefore, for these households, the EITC is effectively a lump-sum transfer.

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[2]Saez (2000) integrates labor force participation into an optimal tax model and shows that with sufficiently high participation elasticities, transfer schemes like the EITC can be optimal.

redistribution, something that is difficult to observe. For the current structure of the EITC to be optimal, taxpayers must value one dollar's worth of utility gain for a typical EITC recipient at roughly 2.5 times a dollar in the hands of the typical non-EITC taxpayer. If society places a relative welfare weight on EITC recipients of 3 or more, then the credit should be expanded substantially. In contrast, if society places a relative weight below 2 on EITC recipients, then the EITC should be reduced or eliminated.

## WELFARE ANALYSIS OF THE EITC

There are five basic scenarios that illustrate the ways in which the labor supply behavior of an unmarried taxpayer could be affected by the introduction of an Earned Income Tax Credit.[3] First, a taxpayer might have had earnings greater than the EITC breakeven point if there were no EITC, but reduces her earnings in order to receive the EITC. Second, a taxpayer might have had income in the EITC phaseout region even in the absence of the EITC, but because the income and substitution effects of the EITC both encourage the taxpayer to reduce her earnings, she moves to a lower level of earnings. Third, a taxpayer with earnings in the constant region might reduce his or her earnings due to the negative income effect from the EITC. Fourth, a taxpayer with earnings in the phase-in region might alter her earnings in either direction since the positive substitution effect and the negative income effect make the net impact on labor supply ambiguous. Finally, a taxpayer who would not have had any annual earnings in the absence of the EITC, might decide to participate because the EITC increases the average return to working. Such a taxpayer could enter the labor force at any level of earnings eligible for the EITC. In all

[3] The impact on married taxpayers is discussed later.

of these cases the taxpayers receiving the EITC have higher utility than they did before the EITC was introduced.

In evaluating the impact of the EITC on economic welfare, it is helpful to convert these utility gains into dollars because it is easier to think about whether society wants to take five dollars from a high income taxpayer in order to give one dollar to a low-income taxpayer than it is to think about transferring utils. Since thought experiments like the one just described usually pertain to lump sum transfers among taxpayers, it is also important to separate the changes in economic welfare into components occurring due to lump sum transfers and components due to deadweight loss.

A standard method for evaluating the welfare implications of changes in economic policies is money metric equivalent variation.[4] This method assigns a dollar amount to each indifference curve by calculating how many dollars would have to be transferred to the individual starting at the pre-reform utility level and prices in order for the individual to achieve the post-reform level of utility. Thus, the money metric equivalent variation for a policy reform that increases a taxpayer's utility from $U_0$ to $U_1$ is

[1] $$MMEV = e(p^0, U^1) - e(p^0, U^0)$$

where *e(•)* is the expenditure function, $p^0$ represents the initial price level, and $U^0$ and $U^1$ represent the initial and post-reform levels of utility, respectively. Deadweight loss is the difference between the increase in government spending due to the policy change and the *MMEV*, and measures the extent to which the utility gain to the EITC recipient is less than if the same

[4] See King (1987) and McKenzie (1983) for discussions of this concept.

money had been transferred lump-sum. Figure I illustrates this measure of welfare gain for a taxpayer in the phaseout region who reduces her hours of work when the EITC is introduced. The increase in utility from $U_0$ to $U_1$ could have been achieved by a lump sum transfer of *BC*. This is the money metric equivalent variation measure of the individual's increase in welfare due to the introduction of the EITC. Since the individual receives EITC payments of *AC* that are greater than *BC*, there is deadweight loss from the transfer equal to *AC-BC=AB*. While similar analysis applies for most EITC recipients, for taxpayers whose original and post-EITC incomes are in the flat region of the credit, prices are not changed, so there is no deadweight loss from the transfer. Similarly, for taxpayers who were out of the labor force receiving welfare, the EITC offsets the negative incentives of the welfare system and often reduces deadweight loss on net; the increase in economic welfare for these taxpayers occurs even as the budgetary cost of the transfers they receive declines.

In addition to increasing the utility of recipients and producing deadweight loss, the EITC requires that tax revenue be raised from higher-income taxpayers in order to pay for the transfers. Raising this revenue produces a direct loss of utility from higher income taxpayers as well as additional deadweight loss. Including both the welfare gains and revenue costs of the EITC, the net benefit to society of transferring income to EITC recipients is:

$$[2] \qquad \sum_i (W_i B_i(\tau) - (1 + MEB) EITC_i(\tau))$$

where *i* indexes all EITC recipients. The first term in the expression measures the benefit to society of transferring income to EITC recipients: $W_i$ is the Bergson-Samuelson social welfare function weight for taxpayer *i* (the average welfare weight for the taxpayers from whom the revenue is raised is normalized to one),[5] and $B_i(\tau)$ is equal to $e(P^0,V_i(\tau))-e(P^0,V_i(0))$ where $P^0$ represents the budget constraint facing the taxpayer in the absence of an EITC, $V(\tau)$ gives the value of the indirect utility function under a particular EITC budget constraint indexed by $\tau$ and V(0) is the value of the indirect utility function in the absence of the EITC. The second term in equation 2 measures the utility loss to taxpayers from whom the revenue for the EITC is raised. *MEB* is the marginal excess burden of raising tax revenue,[6]and $EITC_i(\tau)$ is the amount of EITC received by taxpayer i when she maximizes utility under the particular EITC budget constraint indexed by $\tau$.[7] Thus this term is simply total spending on the EITC multiplied by the marginal excess burden of taxation.[8]

Equation 2 can be rewritten as

$$[3] \qquad \sum_i (W_i(EITC_i(\tau) - DWL_i(\tau)) - (1+MEB)EITC_i(\tau))$$

decomposing the net utility gain to recipients into the utility gain from a lump sum transfer of

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[5] For simplicity, this expression has a single welfare weight for each EITC recipient. In my simulations, the welfare weight for each dollar transferred via the EITC is based on the EITC recipient's utility level after the previous dollar of transfer.

[6]For discussions and estimates of the marginal excess burden of taxation, see Ballard (1985), Browning(1987), and Feldstein(1995).

[7]In altering taxpayers' labor supply choices, the EITC also affects welfare spending and income tax revenue. The simulations presented in the next section incorporate these additional revenue effects.

[8] Because total spending on the EITC is small relative to total government spending, I have made two simplifying assumptions. First, the marginal excess burden from raising revenue from non-EITC recipients to spend on the EITC does not vary with the size of the EITC. Second, the relative social welfare weight society places on non-EITC recipients does not change with the size of the EITC.

EITC($\tau$) minus the deadweight loss that comes from altering incentives facing recipients. Notice that this equation shows clearly that if there is deadweight loss from transferring income (i.e. DWL and MEB are positive) then the net benefit to society of transferring income will be negative unless $W_i$ is sufficiently greater than one. It is also worth emphasizing that DWL($\tau$) can be negative for taxpayers who participate in the labor force only in the presence of the EITC (and for whom the EITC offsets distortions created by the tax and welfare systems).

**SIMULATION METHODOLOGY**

To examine the tradeoffs involved in the design of the EITC, I conduct simulations using a CES utility function, calibrated to individual-level data on hours of work, wages, unearned income, and family composition of single and married taxpayers with children from the March 1999 CPS.[9] The CES utility function can be written as:

$$[4] \qquad U = [(1-\alpha)Y^{-\rho} + \alpha(L-h)^{-\rho}]^{\frac{-1}{\rho}} - FC$$

where Y is after tax and transfer income, h is annual hours of work, L is the maximum possible

[9] The CES utility function has been used in many previous labor supply studies. For examples see Stern(1976), Blinder and Rosen (1985), Auerbach and Kotlikoff (1987), and Zabalza (1983). I use simulation rather than estimation because commonly used structural labor supply models such as the Hausman model have difficulty reproducing the in-sample distribution of hours. In contrast, the simulation methodology used in this paper results in a distribution of preferences that can reproduce the empirical distribution of hours under the initial budget constraint. For related work on the EITC see Triest (1996) who conducts simulations using the Hausman model calibrated to the PSID.

annual hours of work (365 x 24), and FC is the fixed cost associated with work.[10] There are three parameters that need to be chosen in the utility function for each individual, $\rho$, $\alpha$, and *FC*. Using results from Stern (1976), I set $\rho$ for each individual to match the compensated wage elasticity chosen for the simulation. Then I choose $\alpha$ so that the individual's simulated hours choice (under a budget constraint designed to approximate the 1998 tax code and welfare system) matches the individual's observed hours work for 1998 as reported in the CPS. For individuals with positive hours in 1998, fixed costs were randomly drawn from a uniform distribution with a lower limit of 0 and an upper limit equal to the difference between the individual's utility at their observed hours of work and their utility at zero hours of work. These fixed costs were then divided by a scalar so as to produce labor force participation responsiveness to the EITC that is consistent with that measured in the empirical studies cited above. Fixed costs for people out of the labor force were chosen to be large enough so that none of them would choose to work under the 1998 budget constraint. Further details of the calibration methodology are in the appendix.

Once preference parameters are calibrated for each individual (separately for each simulation elasticity), it is straightforward to alter the budget constraint and simulate the individual's new hours choice by searching over all possible hours choices for the one that maximizes the individual's utility.

***Social Welfare Weights***

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[10] This additively separable specification for the fixed costs of work can be thought of as representing the psychological stress associated with the uncertainty of leaving welfare to take a job. Alternatively, if fixed costs were due to purchasing a uniform or new pair of shoes in order to work, then they would more appropriately be specified as part of Y. If they were due to lost leisure during the job search process, then they should be specified as part of h.

Because changes in the EITC budget constraint can alter the characteristics of the EITC population, it is desirable to have a method for valuing dollars transferred to different types of EITC recipients differently. For example, a reduction in the phaseout tax rate will cause higher income taxpayers to receive the credit and dollars transferred to these wealthier taxpayers presumably deserve less weight than dollars transferred to lower-income taxpayers. To weight dollars transferred to recipients with different incomes, I use a standard individualistic social welfare function that is additively separable in the utilities of each recipient:

[5] $$W_i = \nu \frac{U_i^{\mu-1}}{U_r^{\mu-1}}.$$

In this equation, the utility of each EITC recipient, $U_i$, is defined relative to the utility of an arbitrarily chosen reference EITC recipient receiving the maximum EITC, Ur.[11] I take as my reference EITC recipient a single parent with two children who works 2000 hours a year at $6.00 an hour. The parameter, $\nu$, represents the value of a dollar given lump sum to the reference EITC recipient relative to the value of a dollar given lump sum to the typical non-recipient taxpayer from whom the revenue is raised (recall that the value of a dollar to the non-recipient taxpayer has been normalized to $1.00 and that for simplicity I have taken all non-EITC taxpayers to be

[11] I further scale the utilities so that Ur=1000. This normalization ensures that the main curvature in the social welfare function occurs over the utility range of EITC recipients and that even at the end of the current EITC phaseout region, the welfare weight is still considerably greater than that of non-EITC recipients. For example, when the reference EITC recipient receives a weight of 3 ( i.e. $\nu$=3), an EITC recipient with $30,000 of income receives a weight of 2.93 if $\mu$ equals .95, a weight of 2.37 if $\mu$ equals .50, and a weight of 1.92 if $\mu$=.05.

the same because the simulations do not have much impact on who they are). Thus, this first parameter reflects how much society cares about a full-time low-wage worker with children relative to the typical taxpayer.

The parameter $\mu$ (which can range from zero to one) reflects the heterogeneity within the recipient population. In particular, it measures how fast social welfare weights rise at utility levels below that of the reference EITC recipient and how fast they fall at utility levels above that of the reference EITC recipient. Under this standard social welfare function, $\mu$ close to one corresponds to a social welfare function in which all recipient taxpayers are weighted equally (at $\nu$), and $\mu$ close to zero corresponds to a social welfare function in which the lowest income recipients receive much higher weights than higher income recipients.

## SIMULATION RESULTS FOR HEAD OF HOUSEHOLD FILERS

The EITC is often described by six characteristics: the maximum credit, the phase-in subsidy rate, the minimum income at which the maximum credit is received, the maximum income at which the maximum credit is received, the phase-out tax rate, and the maximum income at which any credit is received. However, the choice of any two of the first three parameters pins down the third and similarly for the last three parameters. Therefore, the EITC can be defined by 4 parameters. While historically, EITC parameters have been identical for married and unmarried taxpayers, there is no need for this to be so.[12] Indeed, recent concern about marriage penalties created by the EITC has led to proposals to have a more generous credit

[12] Ellwood (1996) explains that the current EITC parameters were designed to achieve President Clinton's 1992 campaign promise that no full-time worker with children would be poor.

for some married couples.  Therefore, this paper conducts separate simulations for head of household and married filers.  This section of the paper presents the results for head of household filers and begins by focusing on three of the possible parameters (the maximum credit, the phase-in rate, and the phaseout rate) individually. These parameters are the ones than are most often discussed in the policy debate, and serve to illustrate the full range of analytical issues.   Then, at the end of this section, I present results in which I search simultaneously over four EITC parameters in order to find the configuration of the EITC that maximizes social welfare.[13]  The subsequent section of the paper contains results for married taxpayers.

**The Maximum EITC**

The political debate over the size of the EITC tends to be dominated by two extremes. Critics of the program claim that the program has been growing out of control, noting that the growth of spending on the EITC has been faster than that of any other entitlement program.[14] These critics usually fail to mention that this growth is the direct result of legislation designed to expand the EITC and that recent IRS efforts to combat noncompliance have actually reduced expenditures below the level that was forecast when the EITC expansions were enacted.  On the

[13]There are many other reforms that could be explored.  For example, Triest (1996) studies an expansion of the EITC (starting from the 1987 level) in which the phase-in and phase-out rates are held constant, but the income over which the phase-in rate is applied is increased. More generally, one could analyze broader reforms that consider to full range of tax benefits provided for families with children rather than simply treating the EITC as the marginal program. Ellwood and Liebman (2001) discuss options for integrating the EITC, child credit, and dependent exemption in order to reduce work and marriage disincentives.

[14]For an example see James K. Glassman, "A Program Gone Bonkers," *Washington Post*, October 12, 1995.

other side of the debate, a remarkable number of analyses on topics such as rising wage inequality or of the impact of trade on low wage workers conclude with a short policy recommendation section that suggests increasing the EITC.[15] These calls for increasing the EITC seem to be independent of the level of the EITC, and in particular there is no sign that their prevalence is any lower with the maximum EITC for a family with two children at $3816 than they were when it was $851.

What is missing from the public debate is an explicit recognition that there are tradeoffs between the well-being of EITC recipients and that of the taxpayers from whom the revenue is raised. In particular, as the EITC increases, at some point the marginal benefit per dollar spent on the program begins to fall, and eventually will descend below the marginal cost of raising an additional dollar from taxpayers. The marginal benefit per dollar spent falls for three reasons. First, at higher EITC levels, beneficiaries have higher levels of utility and therefore receive less weight in the social welfare function. Second, a higher maximum EITC implies a higher phaseout tax rate (holding constant the income level at which the maximum credit is received and the maximum income for eligibility for the credit) raising deadweight loss and reducing the utility gain to recipients per dollar received. Finally, it is likely that participation elasticities decline as the credit increases and fewer people remain near the margin between work and welfare. Thus, the welfare savings per dollar of EITC expenditure decline.

The simulations presented in tables 1 and 2 illustrate these tradeoffs. They show the

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[15] For examples see Peter Passell, "Rich Nation, poor nation. Is anyone looking for a cure?" *New York Times*, August 13, 1998; Edward N. Wolf, "The Rich Get Richer; and Why the Poor Don't," *The American Prospect*, February 12, 2001; Paul Krugman, "First, Do No Harm," *Foreign Affairs*, July/August 1996.

impact of raising the maximum EITC holding constant the income range over which the maximum EITC is received. Thus, they involve increasing both the phase-in subsidy rate and the phase-out tax rate in proportion to the increase in the maximum credit.[16]

Columns 2 through 6 of Table 1 show the distribution of head of household filers by EITC region. The top panel contains results when the compensated wage elasticity is 0.1; the second panel contains results when the wage elasticity is 0.3; and the third panel contains results when the wage elasticity is 0.5.[17] Recall that the simulations for each elasticity are calibrated to match the actual 1998 distribution of taxpayers under the EITC rules for that year.

The first row of each panel shows results in the absence of an EITC. In the top panel, we see that without an EITC, 2.5 million single parents do not work at all and instead receive welfare, and relatively few taxpayers locate in the phase-in region of the credit where marginal benefit reduction rates from the welfare system are high. As the credit increases, welfare recipients enter the labor force. In the first panel the percentage of single parents who work at some point during the year increases from 78 percent in the absence of the EITC to 82 percent at half of the current maximum EITC and 85 percent at the current level of the EITC. The

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[16] Note that because setting four EITC parameters automatically determines the other two, it is impossible to vary any one of the EITC parameters without varying at least one other. Thus an alternative to the simulation conducted in this subsection would be to vary the maximum credit while holding phase-in and phaseout-out rates constant, but this would require me to vary the income range over which the maximum credit applies.

[17] In early versions of this paper I presented results for higher elasticities. However, under higher compensated wage elasticities the labor force participation elasticities became implausibly large (and the welfare cost of transferring income through the EITC became very small).

participation responsiveness with higher compensated wage elasticities is somewhat larger.[18] These levels of participation responsiveness are roughly consistent with the large increase in annual labor force participation among single mothers from 73 percent in 1984 to 87 percent in 1998[19] that has recently occurred and with the findings of Meyer and Rosenbaum (1999) which indicate that EITC expansions were responsible for 63 percent of this increase. In addition, the results in all three panels show that as the EITC is introduced and then expanded some taxpayers in the phase-out region reduce their hours and locate in lower regions (including the kink point at the upper end of the constant region). In the higher elasticity examples, taxpayers from beyond the phase-out region reduce their hours and become EITC recipients.

The remaining columns of table 1 show the revenue and welfare implications of changes in the maximum value of the credit. As the credit expands, total expenditures on the EITC increase. In addition, the income effect of the credit and the higher phase-out tax rate causes people to reduce their hours of work, decreasing income tax revenue. However, this income tax effect is substantially offset by the savings from lower welfare payments for new participants in the labor force. Thus in many cases the net revenue cost of the program is less than total EITC payments. For example, with a compensated wage elasticity of 0.3, the current level of the EITC costs $15.0 billion and results in $2.5 billion of lost income tax revenue from those reducing their hours of work. However, these two budgetary costs are partially offset by $2.8 billion in

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[18] With the simple model of fixed costs used in this paper, there was no way to set the participation elasticities to be equal across all three compensated wage elasticities (without setting fixed costs to be negative for some individuals – which would lead to a mass of people working exactly 1 hour per year).

[19] Liebman(1998) contains the details of how these participation rates were calculated.

savings on welfare spending, so the total budgetary cost is $14.7 billion.[20]

Because the EITC distorts incentives for recipients, they gain less in utility than if the payments were made as a lump sum. Comparing column 11 to column 7 in the top panel, we see that there is substantial deadweight loss from the transfers – ranging from 22 percent of spending at low levels of the EITC and a compensated wage elasticity of 0.1 to 34 percent at higher levels and elasticities. With higher elasticities we see greater amounts of deadweight loss. At current program levels, the welfare gain from EITC payments to single parent households is 88 percent of EITC spending levels when the compensated wage elasticity is 0.1, 78 percent when the elasticity is 0.3, and 74 percent when the elasticity is 0.5. The welfare gain relative to the combined revenue cost from EITC payments and lost income tax revenue is 76 percent when the elasticity is 0.1, 67 percent when the elasticity is 0.3, and 62 percent when the elasticity is 0.5. In comparison, Browning (1995) calculates that the marginal benefit per dollar of revenue cost is $0.46 is the phase-out range and roughly $1.03 in the phase-in range and $1.00 in the plateau range when the compensated wage elasticity is 0.3. Weighting these three numbers by the total EITC dollars received by taxpayers in each of these ranges in my simulations produces an overall Browning estimate of $0.69 – very close to my estimate of 69 percent. The similarity of the results up to this point serves to highlight that the difference in my overall assessment of the efficiency cost of the EITC from that of Browning does not come from the

[20] It is worth noting that average welfare savings per new participant in my model is only $2502 at current program levels and an elasticity of 0.3. Because I have a fairly simple model of the welfare system that does not take full account of Food Stamps and housing subsidies, it is likely that these savings are understated, and that the efficiency cost of the EITC is even lower than these results indicate. Although I incorporate payroll taxes in calculating a person's budget constraint, my revenue calculations exclude payroll tax revenue since changes in payroll tax revenue will be partially or fully offset by changes in future OASDI benefits.

basic simulations of the benefits per dollar transferred, but rather from the fact that I incorporate the impact of people leaving welfare to participate in the labor market.

When the savings from reduced welfare spending are taken into account, the utility gains can actually exceed the revenue cost. For example with a maximum EITC that is half the current level, and a compensated wage elasticity of 0.3, the welfare gain is $5.7 billion while the net revenue cost is only $5.1 billion, indicating a cost per dollar of utility gain of 89 cents. At higher compensated wage elasticities, the cost per dollar of utility gain sometimes falls relative to lower elasticities because the higher wage elasticities also result in higher participation elasticities and therefore in higher savings on welfare spending.

The last column of Table 1 shows that the cost per dollar's worth of utility gain (calculated by dividing column 10 by column 11) rises as the size of the maximum credit increases. This occurs for two reasons. First, the higher subsidy and tax rates that result from a higher maximum credit lead to more deadweight loss. Second, fewer people are leaving welfare per additional dollar spent on the EITC at higher credit levels, so the cost of the program is not being offset by welfare savings.

As was discussed in the theory section above, the revenue effect does not represent the total cost of the program. There is also deadweight loss from raising the revenue through distortionary taxation. If we assume a marginal excess burden of 0.5[21], we find (by multiplying the numbers in column 12 of table 1 by 1.5) that in all cases the total cost of giving one dollar's worth of utility to an EITC recipient exceeds one dollar. This implies that for the benefit of the

[21]This is higher than the traditional estimates of 0.3 based on labor supply elasticities used by Ballard et al (1985) but lower than some recent taxable income elasticities such as those in Feldstein (1995) would imply.

EITC to outweigh its costs, society must value a dollar of utility for EITC recipients somewhat more than it values a dollar in the hands of the typical taxpayer.[22]

Table 2 shows how the net benefits of the EITC vary with the size of the maximum credit and with how much society cares about EITC recipients. These results use a compensated wage elasticity of 0.3. The three panels of Table 2 correspond to three values of the parameter $\nu$ which represents how much society values a dollar in the hands of the reference EITC recipient (a person receiving the maximum credit) relative to the average taxpayer from whom the revenue is raised. For each value of $\nu$, results are also presented for three values of the parameter $\mu$ which reflects how quickly the value of transfers fall at income levels above that of the reference taxpayer (recall that lower values of $\mu$ implies that the social welfare weight falls more rapidly as income rises).

In the first column of Table 2 we see the cost per dollar of utility gain. This is simply column 12 of Table 1 multiplied by 1.5 to incorporate the excess burden involved in raising the revenue. The second column shows the social welfare benefit per dollar of utility gain when $\mu$ equals .05. This number is calculated by weighting each dollar of utility gain provided by the EITC by the social welfare weight associated with the utility level of the person receiving the gain. These values are below the value of $\nu$ because the average dollar transferred through the EITC to a head of household filer goes to someone with income above that of the reference taxpayer. The third column shows the total utility gains in millions of dollars (this column

[22] In comparing my overall cost per dollar of utility to that of Browning, it is important to note that he assumes a marginal excess burden of taxation of 85.2 cents while my estimates assume that the marginal excess burden is 50 cents. Even if I used his assumption my cost results would be significantly below his.

comes directly from column 11 of Table 1). The fourth column multiplies the total utility gain by the difference between the benefits and costs per dollar transferred to produce the net benefit of the EITC for a given level of the maximum credit.

In the top panel, $\nu$ equals 1 meaning that society does not value dollars in the hands of EITC recipients any more highly than dollars to the average taxpayer. Under this assumption, we see that net benefits from the EITC are always negative. Even though savings from reduced welfare spending is taken into account, the deadweight loss from raising the revenue and making the transfers imply that it costs more than a dollar to make a dollar's worth of transfers; so with dollars to EITC recipients valued the same as dollars to other taxpayers, the program's cost exceeds its benefits.

The second panel contains results for the case in which dollars in the hands of the reference EITC recipients receive twice the weight of dollars in the hands of the average taxpayer. With this assumption, a maximum credit at around 50 percent of the current level yields the highest positive benefits for all three values of $\mu$. In this set of results the net benefits eventually become negative as the size of the credit rises. As the program gets larger, the cost per dollar transferred rises (because the subsidy and tax rates are rising and fewer additional people are leaving welfare for work) and the benefit per dollar transferred falls (because each marginal dollar is adding less to social welfare since the recipients' incomes are rising).

In the third panel, we see that if EITC recipients receive three times the weight of other taxpayers then a program of roughly the current size can be optimal. More specifically, with $\mu$ equal to .05, a credit at 75 percent of current levels is optimal, with $\mu$ equal to .50 the current level is optimal, and with $\mu$ equal to .95 (and high income EITC recipients receiving a welfare weight that is nearly as high as that of an EITC recipient at the current EITC maximum) a credit of 200 percent of the current level (or larger) is optimal. Additional results not shown indicate that if EITC recipients are given four times the weight of the average taxpayers then the optimal EITC is at least 125 percent of current levels, and if they are given five times the weight of the average taxpayer then the optimal size is more than double the current size.

Given the changes underway in the U.S. welfare system and the sensitivity of the efficiency cost estimates to the amount of welfare savings that accrue when welfare recipients enter the labor force, it is worth examining how the optimal size of the EITC varies with the size of the basic welfare benefit. There are two potentially offsetting effects. As the rest of the welfare system becomes less generous, there becomes less of a need for the EITC to offset the negative incentives created by the welfare system. On the other hand, with smaller welfare benefits, people in the phase-in region are poorer and therefore the EITC transfers are more valuable. In my basic results, I model the rest of the welfare system as providing a $6000 guarantee that is phased out dollar for dollar with additional income. Table 3 shows how the optimal size of the maximum credit changes as the size of the basic welfare guarantee is reduced to $3000 and increased to $9000.

With a lower welfare guarantee, the optimal size of the EITC is typically a bit smaller than in the basic results from Table 2 when $\nu$ equals 1 or 2 and larger when $\nu$ equals 3 or 4. The intuition for this is fairly straightforward. With a lower welfare guarantee, very few people are on welfare even in the absence of an EITC, thus the welfare cost saving from introducing the EITC are small. With only a small cost savings to offset the revenue cost of the program, the cost per dollar’s worth of utility is higher than in the basic results. At low levels of $\nu$, this higher cost offsets the higher benefits per dollar of transfer that occur due to low-income EITC recipients having lower levels of utility (because they receive small levels of welfare benefits). Only at the higher values of $\nu$, do the higher benefits per dollar of transfer outweigh the higher per dollar costs and justify a larger program than in the base case.

With the higher welfare guarantee there are similarly offsetting effects. Welfare participation rates are much higher and are less responsive to increases in the EITC. However, with more people out of the labor force receiving welfare EITC spending is significantly lower as well and the cost per dollar's worth of utility gain is generally a bit lower than in the base case, as we would expect because there is a large welfare system and therefore more pre-existing distortions for the EITC to offset. However, the large welfare system means that the lowest income recipients have higher incomes than in the other simulations and the social welfare value of transfers to them is therefore lower. On net, the lower costs and lower benefits generally lead to a similar or slightly smaller optimal maximum size for the EITC than in the base case.

### The Phase-in Subsidy Rate

For a given maximum level of the Earned Income Tax Credit, the phase-in rate determines the income level at which the maximum credit is received. In practice, this income level has remained relatively constant in real dollars, and therefore the EITC phase-in rate has grown essentially in proportion to increases in the size of the maximum credit. Although the phase-in rate has not been treated as an independent parameter in the U.S. to date, it is worth noting that in the UK version of the EITC, the Working Families Tax Credit (WFTC), there is no phase-in region at all. Taxpayers are ineligible for the WFTC unless they work at least 16 hours a week. At 16 hours a week they receive the maximum credit, and it is phased out as hours (and income) rise further. For a full-year worker earnings eight dollars per hour, this would be equivalent to an EITC that was zero for incomes below $6656 and which jumped immediately to its maximum at that income level. Thus, the UK counter example raises the question of why the U.S. has a phase-in region and whether it should be designed differently.[23]

Presumably one reason why the U.S. system has a phase-in region while the UK system does not is that the U.S. bases the EITC on a full calendar year of income while a worker can apply and receive the WFTC after 3 months of work. Thus to create a work incentive for workers who are entering the work force in the middle of the year, the EITC needs to provide some payments for people whose earnings do not reach the level of full-time full-year work.

More generally, a higher phase-in rate (holding the maximum credit constant) will induce a greater number of non-workers to enter the labor force, but will also encourage additional higher-income workers to reduce their hours and take advantage of the generous credit at lower levels of earnings. The simulations shown in tables 4 and 5 illustrate these two offsetting effects.

Table 4 presents simulations using the same format as table 1. Thus, there are panels for each of the three compensated wage elasticities. The first row shows the distribution of head of household taxpayers by EITC region in the absence of an EITC. The second row shows results for simulations in which there is no phase-in region and the credit jumps from zero directly to the

[23] While for a particular individual with a fixed wage, an hours restriction and an earnings restriction can be equivalent, the two types of restrictions can have very different effects on a population with people earning different wages or if people increase their earnings by taking higher wage jobs rather than by increasing their hours. Keane (1995) argues that hours restrictions are more effective at encouraging work at a low cost. However in the U.S., there has been concern that it would not be possible to collect accurate data on hours worked.

current maximum at the point where the maximum credit currently begins. Subsequent rows show results for a 30 percent phase-in rate (a bit slower than the current rate), the current rate (40 percent for families with two children and 34 percent for families with one child), and then a phase-in rate of 60 percent. Comparing the second and fourth rows in the middle panel, these simulations indicate that eliminating the phase-in completely would greatly reduce the EITC's effectiveness in encouraging people to leave welfare for work. An extra 925,000 household heads would leave the labor force. Moreover, relatively few phase-in region taxpayers are induced to work a greater number of hours when the phase-in is eliminated. Only 343,000 extra workers locate in the flat region and only an extra 40,000 locate in the phase-out region compared to current law. Moving to the last column, we see that the cost per dollar's worth of utility gain is noticeably higher (1.35 versus 1.25) without the phase-in.

Comparing the various phase-in rates, we see that for all three compensated wage elasticities, a phase-in rate of 30 percent produce lower costs per dollar's worth of utility gain than do either lower or higher phase-in rates. This occurs because as the phase-in rate rises from zero to 30 percent, significant numbers of welfare recipients are entering the labor force. As the rate rises above current law, however, very few additional participants enter, and the main impact is to induce higher earning taxpayers to reduce their earnings.

Because the phase-in rate has relatively little impact on the distribution of EITC dollars by income, we see in Table 5 that the average benefit per dollar of utility hardly varies at all with the phase-in rate. Therefore, the result that a 30 percent phase-in rate provides the lowest cost per utility gain carries through to imply that the 30 percent rate maximizes net benefits.

**The Phase-out Tax Rate**

Sixty percent of Earned Income Tax Credit recipients have incomes above $12,300, and are therefore in the phaseout region of the credit. In 1999, these 9 million taxpayers received around $15 billion from the EITC. Phaseout-region taxpayers with two children lose 21.06 cents of the EITC for every additional dollar they earn, and taxpayers with one child lose 15.98 cents per dollar. Since these taxpayers face a 15.3 percent OASDHI payroll tax on earnings and many of them are liable for federal and state income taxes, the cumulative marginal tax rates for phaseout rate taxpayers often exceed 45 percent. These marginal tax rates are among the highest in the current U.S. tax system. Congressional proposals introduced over the past few years to reduce the budgeted cost of the EITC by phasing it out more quickly would add as much as 12 percentage points to these marginal tax rates.

If phaseout region taxpayers perceive and respond to these incentives, then it might be possible to redesign the phaseout of the EITC in order to reduce its efficiency cost. On a priori grounds, it is not possible to tell whether a faster or a slower phaseout will be preferable to the current rates. A more rapid phaseout reduces the utility of EITC recipients and causes some taxpayers to leave the labor force and return to welfare. Nonetheless, such a policy could be desirable if it made possible a tax cut for higher income taxpayers that raised their economic welfare by more than the loss for the low-income EITC recipients.

Table 6 presents results from simulations of different phaseout rates (holding constant the current law phase-in and maximum credit, as well as the income level at which the phaseout begins). As in the previous results, the three panels contain results for three different compensated wage elasticities. Each row corresponds to a different EITC phase-out tax rate.

With a phase-out rate of .10 (implying that taxpayers with two children can receive the credit at incomes up to $47,160), 1.7 million household head filers are in the constant region (including those at the kink point at the beginning of the EITC phaseout), 5.2 million such taxpayers are in the balance of the phaseout region, and only 1.4 million have incomes above the EITC breakeven point. In column 7 of Table 6 we see that with a 10 percent phase out rate, total spending on the EITC is $18 billion and that an additional $3 billion in income tax revenue is lost due to taxpayers reducing their hours in response to the EITC. These costs are partially offset by $1 to $5 billion of savings (depending on the compensated wage elasticity) from reduced welfare payments due to people entering the labor force in response to the incentives created by the EITC. With an elasticity of 0.3, the money metric equivalent variation measure of the welfare gain for EITC recipients from the EITC is $15.4 billion, 84 percent of EITC payments made as well as of the net revenue cost.

For all three elasticities, the cost per dollar's worth of utility gain rises with the phaseout tax rate. The phase-out rate also has significant impacts on the characteristics of EITC recipients and total amount of expenditures. In particular, a lower phaseout rate implies that a higher fraction of EITC dollars are going to higher-income taxpayers and raises total expenditures substantially.

Table 7 contains estimates of the net benefit of the EITC that take both of these factors into account. With $\nu$ equal to 1, the costs of the EITC outweigh the benefits and therefore phaseout rates that are higher than current level reduce the total costs of the EITC by minimizing the size of the program. With $\nu$ equal to 2 and $\mu$ equal to .05 or .50, a phaseout rate of 30 or 40 percent is optimal because it combines a wide gap between benefits and costs per dollar and fairly large expenditures on the program. With $\mu$=0.95 (so that a high income EITC recipient at $47,000 receives nearly the same social welfare weight as an EITC recipient at $15,000 of income), a slower phaseout rates is preferable since it allows additional taxpayers with high social welfare weights to receive the credit. With $\nu$ equal to 3, even with social welfare weights that drop off with income, social welfare is maximized with a more gradual phaseout rate that allows additional taxpayers to benefit from the program.

**Maximizing Four Parameters at Once**

The results so far have focused on changes to a single EITC parameter, holding other features of the EITC constant. The results from such an approach could differ substantially from simultaneously optimizing over the entire set of EITC parameters. Table 8 shows results from simultaneously maximizing over six possible phase-in rates (.15, .30, .45, .60, .75, and 1.00), eight levels of the maximum credit (25, 50, 75, 100, 125, 150, 175, and 200 percent of the current law levels), five lengths for the constant region (0, $1500, $3000, $6000, and $9000), and six phaseout tax rates (.10, .20, .30, .40, .50, and a cliff). Thus for each elasticity, 1440 different EITC configurations are analyzed, and then the one that maximizes social welfare for different values of $\nu$ and $\mu$ is determined.

When $\nu$ equals one, a very small EITC is optimal . With a maximum credit that is 25 percent of the current law level, the welfare saving from inducing additional people to enter the labor force offsets a sufficiently high fraction of the cost of the EITC to allow the net benefit from the EITC to be positive (even though the reference EITC taxpayer receives the same welfare weight as the taxpayers from whom the revenue is raised). When $\nu$ equals 2, an EITC that is 25 to 50 percent of its current size is optimal (unless $\mu$=0.95 in which case an EITC that is double current levels is optimal). With $\nu$ equal to 3 or 4, the EITC should be substantially larger than current levels. These results (and additional results not shown) indicate that for the current EITC to be optimal, $\nu$ must be around 2.5. With values much lower than that, a smaller EITC maximizes social welfare and with higher values a larger EITC would be optimal. These results also indicate that the optimal value for a particular parameter depends heavily on the values that the other parameters take on. Therefore the conjecture that different results might be obtained from maximizing over all EITC parameters simultaneously was correct. For example, in table 7 we saw that a phaseout rate of 30 to 40 percent was often optimal given the current structure of the EITC. However, table 8 shows that at either the small values of the maximum credit that are optimal when $\nu$ equals 2 or the larger values that are optimal when $\nu$ equals three or four, a phase-out rate of .10 is generally optimal.

**SIMULATION RESULTS FOR MARRIED FILERS**

The analysis so far has focused on the 66 percent of EITC recipients with children who are not married. The optimal EITC for married taxpayers is likely to differ from that for single taxpayers for three reasons. First, married taxpayers who receive the EITC would rarely have been receiving welfare in the absence of an EITC, and therefore the welfare savings that played a big part in reducing the efficiency cost of the EITC for single taxpayers will not be present for married couples. Second, the empirical labor supply literature indicates that the labor supply of prime-age males is relatively inelastic and that the labor supply elasticity of secondary earners is fairly elastic, particularly on the participation margin. Therefore, we would expect to see most of the impact of the EITC for married couples to be on the labor force participation of the secondary earners.[24] Since the primary earner's earnings will usually be sufficient to reach into the constant region or even the phase-out region, the main labor supply impact of the EITC on married couples is likely to be a negative effect on the labor force participation of women in married couples (both from the income effect of providing more income and the substitution effect from the phaseout of the credit), rather than the positive participation impact that has been found for single EITC recipients. Finally, because the distribution of incomes for married couples is concentrated at the upper end of the phaseout range rather than in the constant region and the beginning of the phaseout as it is for unmarried EITC recipients, changes in the EITC for married couples, particularly changes in the phaseout rate, will have a greater impact on the average social welfare weight of EITC dollars than they do for single taxpayers.

The simulation model for married couples is similar to that for head of household filers. However, two features deserve attention. First, the model assumes that the husband's earnings are fixed and that the household optimizes over the choice of the wife's hours of work. While analytically convenient, this classic "male chauvinist" labor supply model is unlikely to be a good description of the economic behavior of low-income households in which the wife's earnings are often a significant share of total household earnings. Therefore, the results presented here should be seen as illustrating some of the policy tradeoffs facing these households, but may not provide a good guide to the magnitude of the responses to policy changes that would in fact occur. Second, the model for married couples assumes that no public

[24] Eissa and Hoynes (1998) find that recent EITC expansions have reduced the labor force participation of married women by 1.2 percentage points.

assistance is available to them. This assumption means that the lower bound on income for these households is zero rather than the $6000 that it was for single parent households. In some simulations, households in which the wife faces a large fixed cost of work end up optimizing at a very low level of income. These observations receive extremely high welfare weights and lead to optimal phase-in rates that would probably not occur in a more realistic model. For this reason, I limit the single parameter analysis in this section to the maximum level of the credit and to the phaseout tax rate. Results for the phase-in rate are presented only in the context of maximizing four EITC parameters simultaneously.

**The Maximum EITC**

Tables 9 and 10 examine the impact of alternative levels for the maximum EITC for married filers. The format is similar to table 1. However, the second column now shows the labor force participation rate of the second earner rather than the number of taxpayers with zero annual hours. This second column illustrates one of the main differences between the impact of the EITC on household heads and the impact on married filers. For household heads, labor force participation increased as the EITC became more generous. For married households, expanding the EITC reduces the labor force participation of second earners due to both income and substitution effects.[25] Thus table 9 shows that with a compensated wage elasticity of 0.3 the labor force participation rate of second earners declines from 78 percent in the absence of an EITC to 75 percent at current levels of the EITC. Additional simulations (not shown) find that

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[25] For couples in which the primary earner has earnings in the phase-in range, the EITC can encourage the secondary earner to enter the labor force.

simply giving each household a lump sum transfer equal to their EITC payment would reduce secondary earner labor supply to 76 percent, indicating that the income effects are responsible for at least two-thirds of labor force participation responsiveness of these secondary earners.

Comparing the 12th column of table 9 to the 12th column of table 1, we see that in many cases the cost per dollar's worth of utility gain for married filers is smaller than the same cost for household heads. At first this result may appear surprising since the EITC for married couples does not result in any budgetary savings from reduced welfare spending. Indeed, the lack of reduced welfare spending does explain why at low levels of the EITC, the cost per dollar's worth of utility gain is higher for the married filers. However, at higher levels of the EITC a second factor dominates: in one earner households under this male chauvinist model the EITC is effectively a lump sum transfer. Similarly, for some women who leave the labor force in response to the EITC, it is the income effect, not the substitution effect that causes the response and there is no deadweight loss associated with the EITC payment.

Table 10 incorporates social welfare weights to calculate total benefits from the transfers. The reference taxpayer for this table is a married couple with two children and income of $15,300.[26] In this table, we see that with $\nu$ equal to 1, there should be no EITC. This is true for $\nu$ equal to 2 as well, unless $\mu$ is very high. Finally with $\nu$ equal to 3 an EITC larger than the current level is optimal.

**The Phase-out Tax Rate**

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[26] This income level was chosen by taking the $12,000 income level from the single parent reference taxpayer and scaling it up according to the equivalence scale for family size recommended by Panel on Poverty and Family Assistance (1995).

Tables 11 and 12 present simulations of the impact of alternative EITC phase-out rates on married taxpayers. As in previous tables, the last column of table 11 shows the revenue cost per dollar's worth of utility gain. This cost rises steadily with the compensated wage elasticity. Table 12 incorporates social welfare weights to calculate total benefits from the transfers. We see that the average benefit per dollar of utility is lower relative to $\nu$ for married couples (when $\mu$ equals .05 or .50) that it was for head of household filers. This occurs because the distribution of married EITC recipients is concentrated toward the end of the phaseout region, among taxpayers who receive lower social welfare weight due to their higher incomes. The combination of these two factors implies that for $\nu$ equal to 1 or 2, the costs of the EITC outweighs its benefits (except when $\nu$ equals 2 and $\mu$=.95) and a rapid phaseout that minimizes the size of the program is optimal. When $\nu$=3, the current phaseout rate or one of 30 percent is optimal, so long as $\mu$ is not too large.

**Maximizing Four Parameters at Once**

Table 13 presents results from simultaneously maximizing over the same four EITC parameters as in table 8. Two results stand out. First, a very high phase-out rate – even a cliff in which the entire EITC is eliminated immediately at the end of the plateau – is often part of the optimal EITC. Because the distribution of married taxpayers is quite thick at the end of the current phaseout region, increasing the phaseout rate saves a significant amount of money that would go to individuals with relatively low social welfare weights. Second, rapid phase-in rates are often part of the optimal structure for the EITC for married couples, though, as I discussed above, this result is likely due to my modeling strategy and might not persist in a more realistic model.

**Conclusion**

This paper has analyzed the optimal design of the EITC in the context of a simple static labor supply model. The results indicate that the efficiency cost of transferring income through the EITC is substantially lower than previous studies have found. It costs upper income taxpayers only $1.88 to provide a transfer worth $1.00 to EITC recipients. Among head of household filers, the main reason for the difference is that this study takes into account the positive impact of the EITC on labor force participation of single parents and the savings on welfare spending that this labor supply response brings about. Among married filers, it appears that a substantial amount of the labor supply response to the EITC is likely to be due to secondary earners leaving the labor force. The simulations indicate that this responsiveness is primarily due to the income rather than the substitution effects of the credit and therefore that the EITC is effectively a lump-sum transfer for these households.

The paper also illustrates that the optimal structure of the EITC depends heavily on society's taste for redistribution, something that is difficult to observe. For the current structure of the EITC to be optimal, taxpayers must value one dollar's worth of utility gain for an EITC recipient in the plateau region at roughly 2.5 times a dollar in the hands of the typical non-EITC taxpayer. If society places a relative welfare weight on EITC recipients of 3 or more, then the credit should be expanded substantially. In contrast, if society places a relative weight below 2 on EITC recipients, then the EITC should be reduced or eliminated.

There are two important caveats to keep in mind in interpreting these results. First, the simulations were based on a simple static model of labor supply and used a CES specification for utility. Results could differ with a different specification of preferences, particularly one that focused on longer-term labor supply decisions such as choices of careers and human capital accumulation. Second, while this paper has shown that the current design of the EITC may be close to optimal if one is limited to using an EITC-like program, there is a much broader range of policies that could be used to assist low-wage workers, and it is possible that some of them might be preferable to the EITC.

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## Appendix

This appendix describes the CPS data used for the simulations and the details of the calibration methodology.

*Data*

Using the March 1999 CPS, two samples were created, one of single parents with children and another of married couples with children. For each single parent and each woman in the married couples, I calculated a wage as total annual earnings divided by total annual hours (with a minimum value set at the minimum wage). Wages for nonworkers were imputed as the average for women of their marital status and level of education. The total hours variable was also used in calibrating the simulations. Non-wage income was calculated as the difference between the CPS measures of Adjusted Gross Income and earnings. Itemized or standard deductions were determined by subtracting the CPS measure of taxable income from the CPS measure of adjusted gross income. Variables on family size and number of children were used both in constructing equivalence scales and in determining the value of the EITC that the family was entitled to. March supplement weights were used to weight the results up to the general population. The total number of EITC recipients in the simulations tend to be below those in SOI data, in part because of the EITC compliance problem.

***Simulation Methodology***

The simulations use a CES utility function:

[A1] $$U = [(1-\alpha)Y^{-\rho} + \alpha(L-h)^{-\rho}]^{\frac{-1}{\rho}} - FC$$

where Y is net income, h is annual hours of work, and L is the total number of hours in a year. For each individual, a set of parameters (α, ρ, and FC) were chosen for each compensated labor supply elasticity. Stern (1976) shows that the first order condition for maximization of the CES utility function with respect to a linear budget constraint (Y=I +wh) is:

[A2] $$\left[\frac{L-h}{I+wh}\right]^{\rho+1} = \frac{\alpha}{(1-\alpha)w}$$

where I is virtual income and w is the net wage. Logarithmically differentiating the first order condition leads to expressions for the uncompensated wage elasticity and the income effect:

[A3] $$\frac{\partial h}{\partial w}\frac{w}{h} = \frac{(I - wh\rho)(L-h)}{h(\rho+1)(I+wL)}$$

[A4] $$\frac{\partial h}{\partial I}w = \frac{-w(L-h)}{(I+wL)}.$$

Plugging in each individual’s wage, actual hours choice, and the virtual income implied by the budget constraint that they located on yields the income effects for the simulations. After choosing a compensated wage elasticity for the simulations, the uncompensated elasticity can be calculated as

[A5] $$\varepsilon_w = \varepsilon_c + w\frac{\partial h}{\partial I}$$

Then ρ can be found using [A3] as

[A6] $$\rho = \frac{IL - hI - \varepsilon_w(hI + hwL)}{\varepsilon_w(hI + hwL) + wh - wh^2}.$$

In this linear case, α can be solved for as

[A7] $$\alpha = \frac{\kappa w}{1 + \kappa w}$$

where

[A8] $$\kappa = \left[\frac{L - h}{I + wh}\right]^{\rho+1}.$$

Because, in general, labor supply elasticities depend on the particular budget constraint faced by an individual, the procedure above used a linear budget constraint so that the chosen compensated wage elasticity would represent a similar underlying responsiveness to changes in the net wage for each individual regardless of how close the person was to a kink point. However, calibrating preferences using this linear approach and then having the individuals optimize under the true budget constraint resulted in many individuals choosing levels of hours that placed them on a different segment of the budget constraint than their actual choice. Therefore, instead of using equation A7 to calibrate $\alpha$, I searched over values of $\alpha$ so as to match the true hours choice. Since neither the wage nor income elasticity depends on $\alpha$, this approach preserves the desired labor supply responsiveness, while matching the true hours distribution under the full non-linear 1998 budget constraint. However, for about 20 percent of individuals there was no value of $\alpha$ for which they would choose their actual level of hours. I dropped these observations from my simulations and reweighted the remaining observations to replicate the empirical distribution of EITC recicipients by EITC region. The dropped observations were people who located at places at which economic theory suggests they should not locate. For example, some people's true hours placed them at places where the marginal tax rate from the welfare system was 100 percent and others located very near the kink at the end of the EITC phaseout. It is unclear what the direction of bias is from dropping these observations. On the one hand these appear to be people who are not optimizing according to standard theory, and therefore may not be very responsive to incentives. On the other hand, theory would suggest that they should make large changes in location from where they are, and it is possible that small perturbations in the budget constraint would cause them to locate far from their current location. Most likely, these observations simply represent an incorrect specification of the budget constraint or underlying model, and there is no obvious reason that the bias from these sorts of errors would go in one direction or the other.

With this sample restriction, my simulations result in all sample members locating at their true hours choice under the current-law budget constraint and this is true for each compensated wage elasticity. The budget constraint includes the OASDI payroll tax, the federal income tax, the EITC, and a simplified approximation of the welfare system that provides a $6000 guarantee to a non-working household head and then taxes away the benefit at a 100 percent rate as income rises. A more sophisticated model would have higher total welfare benefits (taking into account food stamps as well as TANF), and would have marginal benefit reduction rates below 100 percent due to the various monthly income disregards that are taken into account in calculating benefit levels. The calibration of the parameter measuring fixed costs of working is described in the text.

Table 1
Impacts of Alternative Levels for the Maximum EITC: Head of Household Filers

| | Number of taxpayers (millions) | | | | | Dollars (millions) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage of current law maximum (1) | Zero annual hours (2) | In EITC phase-in (3) | In EITC flat region (4) | In EITC phase-out (5) | Beyond phaseout (6) | Total EITC payments (7) | Lost income tax revenue (8) | Additional welfare spending (9) | Net revenue Cost (10) | Welfare gain (MMEV) from EITC payments (11) | Cost per dollar's worth of utility gain (12) |
| Compensated Wage Elasticity of 0.1 | | | | | | | | | | | |
| 0 | 2.542 | 0.412 | 0.636 | 5.277 | 2.617 | 0 | 0 | 0 | 0 | 0 | NA |
| 50 | 2.025 | 0.980 | 1.270 | 4.592 | 2.617 | 7,242 | 1,013 | -1,905 | 6,350 | 6,432 | 0.99 |
| 100 | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,309 | -1,125 | 16,193 | 13,226 | 1.22 |
| 150 | 1.679 | 1.788 | 1.946 | 3.453 | 2.617 | 23,810 | 2,733 | -547 | 25,996 | 19,487 | 1.33 |
| 200 | 1.621 | 2.365 | 2.051 | 2.830 | 2.617 | 33,205 | 3,246 | -266 | 36,185 | 25,491 | 1.42 |
| Compensated Wage Elasticity of 0.3 | | | | | | | | | | | |
| 0 | 2.819 | 0.281 | 0.516 | 5.221 | 2.647 | 0 | 0 | 0 | 0 | 0 | NA |
| 50 | 1.929 | 1.120 | 1.570 | 4.249 | 2.617 | 7,022 | 1,176 | -3,056 | 5,141 | 5,746 | 0.89 |
| 100 | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,499 | -2,792 | 14,717 | 11,764 | 1.25 |
| 150 | 1.644 | 1.706 | 1.926 | 3.591 | 2.617 | 24,393 | 3,247 | -2,415 | 25,226 | 17,590 | 1.43 |
| 200 | 1.444 | 2.188 | 2.434 | 2.877 | 2.540 | 36,020 | 3,835 | -2,980 | 36,875 | 23,599 | 1.56 |
| Compensated Wage Elasticity of 0.5 | | | | | | | | | | | |
| 0 | 3.187 | 0.283 | 0.410 | 4.719 | 2.885 | 0 | 0 | 0 | 0 | 0 | NA |
| 50 | 1.942 | 1.271 | 1.587 | 3.945 | 2.738 | 6,633 | 1,230 | -4094 | 3,769 | 5,233 | 0.72 |
| 100 | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,762 | -4,972 | 12,799 | 11,033 | 1.16 |
| 150 | 1.550 | 1.631 | 2.101 | 3.704 | 2.498 | 25,809 | 3,752 | -5,350 | 24,211 | 17,904 | 1.35 |
| 200 | 1.482 | 1.817 | 2.679 | 3.257 | 2.249 | 38,311 | 5,029 | -5,335 | 38,005 | 25,983 | 1.46 |

Table 2
The Costs and Benefits of the EITC at Different Levels of the Maximum Credit: Head of Household Filers
(Compensated wage elasticity =0.3)

| Percentage of current law maximum | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\mu$=.05 | | | | $\mu$=.50 | | | | $\mu$=.95 | | | |
| | | | | | $\nu$=1 | | | | | | | |
| 50 | 1.34 | 0.86 | 5,746 | -2793 | 1.34 | 0.92 | 5,746 | -2436 | 1.34 | 0.99 | 5,746 | -2016 |
| 75 | 1.69 | 0.85 | 8,766 | -7406 | 1.69 | 0.91 | 8,766 | -6819 | 1.69 | 0.99 | 8,766 | -6132 |
| 100 | 1.88 | 0.83 | 11,764 | -12271 | 1.88 | 0.91 | 11,764 | -11426 | 1.88 | 0.99 | 11,764 | -10433 |
| 150 | 2.15 | 0.81 | 17,590 | -23596 | 2.15 | 0.89 | 17,590 | -22158 | 2.15 | 0.99 | 17,590 | -20457 |
| 200 | 2.34 | 0.79 | 23,599 | -36705 | 2.34 | 0.88 | 23,599 | -34571 | 2.34 | 0.99 | 23,599 | -32025 |
| | | | | | $\nu$=2 | | | | | | | |
| 50 | 1.34 | 1.71 | 5,746 | 2126 | 1.34 | 1.84 | 5,746 | 2840 | 1.34 | 1.98 | 5,746 | 3679 |
| 75 | 1.69 | 1.69 | 8,766 | 4 | 1.69 | 1.82 | 8,766 | 1176 | 1.69 | 1.98 | 8,766 | 2551 |
| 100 | 1.88 | 1.67 | 11,764 | -2467 | 1.88 | 1.81 | 11,764 | -776 | 1.88 | 1.98 | 11,764 | 1210 |
| 150 | 2.15 | 1.62 | 17,590 | -9354 | 2.15 | 1.78 | 17,590 | -6476 | 2.15 | 1.98 | 17,590 | -3074 |
| 200 | 2.34 | 1.58 | 23,599 | -18097 | 2.34 | 1.76 | 23,599 | -13830 | 2.34 | 1.97 | 23,599 | -8738 |
| | | | | | $\nu$=3 | | | | | | | |
| 50 | 1.34 | 2.57 | 5,746 | 7044 | 1.34 | 2.75 | 5,746 | 8116 | 1.34 | 2.97 | 5,746 | 9375 |
| 75 | 1.69 | 2.54 | 8,766 | 7413 | 1.69 | 2.74 | 8,766 | 9172 | 1.69 | 2.97 | 8,766 | 11234 |
| 100 | 1.88 | 2.50 | 11,764 | 7337 | 1.88 | 2.72 | 11,764 | 9874 | 1.88 | 2.97 | 11,764 | 12853 |
| 150 | 2.15 | 2.43 | 17,590 | 4889 | 2.15 | 2.67 | 17,590 | 9205 | 2.15 | 2.96 | 17,590 | 14308 |
| 200 | 2.34 | 2.37 | 23,599 | 511 | 2.34 | 2.64 | 23,599 | 6911 | 2.34 | 2.96 | 23,599 | 14550 |

Table 3
The Optimal Level of the EITC as a Percentage of the Current Level
for Different Levels of the Welfare Guarantee
(Compensated wage elasticity =0.3)

| | Welfare Guarantee = $3000 | | | Welfare Guarantee = $6000 | | | Welfare Guarantee = $9000 | | |
|---|---|---|---|---|---|---|---|---|---|
| < | | | | | | | | | |
| | π=.05 | π=.50 | π=.95 | π=.05 | π=.50 | π=.95 | π=.05 | π=.50 | π=.95 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 50 |
| 2 | 25 | 25 | 25 | 50 | 50 | 50 | 75 | 75 | 100 |
| 3 | 175 | 200+ | 200+ | 75 | 100 | 175 | 100 | 125 | 125 |
| 4 | 200+ | 200+ | 200+ | 175 | 200+ | 200+ | 125 | 150 | 200+ |

Table 4
Impacts of Alternative Phase-in Rates: Head of Household Filers

| | Number of taxpayers (millions) | | | | | Dollars (millions) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase-in subsidy rate (1) | Zero annual hours (2) | In EITC phase-in (3) | In EITC flat region (4) | In EITC phase-out (5) | Beyond phaseout (6) | Total EITC payments (7) | Lost income tax revenue (8) | Additional welfare spending (9) | Net revenue Cost (10) | Welfare gain (MMEV) from EITC payments (11) | Cost per dollar's worth of utility gain (12) |
| Compensated Wage Elasticity of 0.1 | | | | | | | | | | | |
| No EITC | 2.542 | 0.412 | 0.636 | 5.277 | 2.617 | 0 | 0 | 0 | 0 | 0 | NA |
| No Phase-in | 2.398 | 0.410 | 2.064 | 3.996 | 2.617 | 14,045 | 1,895 | -867 | 15,073 | 12,530 | 1.20 |
| 30 | 1.791 | 2.352 | 0.765 | 4.042 | 2.617 | 14,472 | 2,129 | -1,651 | 14,950 | 12,769 | 1.17 |
| Current law | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,309 | -1,125 | 16,193 | 13,226 | 1.22 |
| 60 | 1.703 | 1.366 | 1.839 | 3.959 | 2.617 | 15,273 | 2,293 | 128 | 17,694 | 13,432 | 1.32 |
| Compensated Wage Elasticity of 0.3 | | | | | | | | | | | |
| No EITC | 2.819 | 0.281 | 0.516 | 5.221 | 2.647 | 0 | 0 | 0 | 0 | 0 | NA |
| No Phase-in | 2.628 | 0.197 | 2.046 | 3.996 | 2.617 | 14,065 | 2,231 | -1,145 | 15,150 | 11,213 | 1.35 |
| 30 | 1.703 | 2.393 | 0.765 | 4.140 | 2.617 | 14,400 | 2,377 | -2,918 | 13,859 | 11,427 | 1.21 |
| Current law | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,499 | -2,792 | 14,717 | 11,764 | 1.25 |
| 60 | 1.703 | 1.452 | 1.753 | 3.959 | 2.617 | 15,490 | 2,502 | -1,679 | 16,313 | 12,106 | 1.35 |
| Compensated Wage Elasticity of 0.5 | | | | | | | | | | | |
| No EITC | 3.187 | 0.283 | 0.410 | 4.719 | 2.885 | 0 | 0 | 0 | 0 | 0 | NA |
| No Phase-in | 2.546 | 0 | 2.325 | 3.996 | 2.617 | 14,993 | 2,438 | -3,816 | 13,615 | 10,495 | 1.30 |
| 30 | 1.762 | 2.334 | 0.765 | 4.183 | 2.617 | 14,294 | 2,606 | -4,710 | 12,190 | 10,685 | 1.14 |
| Current law | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,762 | -4,972 | 12,799 | 11,033 | 1.16 |
| 60 | 1.703 | 1.737 | 1.467 | 3.959 | 2.617 | 15,557 | 2,767 | -3,443 | 14,880 | 11,566 | 1.29 |

Table 5
The Costs and Benefits of the EITC with Different Phase-in Rates: Head of Household Filers
(Compensated wage elasticity =0.3)

| Percentage of current law maximum | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\mu$=.05 | | | | $\mu$=.50 | | | | $\mu$=.95 | | | |
| | | | | | $\nu$=1 | | | | | | | |
| No Phase-in | 2.03 | 0.83 | 11,213 | -13442 | 2.03 | 0.90 | 11,213 | -12599 | 2.03 | 0.99 | 11,213 | -11613 |
| 30 | 1.82 | 0.83 | 11,427 | -11254 | 1.82 | 0.90 | 11,427 | -10416 | 1.82 | 0.99 | 11,427 | -9433 |
| Current law | 1.88 | 0.83 | 11,764 | -12293 | 1.88 | 0.91 | 11,764 | -11352 | 1.88 | 0.99 | 11,764 | -10432 |
| 60 | 2.03 | 0.84 | 12,106 | -14378 | 2.03 | 0.91 | 12,106 | -13528 | 2.03 | 0.99 | 12,106 | -12530 |
| | | | | | $\nu$=2 | | | | | | | |
| No Phase-in | 2.03 | 1.65 | 11,213 | -4178 | 2.03 | 1.80 | 11,213 | -2492 | 2.03 | 1.98 | 11,213 | -520 |
| 30 | 1.82 | 1.66 | 11,427 | -1769 | 1.82 | 1.81 | 11,427 | -91 | 1.82 | 1.98 | 11,427 | 1874 |
| Current law | 1.88 | 1.66 | 11,764 | -2529 | 1.88 | 1.82 | 11,764 | -647 | 1.88 | 1.98 | 11,764 | 1193 |
| 60 | 2.03 | 1.67 | 12,106 | -4242 | 2.03 | 1.82 | 12,106 | -2542 | 2.03 | 1.98 | 12,106 | -545 |
| | | | | | $\nu$=3 | | | | | | | |
| No Phase-in | 2.03 | 2.48 | 11,213 | 5086 | 2.03 | 2.70 | 11,213 | 7616 | 2.03 | 2.97 | 11,213 | 10573 |
| 30 | 1.82 | 2.49 | 11,427 | 7717 | 1.82 | 2.71 | 11,427 | 10233 | 1.82 | 2.97 | 11,427 | 13181 |
| Current law | 1.88 | 2.49 | 11,764 | 7235 | 1.88 | 2.73 | 11,764 | 10058 | 1.88 | 2.96 | 11,764 | 12818 |
| 60 | 2.03 | 2.51 | 12,106 | 5894 | 2.03 | 2.72 | 12,106 | 8444 | 2.03 | 2.97 | 12,106 | 11440 |

Table 6
Impacts of Alternative EITC Phase-out Rates: Head of Household Filers

| | Number of taxpayers (millions) | | | | | Dollars (millions) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Phaseout tax rate (1) | Zero annual hours (2) | In EITC phase-in (3) | In EITC flat region (4) | In EITC phase-out (5) | Beyond phaseout (6) | Total EITC payments (7) | Lost income tax revenue (8) | Additional welfare spending (9) | Net revenue Cost (10) | Welfare gain (MMEV) from EITC payments (11) | Cost per dollar's worth of utility gain (12) |
| Compensated Wage Elasticity of 0.1 | | | | | | | | | | | |
| No EITC | 2.542 | 0.412 | 0.636 | 5.277 | 2.617 | 0 | 0 | 0 | 0 | 0 | NA |
| .10 | 1.703 | 1.484 | 1.721 | 5.181 | 1.395 | 18,433 | 2,694 | -1,125 | 19,974 | 16,684 | 1.20 |
| Current law | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,309 | -1,125 | 16,193 | 13,226 | 1.22 |
| .30 | 1.703 | 1.484 | 1.760 | 2.822 | 3.715 | 12,738 | 1,974 | -1,125 | 13,560 | 10,752 | 1.26 |
| .40 | 1.703 | 1.484 | 1.760 | 2.005 | 4.532 | 11,470 | 1,767 | -1,125 | 12,084 | 9,374 | 1.29 |
| .50 | 1.703 | 1.484 | 1.763 | 1.621 | 4.913 | 10,849 | 1,680 | -1,125 | 11,376 | 8,551 | 1.33 |
| Compensated Wage Elasticity of 0.3 | | | | | | | | | | | |
| .10 | 1.698 | 1.484 | 1.721 | 5.187 | 1.395 | 18,373 | 2,858 | -2,824 | 18,407 | 15,409 | 1.19 |
| Current law | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,499 | -2,792 | 14,717 | 11,764 | 1.25 |
| .30 | 1.703 | 1.484 | 1.763 | 2.790 | 3.744 | 13,208 | 2,244 | -2,792 | 12,659 | 9,561 | 1.32 |
| .40 | 1.703 | 1.484 | 1.789 | 2.080 | 4.427 | 12,372 | 2,020 | -2,792 | 11,600 | 8,471 | 1.37 |
| .50 | 1.703 | 1.484 | 1.950 | 1.649 | 4.698 | 12,316 | 1,966 | -2,792 | 11,491 | 7,978 | 1.44 |
| Compensated Wage Elasticity of 0.5 | | | | | | | | | | | |
| .10 | 1.688 | 1.484 | 1.721 | 5.221 | 1.369 | 18,374 | 3,069 | -4,989 | 16,454 | 14,859 | 1.11 |
| Current law | 1.703 | 1.484 | 1.721 | 3.959 | 2.617 | 15,009 | 2,762 | -4,972 | 12,799 | 11,033 | 1.16 |
| .30 | 1.703 | 1.484 | 1.765 | 2.732 | 3.799 | 13,571 | 2,466 | -4,972 | 11,065 | 9,057 | 1.22 |
| .40 | 1.703 | 1.484 | 1.892 | 2.131 | 4.274 | 13,194 | 2,318 | -4,972 | 10,540 | 8,190 | 1.29 |
| .50 | 1.703 | 1.484 | 2.168 | 1.556 | 4.573 | 13,002 | 2,115 | -4,972 | 10,145 | 7,866 | 1.29 |

Table 7
The Costs and Benefits of the EITC with Different Phase-out Rates: Head of Household Filers
(Compensated wage elasticity =0.3)

| Phaseout tax rate | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | μ=.05 | | | | μ=.50 | | | | μ=.95 | | | |
| | | | | | ν=1 | | | | | | | |
| .10 | 1.79 | 0.79 | 15,409 | -15,387 | 1.79 | 0.88 | 15,409 | -13,990 | 1.79 | 0.99 | 15,409 | -12,304 |
| Current | 1.88 | 0.83 | 11,764 | -12,293 | 1.88 | 0.91 | 11,764 | -11,352 | 1.88 | 0.99 | 11,764 | -10,411 |
| .30 | 1.98 | 0.87 | 9,561 | -10,600 | 1.98 | 0.93 | 9,561 | -10,063 | 1.98 | 0.99 | 9,561 | -9,444 |
| .40 | 2.06 | 0.90 | 8,471 | -9,809 | 2.06 | 0.94 | 8,471 | -9,425 | 2.06 | 0.99 | 8,471 | -8,989 |
| .50 | 2.16 | 0.91 | 7,978 | -9,978 | 2.16 | 0.95 | 7,978 | -9,658 | 2.16 | 0.99 | 7,978 | -9,298 |
| | | | | | ν=2 | | | | | | | |
| .10 | 1.79 | 1.57 | 15,409 | -3,270 | 1.79 | 1.75 | 15,409 | -475 | 1.79 | 1.97 | 15,409 | 2,897 |
| Current | 1.88 | 1.66 | 11,764 | -2,529 | 1.88 | 1.82 | 11,764 | -647 | 1.88 | 1.98 | 11,764 | 1,235 |
| .30 | 1.98 | 1.74 | 9,561 | -2,270 | 1.98 | 1.86 | 9,561 | -1,195 | 1.98 | 1.98 | 9,561 | 42 |
| .40 | 2.06 | 1.79 | 8,471 | -2,209 | 2.06 | 1.88 | 8,471 | -1,442 | 2.06 | 1.99 | 8,471 | -569 |
| .50 | 2.16 | 1.82 | 7,978 | -2,724 | 2.16 | 1.90 | 7,978 | -2,084 | 2.16 | 1.99 | 7,978 | -1,363 |
| | | | | | ν=3 | | | | | | | |
| .10 | 1.79 | 2.36 | 15,409 | 8,848 | 1.79 | 2.63 | 15,409 | 13,041 | 1.79 | 2.96 | 15,409 | 18,098 |
| Current | 1.88 | 2.49 | 11,764 | 7,235 | 1.88 | 2.73 | 11,764 | 10,058 | 1.88 | 2.97 | 11,764 | 12,882 |
| .30 | 1.98 | 2.61 | 9,561 | 6,061 | 1.98 | 2.78 | 9,561 | 7,673 | 1.98 | 2.98 | 9,561 | 9,528 |
| .40 | 2.06 | 2.69 | 8,471 | 5,390 | 2.06 | 2.83 | 8,471 | 6,541 | 2.06 | 2.98 | 8,471 | 7,850 |
| .50 | 2.16 | 2.73 | 7,978 | 4,531 | 2.16 | 2.85 | 7,978 | 5,490 | 2.16 | 2.98 | 7,978 | 6,572 |

Table 8

The Optimal EITC for Head of Household Filers: Varying All Four Parameters at Once

| | ν=1 | | | ν=2 | | | ν=3 | | | ν=4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | μ=.05 | μ=.50 | μ=.95 | μ=.05 | μ=.50 | μ=.95 | μ=.05 | μ=.50 | μ=.95 | μ=.05 | μ=.50 | μ=.95 |
| | Compensated Wage Elasticity =0.1 | | | | | | | | | | | |
| Phase-in subsidy rate | .15 | .15 | .15 | .30 | .15 | .30 | .30 | .30 | .45 | .45 | .45 | .45 |
| Maximum credit (% of current level) | 25 | 25 | 25 | 50 | 50 | 200 | 125 | 200 | 200 | 200 | 200 | 200 |
| Length of plateau | 0 | 0 | 0 | 0 | 0 | 9000 | 6000 | 9000 | 9000 | 9000 | 9000 | 9000 |
| Phase-out tax rate | cliff | cliff | cliff | cliff | .20 | .10 | .50 | .10 | .10 | .20 | .10 | .10 |
| | Compensated Wage Elasticity=0.3 | | | | | | | | | | | |
| Phase-in subsidy rate | .15 | .15 | .15 | .15 | .15 | .15 | .30 | .30 | .30 | .30 | .45 | .45 |
| Maximum credit (% of current level) | 25 | 25 | 25 | 50 | 25 | 200 | 150 | 200 | 200 | 200 | 200 | 200 |
| Length of plateau | 1500 | 1500 | 1500 | 0 | 9000 | 9000 | 6000 | 9000 | 9000 | 9000 | 9000 | 9000 |
| Phase-out tax rate | .40 | .40 | .40 | .10 | .10 | .10 | .10 | .10 | .10 | .10 | .10 | .10 |
| | Compensated Wage Elasticity=0.5 | | | | | | | | | | | |
| Phase-in subsidy rate | .15 | .15 | .15 | .15 | .15 | .15 | .30 | .45 | .45 | .45 | .45 | .45 |
| Maximum credit (% of current level) | 25 | 25 | 25 | 25 | 50 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Length of plateau | 3000 | 3000 | 3000 | 6000 | 0 | 9000 | 9000 | 9000 | 9000 | 9000 | 9000 | 9000 |
| Phase-out tax rate | .10 | .10 | .10 | .40 | .10 | .10 | .10 | .10 | .10 | .10 | .10 | .10 |

Table 9
Impacts of Alternative Levels for the Maximum EITC: Married Filers

| | | Number of taxpayers (millions) | | | | Dollars (millions) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage of current law maximum (1) | Labor Force Partic. Rate of Second Earner (2 | In EITC phase-in (3) | In EITC flat region (4) | In EITC phase-out (5) | Beyond phaseout (6) | Total EITC payments (7) | Lost income tax revenue (8) | Additional welfare spending (9) | Net revenue Cost (10) | Welfare gain (MMEV) from EITC payments (11) | Cost per dollar's worth of utility gain (12) |
| Compensated Wage Elasticity of 0.1 | | | | | | | | | | | |
| 0 | 0.772 | 0.619 | 0.418 | 4.512 | 14.078 | 0 | 0 | 0 | 0 | 0 | NA |
| 50 | 0.760 | 0.558 | 0.630 | 4.420 | 14.018 | 5,350 | 694 | 0 | 6,044 | 5,287 | 1.14 |
| 100 | 0.754 | 0.591 | 0.874 | 4.200 | 13.906 | 11,447 | 1,297 | 0 | 12,744 | 11,179 | 1.14 |
| 150 | 0.696 | 0.633 | 1.285 | 3.906 | 13.802 | 19,844 | 2,191 | 0 | 22,035 | 18,193 | 1.21 |
| 200 | 0.656 | 0.717 | 1.577 | 3.708 | 13.624 | 29,645 | 3,106 | 0 | 32,751 | 27,062 | 1.21 |
| Compensated Wage Elasticity of 0.3 | | | | | | | | | | | |
| 0 | 0.784 | 0.64 | 0.421 | 4.274 | 14.236 | 0 | 0 | 0 | 0 | 0 | NA |
| 50 | 0.772 | 0.531 | 0.597 | 4.397 | 14.047 | 5,096 | 772 | 0 | 5,868 | 5,009 | 1.17 |
| 100 | 0.754 | 0.591 | 0.874 | 4.200 | 13.906 | 11,447 | 2,062 | 0 | 13,509 | 10,825 | 1.25 |
| 150 | 0.713 | 0.635 | 1.142 | 4.051 | 13.743 | 19,359 | 2,909 | 0 | 22,267 | 17,947 | 1.24 |
| 200 | 0.663 | 0.652 | 1.427 | 4.049 | 13.443 | 29,001 | 3,757 | 0 | 32,758 | 26,084 | 1.26 |
| Compensated Wage Elasticity of 0.5 | | | | | | | | | | | |
| 0 | 0.796 | | 0.383 | 4.377 | 14.232 | 0 | 0 | 0 | 0 | 0 | NA |
| 50 | 0.779 | 0.595 | 0.590 | 4.257 | 14.131 | 4,950 | 880 | 0 | 5,831 | 4,739 | 1.23 |
| 100 | 0.754 | 0.591 | 0.874 | 4.200 | 13.906 | 11,447 | 2,296 | 0 | 13,743 | 10,447 | 1.32 |
| 150 | 0.684 | 0.714 | 1.254 | 4.192 | 13.413 | 20,972 | 3,795 | 0 | 24,767 | 18,210 | 1.36 |
| 200 | 0.646 | 0.731 | 1.456 | 4.339 | 13.049 | 31,168 | 5,816 | 0 | 36,983 | 26,734 | 1.38 |

Table 10
The Costs and Benefits of the EITC at Different Levels of the Maximum Credit: Married Filers
(Compensated wage elasticity =0.3)

| Percentage of current law maximum | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | μ=.05 | | | | μ=.50 | | | | μ=.95 | | | |
| | | | | | ν=1 | | | | | | | |
| 50 | 1.76 | 0.80 | 5,009 | -4787 | 1.76 | 0.83 | 5,009 | -4613 | 1.76 | 0.98 | 5,009 | -3888 |
| 75 | 1.87 | 0.79 | 7,733 | -8370 | 1.87 | 0.82 | 7,733 | -8097 | 1.87 | 0.98 | 7,733 | -6911 |
| 100 | 1.88 | 0.78 | 10,825 | -11905 | 1.88 | 0.82 | 10,825 | -11456 | 1.88 | 0.98 | 10,825 | -9721 |
| 150 | 1.86 | 0.74 | 17,947 | -20115 | 1.86 | 0.80 | 17,947 | -19110 | 1.86 | 0.97 | 17,947 | -15890 |
| 200 | 1.89 | 0.71 | 26,084 | -30810 | 1.89 | 0.78 | 26,084 | -29026 | 1.89 | 0.97 | 26,084 | -23932 |
| | | | | | ν=2 | | | | | | | |
| 50 | 1.76 | 1.60 | 5,009 | -783 | 1.76 | 1.67 | 5,009 | -436 | 1.76 | 1.96 | 5,009 | 1015 |
| 75 | 1.87 | 1.58 | 7,733 | -2268 | 1.87 | 1.65 | 7,733 | -1722 | 1.87 | 1.96 | 7,733 | 651 |
| 100 | 1.88 | 1.55 | 10,825 | -3514 | 1.88 | 1.63 | 10,825 | -2615 | 1.88 | 1.95 | 10,825 | 855 |
| 150 | 1.86 | 1.48 | 17,947 | -6849 | 1.86 | 1.59 | 17,947 | -4839 | 1.86 | 1.95 | 17,947 | 1601 |
| 200 | 1.89 | 1.42 | 26,084 | -12322 | 1.89 | 1.55 | 26,084 | -8754 | 1.89 | 1.95 | 26,084 | 1435 |
| | | | | | ν=3 | | | | | | | |
| 50 | 1.76 | 2.40 | 5,009 | 3220 | 1.76 | 2.50 | 5,009 | 3742 | 1.76 | 2.94 | 5,009 | 5918 |
| 75 | 1.87 | 2.37 | 7,733 | 3834 | 1.87 | 2.47 | 7,733 | 4653 | 1.87 | 2.93 | 7,733 | 8212 |
| 100 | 1.88 | 2.33 | 10,825 | 4878 | 1.88 | 2.45 | 10,825 | 6225 | 1.88 | 2.93 | 10,825 | 11431 |
| 150 | 1.86 | 2.22 | 17,947 | 6418 | 1.86 | 2.39 | 17,947 | 9433 | 1.86 | 2.92 | 17,947 | 19092 |
| 200 | 1.89 | 2.13 | 26,084 | 6166 | 1.89 | 2.33 | 26,084 | 11519 | 1.89 | 2.92 | 26,084 | 26801 |

Table 11
Impacts of Alternative Phaseout Tax Rates: Married Filers

| Percentage of current law maximum (1) | Labor Force Partic. Rate of Second Earner (2 | Number of taxpayers (millions): In EITC phase-in (3) | In EITC flat region (4) | In EITC phase-out (5) | Beyond phaseout (6) | Dollars (millions): Total EITC payments (7) | Lost income tax revenue (8) | Additional welfare spending (9) | Net revenue Cost (10) | Welfare gain (MMEV) from EITC payments (11) | Cost per dollar's worth of utility gain (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Compensated Wage Elasticity of 0.1 | | | | | | | | | | | |
| .10 | 0.721 | 0.588 | 0.940 | 7.820 | 10.278 | 19,450 | 3,308 | 0 | 22,758 | 18,815 | 1.21 |
| Current | 0.754 | 0.591 | 0.874 | 4.200 | 13.906 | 11,447 | 1,297 | 0 | 12,744 | 11,179 | 1.14 |
| .30 | 0.746 | 0.588 | 1.007 | 2.581 | 15.450 | 9,101 | 994 | 0 | 10,095 | 8,462 | 1.19 |
| .40 | 0.745 | 0.588 | 1.030 | 1.716 | 16.283 | 7,656 | 852 | 0 | 8,509 | 7,038 | 1.21 |
| .50 | 0.746 | 0.588 | 1.030 | 1.048 | 16.951 | 6,875 | 788 | 0 | 7,663 | 6,330 | 1.21 |
| Compensated Wage Elasticity of 0.3 | | | | | | | | | | | |
| .10 | 0.714 | 0.591 | 0.795 | 7.955 | 10.231 | 19,493 | 4,604 | 0 | 24,097 | 19,033 | 1.27 |
| Current | 0.754 | 0.591 | 0.874 | 4.200 | 13.906 | 11,447 | 2,062 | 0 | 13,509 | 10,825 | 1.25 |
| .30 | 0.762 | 0.591 | 0.885 | 2.600 | 15.496 | 8,695 | 1,460 | 0 | 10,155 | 8,071 | 1.26 |
| .40 | 0.763 | 0.591 | 0.885 | 1.744 | 16.304 | 7,223 | 1,311 | 0 | 8,534 | 6,622 | 1.29 |
| .50 | 0.765 | 0.591 | 0.934 | 1.165 | 16.834 | 6,591 | 775 | 0 | 7,366 | 5,897 | 1.25 |
| Compensated Wage Elasticity of 0.5 | | | | | | | | | | | |
| .10 | 0.702 | 0.602 | 0.819 | 8.307 | 9.846 | 20,007 | 5,589 | 0 | 25,659 | 18,995 | 1.35 |
| Current | 0.754 | 0.591 | 0.874 | 4.200 | 13.906 | 11,447 | 2,296 | 0 | 13,743 | 10,447 | 1.32 |
| .30 | 0.766 | 0.602 | 0.896 | 2.579 | 15.480 | 8,826 | 1,359 | 0 | 10,185 | 7,600 | 1.34 |
| .40 | 0.769 | 0.602 | 0.940 | 1.642 | 16.373 | 7,308 | 1,054 | 0 | 8,362 | 6,158 | 1.36 |
| .50 | 0.767 | 0.602 | 1.012 | 1.004 | 16.894 | 6,837 | 813 | 0 | 7,650 | 5,492 | 1.39 |

Table 12
The Costs and Benefits of the EITC with Different Phase-out Rates: Married Taxpayers
(Compensated wage elasticity =0.3)

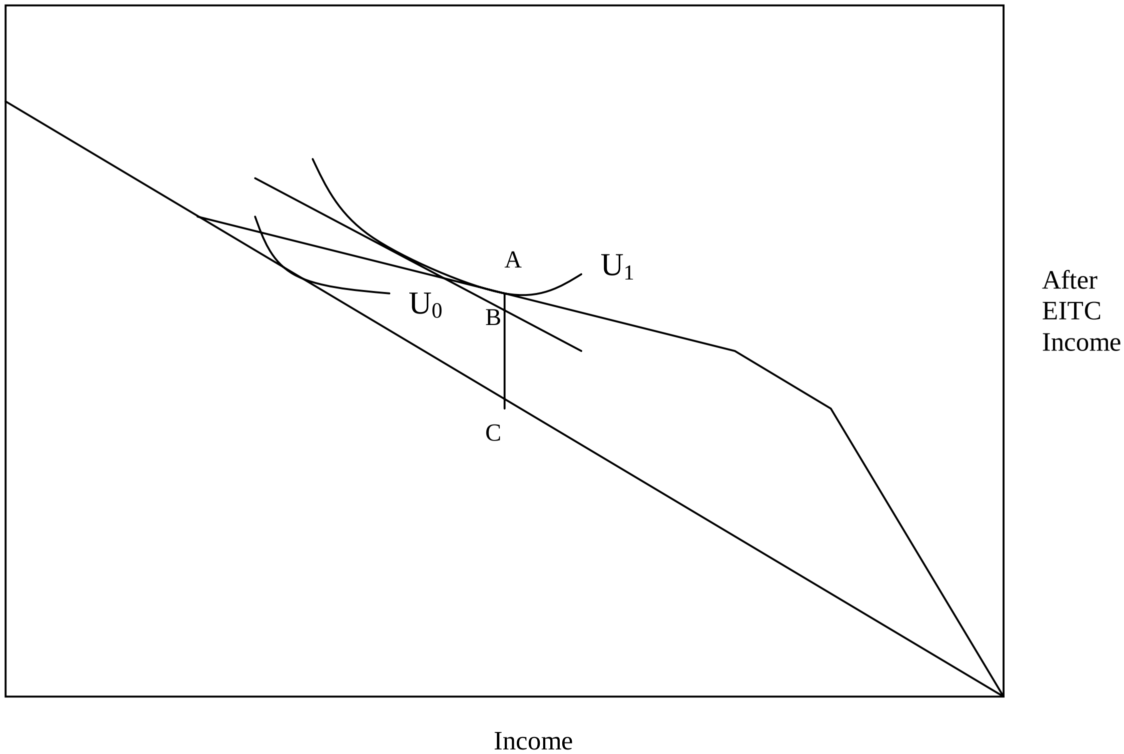
| Phaseout tax rate | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions | cost per dollar of utility | benefit per dollar of utility | mmev (mil.) | net benefits (millions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | μ=.05 | | | | μ=.50 | | | | μ=.95 | | | |
| | | | | | ν=1 | | | | | | | |
| .10 | 1.91 | 0.60 | 19,033 | -24819 | 1.91 | 0.71 | 19,033 | -22811 | 1.91 | 0.96 | 19,033 | -17939 |
| Current | 1.88 | 0.78 | 10,825 | -11853 | 1.88 | 0.82 | 10,825 | -11420 | 1.88 | 0.98 | 10,825 | -9688.4 |
| .30 | 1.89 | 0.84 | 8,071 | -8472.9 | 1.89 | 0.87 | 8,071 | -8270 | 1.89 | 0.98 | 8,071 | -7320.4 |
| .40 | 1.94 | 0.86 | 6,622 | -7087.5 | 1.94 | 0.90 | 6,622 | -6882 | 1.94 | 0.99 | 6,622 | -6279.6 |
| .50 | 1.88 | 0.91 | 5,897 | -5710.7 | 1.88 | 0.92 | 5,897 | -5638 | 1.88 | 0.99 | 5,897 | -5223 |
| | | | | | ν=2 | | | | | | | |
| .10 | 1.91 | 1.20 | 19,033 | -13380 | 1.91 | 1.41 | 19,033 | -9364 | 1.91 | 1.93 | 19,033 | 380.66 |
| Current | 1.88 | 1.56 | 10,825 | -3409.9 | 1.88 | 1.64 | 10,825 | -2544 | 1.88 | 1.96 | 10,825 | 920.125 |
| .30 | 1.89 | 1.68 | 8,071 | -1691.7 | 1.89 | 1.73 | 8,071 | -1287 | 1.89 | 1.97 | 8,071 | 613.396 |
| .40 | 1.94 | 1.73 | 6,622 | -1361.5 | 1.94 | 1.79 | 6,622 | -949.6 | 1.94 | 1.97 | 6,622 | 254.285 |
| .50 | 1.88 | 1.81 | 5,897 | -364.43 | 1.88 | 1.84 | 5,897 | -219.4 | 1.88 | 1.98 | 5,897 | 610.929 |
| | | | | | ν=3 | | | | | | | |
| .10 | 1.91 | 1.80 | 19,033 | -1941.4 | 1.91 | 2.07 | 19,033 | 3140.4 | 1.91 | 2.89 | 19,033 | 18699.9 |
| Current | 1.88 | 2.34 | 10,825 | 5033.63 | 1.88 | 2.46 | 10,825 | 6332.6 | 1.88 | 2.94 | 10,825 | 11528.6 |
| .30 | 1.89 | 2.52 | 8,071 | 5089.57 | 1.89 | 2.60 | 8,071 | 5697.3 | 1.89 | 2.95 | 8,071 | 8547.19 |
| .40 | 1.94 | 2.59 | 6,622 | 4364.56 | 1.94 | 2.69 | 6,622 | 4982.4 | 1.94 | 2.96 | 6,622 | 6788.21 |
| .50 | 1.88 | 2.72 | 5,897 | 4981.79 | 1.88 | 2.76 | 5,897 | 5199.4 | 1.88 | 2.97 | 5,897 | 6444.83 |

Table 13

The Optimal EITC for Married Filers: Varying All Four Parameters at Once

| | $\nu=1$ | | | $\nu=2$ | | | $\nu=3$ | | | $\nu=4$ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\mu=.05$ | $\mu=.50$ | $\mu=.95$ | $\mu=.05$ | $\mu=.50$ | $\mu=.95$ | $\mu=.05$ | $\mu=.50$ | $\mu=.95$ | $\mu=.05$ | $\mu=.50$ | $\mu=.95$ |
| | Compensated Wage Elasticity =0.1 | | | | | | | | | | | |
| Phase-in subsidy rate | .60 | NA | NA | .75 | 1.00 | .60 | 1.00 | 0.75 | .30 | 1.00 | 1.00 | .30 |
| Maximum credit (% of current level) | 50 | 0 | 0 | 200 | 75 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Length of plateau | 3000 | NA | NA | 3000 | 9000 | 9000 | 6000 | 9000 | 9000 | 6000 | 9000 | 9000 |
| Phase-out tax rate | cliff | NA | NA | cliff | cliff | cliff | cliff | cliff | .10 | cliff | .30 | .10 |
| | Compensated Wage Elasticity=0.3 | | | | | | | | | | | |
| Phase-in subsidy rate | 1.00 | .75 | .75 | 1.00 | .60 | .60 | 1.00 | .60 | .30 | 1.00 | 1.00 | .30 |
| Maximum credit (% of current level) | 50 | 25 | 25 | 200 | 50 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Length of plateau | 0 | 0 | 0 | 1500 | 9000 | 9000 | 6000 | 9000 | 9000 | 9000 | 9000 | 9000 |
| Phase-out tax rate | .50 | .50 | .50 | cliff | cliff | cliff | cliff | cliff | .10 | cliff | .20 | .10 |
| | Compensated Wage Elasticity=0.5 | | | | | | | | | | | |
| Phase-in subsidy rate | .60 | .75 | .75 | 1.00 | 1.00 | .60 | 1.00 | 1.00 | .30 | 1.00 | .60 | .30 |
| Maximum credit (% of current level) | 25 | 25 | 25 | 200 | 100 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Length of plateau | 0 | 0 | 0 | 0 | 1500 | 9000 | 6000 | 9000 | 9000 | 9000 | 9000 | 9000 |
| Phase-out tax rate | .20 | .50 | .50 | cliff | .30 | cliff | cliff | cliff | .10 | cliff | cliff | .10 |

Figure I
Dollar Measure of Welfare Gain from EITC




MMEV=BC
EITC=AC
DWL=AB