Kevin P. Baier

*The Effect of the ARRA EITC Expansion on Social Mobility Spending Between EITC Recipients With and Without At Least Three EITC Eligible Dependents*

University of Maryland, Baltimore County

ECPA Capstone

Department: Public Policy

Chair: Dr. Dennis Coates

Table of Contents

[I. Abstract 3](#_Toc450735700)

[II. Introduction & Motivation 4](#_Toc450735701)

[III. Literature Review 8](#_Toc450735702)

[a. Effectiveness of ARRA Tax Policies Generally 8](#_Toc450735703)

[b. Tax Rebates’ & Credits’ General Effects 11](#_Toc450735704)

[c. Effects of Expansions of the Earned Income Tax Credit 14](#_Toc450735705)

[IV. Research Questions and Hypotheses 18](#_Toc450735706)

[a. Introduction 18](#_Toc450735707)

[b. The Expansion of the EITC 20](#_Toc450735708)

[V. Research Design and Methodology 22](#_Toc450735710)

[a. Data 22](#_Toc450735711)

[1. Summary 22](#_Toc450735712)

[2. Sampling Procedures 23](#_Toc450735713)

[3. Collection and Processing 25](#_Toc450735714)

[4. Top-Coding 26](#_Toc450735715)

[b. Operationalization of Research Questions and Hypotheses 27](#_Toc450735716)

[c. Measurement and Statistical Techniques 31](#_Toc450735717)

[1. The Expansion of the EITC 31](#_Toc450735718)

[2. Other Explanatory Variables 34](#_Toc450735719)

[3. General Model Equation 39](#_Toc450735720)

[4. Tests for Robustness 39](#_Toc450735721)

[VI. Results and Outcomes 41](#_Toc450735722)

[a. Summary Statistics 41](#_Toc450735723)

[b. Baseline Regression Results 43](#_Toc450735724)

[c. Robustness Checks 48](#_Toc450735725)

[d. Sensitivity Analysis 53](#_Toc450735726)

[VII. Discussion 56](#_Toc450735728)

[a. Policy Implications 56](#_Toc450735729)

[b. Issues for Future Research 57](#_Toc450735730)

[VIII. Conclusion 58](#_Toc450735731)

[IX. Bibliography 60](#_Toc450735732)

# Abstract

In February 2009, Congress enacted and the President executed the American Recovery and Reinvestment Act (ARRA) also known as the “stimulus package”. The bill provided 12 major tax provisions intended for individuals which included provisions expanding the earned income tax credit (EITC) (U.S. Internal Revenue Service, 2016). The major expansion of the EITC by ARRA was adding in a new credit category: recipients with three or more eligible dependents now receive the credit at different levels than before when the maximum credit amounts were based on having two or more eligible dependents. This paper to assesses the distributional impact of this expansion with the main question of interest being whether this expansion of the EITC had a significant positive effect on social mobility expenditures for EITC recipients with three or more eligible dependents as compared to recipients with two or fewer eligible dependents. Individual level data from consumer units in the Consumer Expenditures Survey (CES) was used from November 2009 to July 2010. Regression techniques that properly controlled for censored dependent variable values were used. Results show that the EITC expansion had a marginal propensity to consume (MPC) on social mobility expenditures of -0.062 to 0.324, though not all estimates were statistically significant. Furthermore, the EITC for all recipients had a statistically significant MPC of 0.001 to 0.002 for social mobility expenditures. This paper will be organized as follows: section II will be an introduction to and motivation for the issue being studied; section III will discuss the principal scholarly literature related to the topic; section IV will outline the major research questions and hypotheses; section IV will discuss the data used for the analyses; section V will review the methodologies and models to be used for the analyses; section VI will provide the results; section VII will discuss the results and their implications; and section VIII will provide some concluding remarks.

# Introduction & Motivation

The American Recovery and Reinvestment Act (ARRA) was a $787 billion bill intended to boost economic output through a combination of expansionary spending and tax policies. The bill provided 12 major tax provisions intended for individuals which included provisions expanding the earned income tax credit (EITC).

Enacted in 1975, the Earned Income Tax Credit (EITC) is a refundable tax credit to help working individuals and families, particularly those with children, who have low to moderate incomes. It was structured to require recipients have earned income to combat the disincentive to work from a traditional negative income tax and spur labor supply decisions. Generally, the tax credit phases in slowly, has a moderate-length plateau, and phases out slower than it phased in. The ARRA increased the maximum credit amount for taxpayers with three or more qualifying dependents ($5,657 in tax year 2009) and increased the beginning point of the phase-out range of the credit for all joint return filing married couples regardless of the number of eligible dependents (U.S. Internal Revenue Service, 2016).

For tax year 2009, the phase-out for the credit begins at $21,450 for married couples filing a joint return with eligible dependents and completely phases out at $40,463 for couples with one eligible dependent, $45,295 for couples with two eligible dependents, and $48,279 for couples with three or more eligible dependents. For married couples with no eligible dependents, the credit begins to phase out at $12,500 and completely phases out at $18,440 (U.S. Internal Revenue Service, 2016). These changes were initially only for tax years 2009 and 2010 but were extended to tax years 2011 and 2012 by The Tax Relief and Job Creation Act of 2010 and further extended through tax year 2017 by The American Taxpayer Relief Act of 2012. Individuals and families claim the EITC when filing their tax returns each year.

This expansion has the potential to increase economic output by increasing consumption spending and increasing disposable income generally. While this expansion increases overall purchasing power, it is not certain that it will increase consumption spending above and beyond what individuals and households were already planning to spend. According to the Congressional Budget Office (2015), the expansion of the EITC had an estimated multiplier effect on economic output of 0.3 to 1.5. Given the range of this estimate, this multiplier effect does not cement whether this EITC expansion significantly increased consumption spending beyond what would have been otherwise.

Furthermore, it’s uncertain that these tax policies will have homogenous effects across different populations, income levels, geographic regions, etc. CBO (2015) notes that after reviewing the responses of households it found that one-time payments were less likely to have an impact on household consumption because the payments will have a smaller effect on total long-term disposable income. However, CBO also found that increases in disposable income are likely to boost household consumption for lower-income households as compared to higher-income households due to lower-income households’ inability to borrow to smooth consumption. Possible heterogeneities in effects for different groups, such as groups living in poverty, affect the success and outcome of any expansionary fiscal policy.

Prior to the passage of the ARRA, then-Senator John Kerry gave a speech to the Senate body in favor of increasing the EITC with the Strengthen the Earned Income Tax Credit Act of 2009 in order to lift more families out of poverty (U.S. Congress, 2009). Senator Kerry, citing President Ronald Reagan, said, “…the EITC [is] ‘the best anti-poverty…measure to come out of Congress,’” (U.S. Congress, 2009: S172). Furthermore, Senator Kerry cites a Center on Budget and Policy Priorities study that found the EITC eliminates poverty for children more than any other government program. The senator suggests what later becomes part of the ARRA EITC expansion: creating a new credit category for earners with three or more children. Regarding the expansion, Senator Kerry says, “One of the purposes of the EITC is to lift families above the poverty level. Because the EITC adjustment for family size is limited to two children, over time large families will not be kept above the poverty threshold,” (U.S. Congress, 2009: S172). Given that Senator Kerry was speaking in support of the eventual ARRA EITC expansion in order to combat poverty, this cash-windfall policy should cause positive changes in anti-poverty spending.

Based on the work of Steuerle (2012), anti-poverty spending, or social mobility spending, is composed of personal expenditures related to homeownership, savings and investment financial products, education and training, and entrepreneurial opportunities. Although not all EITC recipients are technically in poverty, the eligibility criteria dictate that even the highest-earning recipients are still relatively low-income families. Thus, if the EITC expansion caused no exogenous change in related expenditures, then there is evidence that EITC simply lessens the burden of being poor rather than actively reducing poverty and promoting upward social mobility. The main reason to study the expansion of the EITC is to learn spending behaviors of recipients to determine what effect the EITC has on spending on certain goods: in this case, social mobility goods. Ancillary to that, it is also important to study this expansion in order to learn the spending behaviors of two sub-groups of EITC recipients: those with three or more children and those with two or fewer children. Doing so provides another evaluation of the effect the EITC has on spending on certain social mobility goods. Larger families may be normally limited by childcare costs to make meaningful social mobility expenditures. Thus, looking at how the EITC affects their related spending behaviors is important for understanding social mobility of larger lower-income families. From a paternalistic policy view, policymakers, as indicated by Senator Kerry’s remarks mentioned above, want to know that public money is being spent on meritorious goods. Evidence suggesting that the EITC has a significant effect on social mobility demonstrates the general effectiveness and worthiness as expansionary fiscal policy while also demonstrating the anti-poverty value inherent to the tax credit. Evidence to the contrary suggests that in its current form the EITC is doing little to combat poverty and promote upward social mobility.

Policymakers have many options of anti-poverty fiscal policy and should have research to guide their decisions in order to pick the most effective one. Enacting a policy with overall positive effects and with distributional positive effects to groups most needing them should be the twin goals guiding policymakers. Given that the introduction of the new EITC category acts as a natural experiment, if EITC recipients with three or fewer children demonstrate statistically insignificant social mobility spending caused by the EITC as compared to recipients with two or fewer children, this suggests to policymakers that the cost of raising more children even when combined with EITC stunts upward social mobility for the poorer segments of our society. If the results are statistically significant but practically insignificant, this suggests to policymakers that the marginal effect of the new three-children category of the EITC on social mobility spending is low. To conclude, this research is important because it provides evidence on EITC recipients’ spending behaviors, on purchases made with EITC funds, such as social mobility goods, and on the general effectiveness of the EITC in promoting upward social mobility. The next section will discuss the previous literature related to the themes of this research.

# Literature Review

## Effectiveness of ARRA Tax Policies Generally

Although discussed briefly above, this section will examine the effectiveness of ARRA’s tax policies on national output. Most of the research focuses on the policy generally rather than the individual parts. When possible, this section will discuss what other authors have found regarding the EITC expansion directly. Otherwise, this section will discuss the previous research on ARRA tax policies generally to frame expectations regarding the effectiveness of the EITC expansion studied in this paper.

Romer and Bernstein (2009) released the first report concerning ARRA prior to President Obama’s inauguration. They estimated output multipliers using the Federal Reserve’s FRB/US model as well as leading private-sector forecast models, such as Macroeconomic Advisers. One of their major model assumptions was that households treated any tax credit or rebate as permanent in determining their short-run spending. Romer’s and Bernstein’s estimates of ARRA tax policy multipliers were 0.43 in 2009 and 0.85 in 2010.[[1]](#footnote-2) Assuming that multiplier values of less than one demonstrate decreasing returns (i.e. for every government expenditure dollar spent, new output generated is less than one dollar), multiplier values of one demonstrate constant returns, and multiplier values of greater than one demonstrate increasing returns, these results demonstrate that ARRA tax policies had a positive effect on output, albeit smaller than theoretically desired. While this lacks the precision of studying the EITC expansion directly, it provides a useful benchmark of the ARRA overall.

The Congressional Budget Office has conducted an updated evaluation of ARRA component multipliers. As outlined in the introduction, the expansion of the EITC had an estimated multiplier effect on economic output of 0.3 to 1.5 (U.S. Congressional Budget Office, 2015). Other findings included one-time payments were less likely to have an impact on household consumption because the payments will have a smaller effect on total long-term disposable income; and, increases in disposable income are likely to boost household consumption for lower-income households as compared to higher-income households due to lower-income households’ inability to borrow to smooth consumption (U.S. Congressional Budget Office, 2015).

One possible concern with a large increase in government spending is the possibility of higher interest rates due to crowding-out of loanable funds. CBO notes that such crowding out can discourage consumption spending on durable goods and other goods related to social mobility (e.g. cars). However, the Federal Reserve’s policies of extremely low interest rates made this an irrelevant concern when examining the effectiveness of ARRA in the years of its implementation (Congressional Budget Office, 2015).

Adams and Gangnes (2010) found similar results to the CBO in regards to the multiplier effect of personal tax policies in ARRA. To estimate the multiplier effect of the component tax policies of ARRA, they used a policy simulation of an approximate 1 percentage point reduction in the effective average Federal personal income tax rate.[[2]](#footnote-3) Adams and Gangnes found that the change in personal tax policies in ARRA should have an estimated multiplier effect on economic output of 0.6 in 2009 and 1.1 in 2010.

Zandi and Blinder (2010) use the Moody’s Analytics model of the U.S. economy to measure how different types of tax cuts will stimulate the economy. The authors created a “bang for the buck measure” (Zandi and Blinder, 2010: 16) which is estimated by the one-year dollar change in GDP for a given dollar reduction in federal tax revenue. For refundable lump-sum tax expenditures (generically similar to the EITC), the authors found a measure of 1.22. Based on their model results, the authors conclude ARRA tax policies of similar structure will have a modest multiplier effect on output, concurring with the findings from Adams and Gangnes (2010) and the CBO (2015).

Some research suggests a more pessimistic effect of ARRA tax policies. Cogan et al. (2009) used Smets and Wouters (2007) new Keynesian model to simulate the U.S. economy under ARRA. Cogan et al. found a multiplier effect on output due to ARRA tax policies to be 0.19. Drautzberg and Uhlig (2011) also used Smets and Wouters (2007) new Keynesian model to find short-run (i.e. one year) multiplier effects of ARRA transfers (i.e. direct outlays or tax transfers) to liquidity constrained individuals[[3]](#footnote-4). They found an output multiplier effect of 0.54 for liquidity constrained individuals receiving ARRA transfers[[4]](#footnote-5). Taylor (2011) used data from the Bureau of Economic Analysis’ “Personal Income and Output” and found a negligible and statistically insignificant effect on consumption due to the tax rebates and temporary transfers of ARRA. While his results suggest no effect on overall consumption, his methodological approach ignores the distributional effects examined by other authors and has some model flaws. For example, Taylor aggregates the 2001, 2008, and 2009 stimulus package payments into one variable instead of separate variables and looks at their effect on consumption across quarter 1 of 2000 to quarter 1 of 2011. The standard methodological approach to measuring behavioral responses to tax changes is to use aggregate consumption data and look for changes in behavior around the implementation date of tax policy changes: see Modigliani et al. (1977), Blinder (1978), Poterba (1988), Parker (1999), Souleles (1999, 2002), and Stephens (2003), for example.

Feyrer and Sacerdote (2011) look at the output multiplier effect of ARRA transfers (excluding tax transfers) to low income individuals and find an effect estimate of 1.088, though it is statistically insignificant. Though the effect is statistically insignificant and focused on expenditures targeting low-income individuals rather than tax policies, Feyrer and Sacerdote note it is the largest of the output multipliers and conclude that transfers directed at low-income individuals have the greatest relative economic benefit. The research illustrates a high degree of variability in the multiplier effects of ARRA tax policies generally. However, CBO’s research into the multiplier effect of the EITC expansion is more promising in that its multiplier estimate has a high upper bound relative to many of the other estimates from other studies.

## Tax Rebates’ & Credits’ General Effects

This section examines previous research on the consumption effects of tax rebates and credits generally. Given that the EITC is a refundable tax credit, it is functionally equivalent to a tax rebate in that both are windfalls of cash. Much like the preceding section, this section will help frame expectations regarding the EITC research of this paper by looking at the consumption effects of other tax policies.

Souleles’ (2002) tested household responses to the second and third phases of the Reagan tax cuts of the 1980s. These phases of the tax cuts were announced well in advance of their enactment. Given this, Souleles suggests that based on the permanent-income/life-cycle hypothesis the consumption response should be rather muted. Souleles used Consumer Expenditure Survey data from 1982 and 1983 and used variables measuring the amount of federal income tax withheld from each paycheck in the process of measuring consumption responses. Souleles found a marginal propensity to consume (MPC) on non-durable goods of 0.66 (significant at the 5-percent level). His results were consistent when changing model specification, suggesting robustness. However, Souleles found no significant consumption response from the bottom income quintile.. Given that EITC recipients by definition are lower-income, non-results from the bottom income quintile is discouraging to this research.

Shapiro and Slemrod (2003) examine whether or not the 2001 tax rebates stimulated consumption spending above the non-rebate level. They used survey responses to the University of Michigan Survey Research Center’s Monthly Survey (known as Survey of Consumers) which was compartmentalized into three distinct surveys. Shapiro and Slemrod note that the first survey reported 21.8 percent of households said the tax rebate would lead to increased spending; the second retrospective survey reported 24.9 percent of households said the tax rebate would lead to increased spending[[5]](#footnote-6); and the third survey on a hypothetical rebate reported 16.6 percent of households said the tax rebate would lead to increased spending. Furthermore, the authors found no significantly higher spending rates among low-income households in the first survey. In this respect, Shapiro and Slemrod (2003) is similar to Souleles (2002) in that there is a modest effect on consumption but no evidence suggesting a significant effect for lower income households, which are primary EITC recipients.

Johnson et al. (2004) used the Consumer Expenditure (CE) survey and a special section of questions regarding how the 2001 tax rebate was spent to measure the change in consumption caused by the 2001 tax rebate. The authors of the 2001 law worked with the Bureau of Labor Statistics (BLS) and other government agencies to insert a special module of questions asking about the rebate. The questions asked about the timing and amount of the rebate received by participants. The authors compare changes in consumption due to the rebate by comparing the expenditures of households that received the rebate at different times. Given that the timings of the mailings of the rebates were based on the second-to-last digit of individuals’ social security numbers, the date at which households received a rebate is randomly assigned. Therefore, the receipt of (and thus spending of) the tax rebate is uncorrelated with other macroeconomic events.

The authors found that in the three-month period following rebate receipt, spending on non-durable goods increased by approximately 37 percent of the rebate amount (a statistically significant result). To check for robustness, the authors changed the functional form: the results were similar in both statistical significance and magnitude. When controlling for only households that received a rebate, the authors found spending on nondurable goods increased by 24.7 percent of the rebate received.

Shapiro and Slemrod (2009) and Sahm, Shapiro and Slemrod (2010) examined how the tax rebate of the Economic Stimulus Act of 2008 was used by recipients. The authors used survey responses from a rider to the University of Michigan Survey Research Center’s Monthly Survey.[[6]](#footnote-7) The survey rider was included each month from February through June 2008[[7]](#footnote-8) and asked whether the tax rebate from the Economic Stimulus Act would lead to either mostly increased spending, mostly increased saving, or mostly increased debt repayment. According to the authors, their research with the survey found that approximately 19 to 22 percent of respondents planned to increase spending. The authors also found a marginal propensity to consume (MPC) from the rebate of 0.33.

Overall, the literature finds that tax transfers of cash equivalents produce modest effects on output and consumption spending. However, some studies found little effect among lower-income households. Given that EITC recipients by nature are lower-income households, non-results for these households suggest that the ARRA EITC expansion should have little effect on consumption spending of recipients. However, there are some reasons to expect differences. One, most of the literature discussed here focuses exclusively on total consumption expenditures. It’s possible that tax credits and rebates change the distribution of consumption expenditures rather than the total amount. This paper assesses whether the EITC expansion affected social mobility expenditures, not total consumption expenditures. Second, these studies examined tax policies other than the EITC: there may be some unobservable effects of EITC receipt that isn’t captured by these other policies.

## Effects of Expansions of the Earned Income Tax Credit

Much of the research on the EITC focuses on labor supply effects: see Liebman (1998), Meyer and Rosenbaum (1999), and Meyer (2010), for example. Liebman (1998) notes the effects of the EITC are concentrated around the poverty line. Given that the broad intent of the ARRA’s tax policy for individual households and consumers was to increase consumption spending[[8]](#footnote-9), this section will focus on how EITC reforms affect recipient consumption spending.

Smeeding et al. (2000) sampled 7,000 Chicago area households that filed tax returns (freely) with the Center for Law and Human Services (CLHS) in the winter and spring 1998 to assess the impact the EITC had on these households. Respondents were asked to detail their expenditures, their assets, and their ability to make certain expenditures absent assistance from the EITC. Expenditures included paying bills, purchasing goods and services, and saving. The authors divided all uses of the EITC for expenditures into two categories: improving social mobility (e.g. purchasing a car, paying tuition, housing) and “making ends meet” (e.g. paying routine bills, purchasing food).[[9]](#footnote-10) Smeeding et al. used logistic regressions and reported odds ratios instead of coefficients. The authors found that recipients of the EITC are more than 1.24 times more likely (significant at the 5 percent level) to have a social mobility use for a portion of their refund than non-EITC receiving recipients. The authors found a statistically insignificant odds ratio for a “making-ends-meet” use of recipients’ refunds.

Simpson et al. (2010) analyzed survey data collected through the Madison County (a rural county in upstate New York) Volunteer Income Tax Assistance Program (VITA) for tax years 2002 to 2004. This program offers free tax return preparation to low-income workers. The authors studied the responses of 282 EITC recipients and used a methodology similar to Smeeding et al. (2000) in that they looked at how EITC recipients were going to use their refunds. The authors created three categories of planned spending: basic needs, debt repayment, and purchase of durable goods. Basic need spending includes spending on rent, utilities, groceries, medical bills, and clothing. Debt repayment spending includes spending on credit card bills, car payments, and bank, student or personal loans. Durable goods purchases include spending on automobiles and household appliances. The authors found that 64.2 percent of recipients stated basic needs spending would be an intended use of their refund; 49.6 percent of recipients stated debt repayment would be an intended use of their refund; and 26.6 percent of recipients stated durable goods purchases would be an intended use of their refund.[[10]](#footnote-11)

Barrow and McGranahan (2000) explored the effect of EITC on consumption using data from the Consumer Expenditure Survey (CES) from 1982 through 1996. The authors impute EITC eligibility and payments based on information concerning children, earnings, and household structure. This imputation is done because the CES did not ask any direct questions relating to EITC status. The authors are particularly interested in the differences in durable goods expenditures in the months of February through April because February is the modal month of EITC refund receipt with March and April as the other most common months of EITC refund receipt. Durable goods expenditures consist of purchases of household furnishings and equipment, televisions and other home electronics, and vehicle purchases. The authors found that durable goods expenditures were 5 percent, 0.2 percent, and 2.6 percent higher for EITC recipients versus non-EITC recipients in the months of February, March, and April, respectively (significant at the 5 percent level).

Gao, Kaushal, and Waldfogel (2009) used data from the Consumer Expenditure Survey (1994 to 2004), selected a sample of single mothers as a proxy for EITC recipients, and measured their consumption responses to increases in the EITC. Aside from using single mothers as an EITC proxy rather than imputation, their study differs from Barrow and McGranahan (2000) in that it includes levels of family debt, detailed expenditure patterns, and analysis by education groups. Using OLS regression, the authors find no statistically significant effects on consumption expenditures overall from the EITC. However, the authors found that the effect of receiving the EITC in February increased consumption expenditures by 9.7 percent (significant at the 5 percent level) and increased durable goods expenditures by 5.7 percent (significant at the 5 percent level).

Mendenhall et al. (2012) visited selected non-profit and for-profit tax preparation sites in Boston and Central Illinois at random intervals and invited all who filed an Earned Income Credit (EIC) schedule to participate in a survey focusing on their planned uses of the refund. Of all the households asked to participate only 194 households (79 in Central Illinois and 115 in Boston) participated in in-depth interviews that collected data on actual spending of the refund, amount saved, monthly and post-refund expenditures and other things (Mendenhall et al., 2012: 13). The authors found that 45.59 percent of the total refund of EITC recipients was spent on current consumption, 19.07 percent was spent on asset building (e.g. savings, education, home purchase or improvement), and 35.78 percent was spent on debt servicing (e.g. bills, credit card and other debt). However, there are limitations to this and other studies.

Mendenhall et al. (2012) note that much of the literature about the EITC and consumption spending focuses on how recipients plan to allocate their refunds rather than how much recipients actually spend on those allocations: see Smeeding et al. (2000), Spader et al. (2005), and Rhine et al. (2006). Rhine et al. (2006) note that only a small portion of EITC recipients use non-profit tax preparers despite many studies relying on samples of EITC recipients who use non-profit tax preparers. This creates a sample selection bias in that this portion of EITC recipients who use non-profit tax preparers may exhibit certain heterogeneities when compared to all other EITC recipients. Gao, Kaushal, and Waldfogel (2009) used data from the Consumer Expenditure Survey (1994 to 2004), selected a sample of single mothers as a proxy for EITC recipients, and measured their consumption responses to increases in the EITC. While an intriguing design, it lacks the precision of the imputation method used by Barrow and McGranahan (2000) but is not limited by a few locations as with Smeeding et al. (2000), Spader et al. (2005), Rhine et al. (2006), Mendenhall et al. (2012).

Seeing evidence suggesting an exogenous effect from the EITC on components of total expenditures (primarily durable goods expenditures) suggests that there is good reason to study other expenditure components of EITC recipients. This paper builds on that research by studying the effect of the EITC expansion on social mobility spending. While Smeeding et al. (2000) examined the likelihood of using the EITC for social mobility spending, this paper improves on his work by providing a marginal propensity to consume (or marginal change) of the EITC receipt on social mobility expenditures. Furthermore, this paper seeks to narrow Smeeding et al.’s definition of mobility spending to focus more on the categories central to low-income households suggested by Steuerle (2012). Smeeding et al.’s definition includes many categories of expenditures that are closer to debt-repayment than they are to direct generators of upward social mobility. Furthermore, this paper adds to the discussion on the effectiveness of ARRA generally and the ARRA EITC expansion specifically. Some of the research above looks at the effect of the EITC over many years while this paper will examine the response to the ARRA change in the EITC over a few months.

# Research Questions and Hypotheses

## Introduction

There are issues and inconsistencies across the literature on the effectiveness of tax rebates and credits in stimulating consumption spending. In regards to the particular case of recipients of the Earned Income Tax Credit (EITC), Smeeding et al. (2000), Barrow and McGranahan (2000), and Simpson et al. (2010) found evidence that EITC recipients are generally liquidity constrained and that they tend to increase consumption spending upon receipt of the EITC. Souleles’ (2002), Shapiro’s and Slemrod’s (2003, 2009) and Stephens’ (2003) research suggest that being liquidity constrained does not induce more consumption spending than otherwise. Conversely, Johnson et al. (2004), Agarwal et al. (2007), Elmendorf and Furman (2008), Bertrand and Morse (2009), and the Congressional Budget Office (2015) conclude that liquidity constrained households and individuals have a higher marginal propensity to consume in regards to tax rebates.

One reason tax rebates and tax credits are issued is to incentivize consumers to spend more than they would have otherwise. Thus, some research on tax rebates operationalize their effectiveness by measuring their exogenous effect on consumption spending. Shapiro’s and Slemrod’s (2003) work concluded that the 2001 tax rebates generally lead to higher rates of saving among lower income individuals, thus making them ineffective policy tools for boosting short-term consumption spending. However, Shapiro and Slemrod (2009) and Sahm, Shapiro and Slemrod (2010) demonstrated that the 2008 Economic Stimulus Act tax rebates had a non-trivial effect on aggregate consumption for quarters two and three of 2008. Taylor (2011) found no significant effect on aggregate consumption for the 2001, 2008 and 2009 stimuluses; though his methodology is flawed.[[11]](#footnote-12)

For this paper, the primary research question of interest for the expansion of the EITC will be how the receipt of the tax credit by households with three or more eligible dependents compared to the receipt of the tax credit households with two or fewer eligible dependents affects social mobility expenditures. The primary hypothesis will be that the marginal propensity to consume (MPC) for social mobility expenditures from the interaction of EITC and households with 3 or more EITC eligible dependents will be positive. As discussed above on general ARRA effectiveness, most of the research related to ARRA tax policies focuses on the multiplier value of those policies (e.g. Cogan et al., 2009, or Adams and Gangnes 2010). Some of the research discussed above simply lumps all personal expansionary tax policies as one measure. This paper adds to the discussion on the effectiveness of ARRA tax policy by studying a specific personal tax policy as opposed to the lump-sum of all personal tax policies. The primary research question is based on the work of Smeeding et al. (2000) and Steuerle (2012).

## The Expansion of the EITC

Enacted in 1975, the Earned Income Tax Credit (EITC) is a refundable tax credit to help working individuals and families, particularly those with children, who have low to moderate incomes. It was structured to require recipients have earned income to combat the disincentive to work from a traditional negative income tax and spur labor supply. The tax credit has a slow phase-in length, a moderate-length plateau, and a slow phase-out length. ARRA increased the maximum credit amount for taxpayers with three or more qualifying children ($5,657 in tax year 2009) and increased the beginning point of the phase-out range of the credit for all joint return filing married couples regardless of the number of children (U.S. Internal Revenue Service, 2016). Individuals and families claim the EITC when filing their tax returns each year.

Given that the EITC is a refundable credit, it is functionally a windfall of cash. This creates a two-stage question: what percentage do recipients allocate between spending and savings and how much is allocated to specific spending and saving outcomes. This paper will seek to answer the second-stage of this question by looking at the effect on social mobility spending. EITC recipients by nature are lower-income households and thus if these income windfalls are associated with unique purchasing behaviors is of particular interest.

The expansion of the EITC by the ARRA can be viewed as a policy shock and a quasi-experiment of sorts. The treatment group being recipients with three or more eligible dependents and the comparison group being all other recipients. The assignment to the treatment condition was ultimately controlled by Congress. Examining how individuals and households with three or more eligible dependents react to the expansion as compared to individuals and households with two or fewer eligible dependents tests the effectiveness and success of the ARRA expansion of the EITC on stimulating social mobility spending. The quasi-experimental design of this policy shock allows for the measured effects to have some generalizability to the effect of the EITC expansions on social mobility expenditures generally.

Given their low regular income, social mobility spending of EITC households, with three or more eligible dependents in particular, may be rather limited throughout the year. Thus studying how these recipients behave when receiving the EITC provides evidence as to the effectiveness of the EITC as an anti-poverty policy for larger families. Determining if the EITC had an overall significant effect on social mobility expenditures is important for determining the success of this tax credit expansion’s stated policy goals. A significant effect provides policymakers with more evidence to expand the EITC in the future if their goal is to increase social mobility. This paper contributes to the literature regarding the effectiveness of tax credits in stimulating consumption spending, in this case social mobility spending. If policymakers know that larger families tend to spend less of their EITC on social mobility, then they can enact complimentary policies that benefit these populations. For example, boosting child supports may help EITC families with more children improve social mobility.

Social mobility expenditures will be the dependent variable in the regression models used to answer the research question. The Consumer Expenditure Survey (CES) Public-Use Microdata (PUMD) from the Bureau of Labor Statistics will be used and contained within it are variables directly measuring total consumption expenditures per household. There are also variables measuring types of expenditures (sorted by universal classification code or UCC) which can be aggregated to create variables for social mobility expenditures. Following the work of Smeeding et al. (2000) and Steuerle (2012), social mobility expenditures will include human, physical and financial capital acquisition purchases.

# Research Design and Methodology

## Data

### Summary

This paper will use the Consumer Expenditure Survey (CES) Public-Use Microdata (PUMD) for 2009 and 2010. The CES is administered quarterly by the Bureau of Labor Statistics (BLS) and is comprised of “Diary” and “Interview” components. For sampling units selected to the Diary survey, each unit is required to keep two 1-week diaries of expenditures over consecutive weeks. For the Interview survey BLS employs a panel rotation survey method whereby each panel (i.e. all sampling units) is interviewed for five consecutive quarters then dropped from the survey. Based on this method, approximately 20 percent of the addresses are new to the survey each month (Bureau of Labor Statistics, 2010a) (Bureau of Labor Statistics, 2010b).

For Interview survey data, BLS has an annual target sample of 7,060 per quarter, similar to its sample size for the Diary survey, with an estimated total work load of 11,500 sampling units per quarter. The total work load is larger to allow for refusals, vacancies, and nonexistent sample unit addresses. Many variables in the Interview component used in this paper are top-coded. For example, the market values of savings accounts and securities are top coded at $313,601 and $3,679,267, respectively.

This paper will use the Interview component of the CES PUMD. The unit of analysis is the consumer unit (CU). The CU is representative of a household or family at a particular address or housing unit. The CU aggregates all individual members’ spending, income, tax refunds, taxes paid, and other economic and financial characteristics. Unfortunately, there are no direct questions concerning receipt of the EITC.

### Sampling Procedures

The Consumer Expenditure Survey (CES) Public-Use Microdata (PUMD) will be used for years 2009 and 2010. According to the BLS’s documentation, samples for the CES are created “using national probability samples of households designed to be representative of the total U.S. civilian population (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b). The non-institutionalized, civilian population is eligible for inclusion in the CES. From here, BLS’s first step in sampling is to create primary sampling units (PSUs) which consist either of counties (or parts thereof) or groups of counties.

These PSUs consist of four groups: “A” PSUs are Metropolitan Statistical Areas (MSA’s) with a population greater than 1.5 million; “X” PSUs are “medium-sized MSA’s”; “Y” PSUs are non-metropolitan areas that are included in the Consumer Price Index (CPI); and “Z” PSUs are non-metropolitan areas where only the urban population data is included in the CPI (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b).

The sampling frames (i.e. housing units available for participation) for the 2009 and 2010 surveys were generated from the 2000 Census. In each of the datasets, an un-clustered sample of housing units within each PSU was selected to the degree possible. According to BLS, a minimal degree of clustering is desirable given the smaller sample size of some of the CES datasets and the relatively large intraclass correlations for expenditure characteristics. The primary unit of analysis in the CES is the consumer unit (CU) which is representative typically of a household or family at a particular address or housing unit (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b). In the datasets, each unique consumer unit is given a unique identifier. It should be noted that some consumer units may contain more than one household or family despite being at the same particular address or housing unit.

In order to estimate average expenditures, BLS uses data from the “Diary” survey combined with data from the “Interview” survey. For sampling units selected to the Diary survey, each unit is required to keep two 1-week diaries of expenditures over consecutive weeks. For the Interview survey BLS employs a panel rotation survey method whereby each panel (i.e. all sampling units) is interviewed for five consecutive quarters then dropped from the survey. Based on this method, approximately 20 percent of the addresses are new to the survey each month (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b).

When interviewed, respondents are asked to report expenditures made since the first day of the month three months prior to the interview month. For example, if a respondent is being interviewed in April 2012 then he/she is reporting expenditures for January 1, 2012 through March 31, 2012. Given this structure, BLS defines the collection period as when expenditures were reported and the calendar period as when expenditures were made (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b)

For Diary survey data, BLS has an annual target sample size of 7,200 sampling units with an estimated total work load of 12,200 sampling units. The larger total work load is used to allow for refusals, vacancies, or non-existent sample unit addresses (U.S. Bureau of Labor Statistics, 2010a). For Interview survey data, BLS has an annual target sample of 7,060 per quarter, similar to its sample size for the Diary survey, with an estimated total work load of 11,500 sampling units per quarter. As with the Diary survey, the larger total work load is larger to allow for refusals, vacancies, and nonexistent sample unit addresses.

Across both the Diary and Interview surveys, BLS uses similar weighting procedures for each CU included in the CES to ensure that each CU represents a given number of CUs with similar characteristics in the U.S. According to the BLS, there are four basic steps when weighting CUs: one, the inverse probability of selection of the housing unit is the basic weight assigned to an address; two, if subsampling is performed in the field, a “weight control factor” is applied to each diary/interview (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b); three, a non-interview adjustment as a function of region, housing tenure, family size, and race is made for units where data could not be collected; and four, sample estimates are adjusted to national population controls derived from the Current Population Survey (CPS)[[12]](#footnote-13) (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b).

### Collection and Processing

The CES is collected and processed by two different entities: first the U.S. Census Bureau then the Bureau of Labor Statistics (BLS). According to BLS (2010a, 2010b) documentation, the Census Bureau conducts quality checks for counts, missing values, and other errors and inconsistencies proprietary to both the Diary and Interview survey data. After this, the data is sent over to BLS.

From here, BLS employs proprietary methods that correct irregularities and inconsistencies, eliminates business and reimbursed expenses, applies sales taxes, and derives CU weights (see above for discussion of how weights are calculated). BLS imputes demographic and work experience fields when the values are missing or invalid. BLS reviews counts, weighted and unweighted means, and expenditure and income extreme values. Any extreme data values are corrected. All data transformation efforts are verified before being finalized.

BLS conducts two types of data adjustment: imputation and allocation. Imputation is done to correct for missing or invalid entries.[[13]](#footnote-14) Allocation is performed when respondents provide insufficient detail regarding certain expenditure items. For example, fields related to combined fuel and utilities expenditures are allocated among gas, electricity, and other. Fields are also adjusted to categorize expenditures by month. All the above procedures are applied to both the Diary and Interview portions of the survey. For a fuller discussion of the collection and processing of the CES, see BLS (2010a, 2010b) documentation.

### Top-Coding

To protect the identify of some of the CES respondents, certain fields were top-coded. As defined by BLS, top-coding “…refers to the replacement of data in cases where the value of the original data exceeds prescribed critical values,” (U.S. Bureau of Labor Statistics, 2010b: 40). Values that fall above any critical value are replaced with the top-coded value that is the mean of all outliers for that particular field. The critical values and top-coded values are created using all five quarters of CES data in a particular survey year. These values are subject to change over time based on the values gathered from each yearly survey.

Some examples of top-variables include the market value of all securities and the market value of all U.S. savings bonds. For the market value of all securities, the critical value is 1,000,000 and the top-coded value is 3,679,267. For the market value of all U.S. savings bonds, the critical value 29,000 and the top-coded value is 67,310. The issue with top-coding is it reduces precision and introduces some measurement error into the data. However, given that the primary research questions are concerned with liquidity constrained households which are typically lower income and lower wealth, the measurement error should be minimal for this treatment group. For a fuller discussion of the top-coding and non-disclosure of the CES, see BLS (2010a, 2010b) documentation.

## Operationalization of Research Questions and Hypotheses

For tax year 2009, the phase-out for the credit begins at $21,450 for married couples filing a joint return with eligible dependents and completely phases out at $40,463 for couples with one eligible dependent, $45,295 for couples with two eligible dependents, and $48,279 for couples with three or more eligible dependents. For married couples with no eligible dependents, the credit begins to phase out at $12,500 and completely phases out at $18,440 (U.S. Internal Revenue Service, 2016). The CES did not start asking if a CU was eligible or received the EITC until years after the 2009 and 2010 surveys. Eligibility for the EITC and the amount of the EITC received will be imputed from the CES. Using the properties of eligible recipients, this paper will create a binary variable representing receipt of the EITC, a continuous variable measuring the amount of the credit received, a categorical variable measuring tax filing status, a continuous variable measuring the number of eligible dependents, and a binary variable if the CU received the EITC and had three or more eligible dependents.[[14]](#footnote-15) This paper will use an imputation method similar to Barrow and McGranahan’s (2000) method to predict the value of EITC payments.

These predictions will be based on data regarding number of children, earnings, and household structure. Tax-unit earnings can be created using earnings reported in the second and fifth CES interview sessions. Earnings is defined as all earned income and any investment income below $3,100. Earned income is defined as all wages, salaries, tips, net earnings from self-employment, and gross income received as a statutory employee ; and, investment income is defined as all income from dividends, royalties, estates, or trusts, and all interest earnings on savings accounts or bonds (U.S. Internal Revenue Service, 2015). Data on investment income and on earned income is available in the CES. Using reported earnings from the CES to determine tax-unit earnings will most likely overestimate EITC eligibility because of the earnings underreporting common in CES data (Barrow & McGranahan, 2000: 1215). Eligible children are those who are under 19 years of age; or are under 24 years of age and a full-time student; or any age but permanently and totally disabled. This information is all available on the CES. Data on marital status of the household members is also available on the member files of the CES.

To capture the amount received in tax year 2009, the 5-quarter panel selected for measurement of the EITC research questions will be those surveyed from the third quarter of 2009 to the third quarter of 2010. Using this particular panel allows for measurement of consumption expenditures from the second quarter of 2009 to the second quarters of 2010 while measuring income and family structure in 2009. Using this panel creates two choices for determining income for tax year 2009. First, the unweighted income responses recorded in the fourth quarter of 2009 could be used as the tax-unit earnings. The CES income variables ask respondents for income in the past twelve months. Thus, this approach would contain income from all of 2009. Alternatively, tax-unit earnings could be created by weighting the income responses recorded in the third quarter of 2009 and the third quarter of 2010. However, some error will be introduced given that earnings from 2010 are included in this particular procedure.

The earnings eligibility criteria are based off of adjusted gross income (AGI). Given that the CES does not measure AGI nor can it be calculated based on the variables in the dataset, the weighted earnings averages will have to use before-tax income which introduces some measurement error. Before-tax income and AGI both are income levels before an individual’s total tax bill is paid. However, before-tax income is likely to be higher than AGI because AGI subtracts certain expenses from one’s income (Intuit, 2016). Given that before-tax incomes are larger than adjusted gross incomes (AGI), the number of people receiving the EITC and the amount of the EITC received may be underestimated using this approach as tax-unit earnings will be measured higher than actual earnings used to determine EITC eligibility. However, given the earnings underreporting common in the CES data as documented by Barrow and McGranahan (2000), the biases act in opposite directions and may reduce the overall bias of the measurement error in using before-tax income as compared to AGI. Based on analysis of the selected panel of CUs, there were 1,262 unique CUs and 148 unique CUs (approximately 12 percent) received the EITC according to the imputation methods described above. This error has the potential to be large, assuming the individual biases above are large and have an absolutely large difference between them.

Social mobility expenditures will be the dependent variable in all regression models. CES contains variables directly measuring consumption expenditures per household with variables measuring types of expenditures (sorted by universal classification code or UCC). These can be aggregated to create variables for social mobility expenditures. Social mobility expenditures will be operationalized based on the work of Smeeding et al. (2000) and Steuerle (2012). This includes spending on purchasing a new home, savings and other financial products (e.g. stocks, bonds), education and work-force training (i.e. tuition and school expenses), purchasing a car, and entrepreneurial activities (e.g. investing in a personal business). All of these spending categories are measured directly on the CES. The dependent variable will be measured at both its absolute dollar values and the natural logarithm of its dollar values. The reason for using the natural logarithm of its dollar values is to produce a more normal-distribution from one with high positive skewness (Angrist & Picshke, 2008) (Kennedy, 2008).

Expenditures on savings and financial products includes spending on checking accounts, savings accounts, stocks, bonds, and mutual funds, and U.S. Savings Bonds. New home purchases include owned home purchases, vacation home purchases, and other properties purchases. Vehicle purchases include spending on new and used cars, trucks, vans, and motorcycles. Educational expenses include spending on tuition, supplies, and tutoring/test-prep services for colleges, universities, technical, and vocational schools. Entrepreneurial activities include net investment spending on an owned farm or business.

The primary research variable will be measured as an interaction term (variable X1 in regression equations) between the binary variable (variable X2 in regression equations) of having received the EITC and having three or more eligible dependents or having received the EITC and having fewer than three eligible dependents, and the continuous variable (variable X3 in regression equations) of the dollar amount received of the EITC. This measurement captures how each additional EITC dollar received while being part of the new EITC category compared to each additional dollar received while not part of the new EITC category affects social mobility expenditures. Coefficients of the primary research variable will be the marginal propensity to consume (MPC) of the EITC expansion on social mobility expenditures. Per the quasi-experimental design, any MPCs have some generalizability to the effect of the EITC expansions on social mobility expenditures generally. Other demographic and control variables will be included, such as education level, race, and region, to control for the effects of other variables on expenditures. Given the variations of the dependent variable to be tested, there will be two separate regression models in the base-case analysis for the EITC. This includes social mobility expenditure variables measured two distinct ways (level and natural logarithm).

## Measurement and Statistical Techniques

### The Expansion of the EITC

As discussed by Barrow and McGranahan (2000) and Gao, Kaushal, and Waldfogel (2009), the modal month of EITC receipt is February with March and April as the other most common months of EITC receipt. The model will assume that all EITC payments are received in these three months exclusively and that each recipient will have its imputed receipt value randomly assigned to one of these three months.

To measure the effect of the EITC on social mobility spending, the model will use the monthly expenditure data in the CES, which categorizes spending by universal classification code (UCC), and examine expenditures from November 2009 to July 2010. Data for 2010 is being used with data for 2009 because changes to the EITC were for tax year 2009 and thus would not be received by families until calendar year 2010. Other monthly expenditures besides those in February, March, and April are being used as a comparison of consumption prior to and after the receipt of the EITC. The IRS provides in its 1040 Instructions Manual a complete table of the value of the EITC based on income, number of children, and tax-filing status. For example, a married household filing jointly with one child and an adjusted gross income (AGI) between $2,000 and $2,050 received $689 for the EITC in tax year 2009.[[15]](#footnote-16) To control for seasonal differences in expenditures, fixed effects for time will be included. This includes fixed effects for the month-year combinations present in the model. Assuming the model has controlled for all other relevant variables with fixed effects for time, measuring consumption expenditures from late-2009 to mid-2010 should provide a representative effect of the EITC less timing effects.

The baseline model for the EITC will be that with logarithmic expenditures. To reiterate, the primary research variable will be an interaction term between the binary variable of having received the EITC with having three or more eligible dependents and the continuous variable of the dollar amount received of the EITC. Tangent to this, the binary variable of having received the EITC and having three of more eligible dependents and the continuous variable of the amount of the EITC received will also be included in addition to the interaction term in all related models. The results from the baseline model will be the focus of the results section and all following models will be discussed relative to the baseline model. Marginal effect estimates of the primary research variable will be MPCs of the EITC on social mobility expenditures.

To measure the effect of the EITC expansion on social mobility expenditures, the baseline model will use an OLS regression. There are two things of note when using OLS regression with this data and model. First, there are many values of zero for expenditures in the dataset. Given that the natural log of zero does not exist, these values will have to be dropped in the baseline case. The baseline model will also use the level value of social mobility expenditures to include these dropped observations. Second, the baseline model uses a natural logarithmic dependent variable. All marginal effect estimates will appropriately adjust their estimation procedures to account for the correct interpretation of coefficients in a logarithmic-linear functional form (Kennedy, 2008) (Salkever, 2015).[[16]](#footnote-17)

To test for fragility in the estimates, other statistical techniques that properly control for censored dependent variable values (i.e. zero dollar expenditures) will be used. A generalized linear model with a log-link function will be tested across the various specifications. One advantage to using this approach is that the observations with zero expenditures are included and more appropriately estimated. A second approach used will be the tobit model. The advantage of this approach is that it can be used with dependent variables with either left-or-right censoring. In this case, social mobility expenditures are left-censored at zero dollars.. A zero-inflated poisson regression model and Cragg’s hurdle model will also be used. Ilienko (2012) and Lauderdale (2012) discuss the appropriateness of using dollar variables as count variables while Cragg (1971) discusses the appropriateness and effectiveness of his hurdle model for censored dependent variables. These two models involve two stages of estimation. The first stage uses a probit or logit model to model if the dependent variable is the censored value or not: in this case, whether social mobility expenditures are non-zero is modeled. The second stage then models the effect of the covariates on non-censored (non-zero) dependent variable values. Like the tobit model, these models are useful when censoring is present in the dependent variable and allow fewer restrictions on the included observations. These models will include observations with zero social mobility expenditures. These measurements from both the baseline model and the sensitivity analysis will determine marginal propensities to consume social mobility goods from the sudden windfall of the EITC.

As discussed earlier in this paper, much of the research on ARRA tax policies focuses on constructing estimates of the multiplier effects of the tax policies, with a lot of the research constructing multiplier estimates using forward-looking simulations. The CBO created multiplier ranges for transfer payments to individuals as a policy group rather than individually for the EITC expansion. While this paper does not construct sophisticated multiplier estimates, it adds to the discussion by providing MPC estimates specifically for social mobility expenditures of EITC recipient individuals and households using post-ARRA data. This is a useful sub-group analysis while also looking at a single ARRA provision rather than a group of provisions.

### Other Explanatory Variables

The following explanatory variables will be included in all models for the expansion of the EITC. The other explanatory variables included are region of CU residence, age of the CU, a dummy variable of urban CU residence, a dummy variable of home-owning CU, the education level of the CU, the CU monthly after-tax income, the CU reference person’s race, a dummy variable of CU reference person’s marital status, a dummy variable if the CU reference person’s primary occupation is a professional one, the number of children in the CU, a dummy variable if the CU lives in poverty, a variable of the gender of the CU reference person, a fixed effect for time, and a continuous variable of total liquid wealth.

The region of CU residence has values of living in the Northeast, Midwest, South, or West. Each value of region will be defined as a separate dummy variable (variable Regionj in regression equations where j is each value of region) with one region dummy variable omitted in every regression model. The Northeast region dummy variable will be the likely omitted category in each regression. Region is included to control for cost-of-living differences and possible cultural heterogeneities related to spending and saving in different areas of the country. Consider that housing markets, labor markets, and price levels are not homogenous in all states let alone all regions of the country. Age, measured in years, is included to control for spending preferences and behaviors that vary by age. For example, younger people typically lack houses and the attendant household furnishings and equipment whereas older people have had more time to collect and acquire homes and their attendant household furnishings and equipment. Age will be modeled as a quadratic to capture the presumed diminishing rate of consumption by age. The model assumes that individuals have an increasing rate of consumption through mid-adulthood due to acquiring a certain quantity of goods and services. After a point, whether due to obtaining most needed and wanted goods and services over the course of a lifetime or children becoming financially independent, the model assumes consumption will fall with age.

A dummy variable of urban CU residence is included to control for the cost-of-living differences inherent to living in an urban area. The variable equals 1 if the CU residence is in an urban area and equals 0 otherwise. The model assumes that urban residence decreases the level of savings because of an assumed increase in cost-of-living due to more expensive housing prices, tax rates, general prices, etc. A dummy variable of homeownership is included because of Engelhardt’s (1996) research that demonstrated homeowners have different consumption behaviors than non-homeowners. Particularly, Engelhardt found that non-homeowners tend to depress consumption due to saving for a down payment for a house. The variable equals 1 if the CU residence owns a home and equals 0 otherwise.

Education level is a categorical variable with the levels being no high school diploma, a high school diploma, some college, an Associate’s Degree, a Bachelor’s Degree, a Master’s Degree, or a Professional/Doctorate Degree. Each value of education level will be defined as a separate dummy variable (variable Educationi in regression equations where i is each value of education) with one education level dummy variable omitted in every regression model. The high-school diploma education dummy variable will be the likely omitted category in each regression. Education is included to control for the effect of education on social mobility spending. The model assumes that more education increases the level of spending as individuals become more aware and learned of financial planning behaviors, long-term financial goals, and opportunities for upward social mobility.

Monthly after-tax income is included to serve as the theoretical budget constraint for CUs when making consumption and saving decisions. It is a continuous variable. Although the income variable is measuring monthly income, the value it is based on is yearly income for the CU. The model assumes that yearly income is earned equally throughout the year and thus divides the original income value by 12. Earnings are reported in the second and fifth CES interview sessions. The yearly after-tax income reported in the fifth CES interview session asks CUs to report income from the third quarter of 2009 to the third quarter of 2010, which captures income for the monthly observations of November 2009 to July 2010. Given the high level of positive skewness in the income variable, the variable may be transformed to its natural logarithmic form to produce a more normal-distribution if necessary (Angrist & Pischke, 2008) (Kennedy, 2008).Race is a categorical variable with the different categories being White, Black, Hispanic, Asian, Native American, Pacific Islander, and multi-race. Each value of race will be defined as a separate dummy variable (variable Racek in regression equations where k is each value of race) with one race dummy variable omitted in every regression model. The White race dummy variable will be the likely omitted category in each regression. Race is being included to control for possible differences in savings between races due to unobservable heterogeneities of the particular races. The dummy variable of CU marital status is included to control for different consumption behaviors caused by marriage. For example, since it is more likely that married couples share income, the act of sharing may alter their willingness to consume. The variable equals 1 if the CU reference person is married and equals 0 otherwise.

The dummy variable if the CU reference person’s primary occupation is a professional one defined a professional occupation as any category of administrator, manager, teacher, professional, administrative support, sales of business goods and services, and technician. It was included because the model assumes these occupations afford certain benefits, such as health care, retirement plans, life insurance, etc., that increase the ability to spend. The variable equals 1 if the CU reference person has a professional occupation and equals 0 otherwise.

The number of children in the CU is included because children limit the ability to save and spend given that they are dependent on parents for financial support and are inherently expensive. The number of children is also important for the research question given that the EITC expansion created a new category for households based on having three or more children. The dummy variable if the CU lives in poverty is included because Zeldes (1989), Shea (1995), and Engelhardt (1996) find results suggesting people in poverty have different consumption patterns and behaviors. Poverty is defined as the CU being below the Federal Poverty Line at any time during the survey. The variable equals 1 if the CU reference is or was in poverty and equals 0 otherwise.

The variable of the gender of the CU reference person is included to control for possible differences in spending preferences and behavior by gender. The variable equals 1 if the CU reference person is female and equals 0 if male. A fixed effect variable for time will be included to control for unobservable effects of the particular months of the year on consumption. The variable of current liquid wealth is to control for the effect wealth has on current social mobility spending. While wealth and social mobility spending likely have a high positive correlation, its included to try and capture the effect of the EITC exclusively on social mobility spending. Following the work of Hubbard et al. (1986), Zeldes (1989), Shea (1995), Engelhardt (1996), and Johnson et al. (2004), total liquid assets will be defined as the sum of dollar amounts in checking accounts, savings accounts, common stocks and bonds, and U.S. Saving Bonds. All of these variables defined in total liquid assets are available in the CES. The variables concerning liquid assets are only asked of consumer units (CUs) in their fifth and final interview of the survey. These variables ask for the total amount had on the last day of last month and the total amount had on the last day of last month, one year ago. As discussed above, monthly expenditures will be used and therefore total liquid assets in a given month will also be used. To calculate total liquid assets in a given month, the average monthly rate of change between current and previous liquid assets will be calculated and applied appropriately. Total liquid wealth will exclude any calculated expenditures on savings and/or financial products.

### General Model Equation

The following equation represents the unrestricted regression model that each research question function will take:

Expenditures = β0 + β1X1 + β2X2 + β3X3 + [∑(βj)(Regionj)] + β4Age + β5Age2 + β6Urban + β7Homeowner + [∑(βi)(Educationi)] + β8Income + [∑(βk)(Racek)] + β9Married + β10Professional + β11Children + β12Poverty + β13Gender + β14Liquid\_Wealth + [∑(βl)(Timel)] + Ɛ

### Tests for Robustness

It is likely there will be some imperfections with the models presented in this paper. To diagnose any issues, this section will discuss strategies for testing for issues related to multicollinearity, heteroskedasticity, specification, outliers, and influential observations. Any issues diagnosed in the baseline model will be applied throughout the sensitivity analysis.

Multi-collinearity to some degree should be expected given that the variables in the models are not independent of one another. For example, the interaction terms of the models and their components should be highly collinear. To test for multi-collinearity, tests for the variance inflation factor (VIF) of each variable and the condition number of whole models can be done. VIFs greater than 5 (or 10) and condition numbers above 30 are accepted thresholds of significant multi-collinearity. These thresholds are according to Studenmund (2006) and Kennedy (2008), and Baum (2006) and Kennedy, respectively. However, they suggest these criteria for VIF and condition number are not very sensitive criteria. Multi-collinearity can be reduced by dropping multi-collinear variables from the model. Per Studenmund (2006), this is an unlikely course of action as doing so could simply create an omitted variables bias: multi-collinearity will likely just be identified with no prescriptive actions taken.

Heteroskedasticity is another issue common to many regression models. Heteroskedasticity in standard errors can be identified using the White and/or the Breusch-Pagan/Cook-Wiesenberg tests. Correcting heteroskedasticity can be done by using heteroskedasticity-robust standard errors and specifying the proper variance-covariance matrix. To test for general specification error, the Ramsey RESET test will be employed on the baseline models. However, it is expected that the null hypothesis of no specification error will be rejected given the large number of observations in each model (Studenmund, 2006) (Kennedy, 2008).

Outliers will be determined based on Kennedy’s (2008) criteria: observations with residuals less than -2 or greater than 3 will be tested for statistical significant as outliers. If outliers are found to be significant then the models will be corrected. Influential observations are those which significantly change regression coefficients with their inclusion or exclusion and will be examined in continuous variables with a wide range (Studenmund, 2006) (Kennedy, 2008). Income is an example of a variable with a wide range (due to large positive skewness) and a likely candidate for testing. This paper will use Hamilton’s (2012) criteria for influential observations: those with Pregibon Delta-Beta influence statistics greater than the value of 2 divided by the square root of the sample size. Any influential observations will be tested for statistical significance.

# Results and Outcomes

## Summary Statistics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 1: Summary Statistics of Selected Model Variables** | | | |  |  |  |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | N | Mean | Median | St.Dev. | Min | Max |
|  |  |  |  |  |  |  |
| Month of Expenditures | 1,332 | 5.667 | 5 | 3.591 | 1 | 12 |
| Monthly Social Mobility Expenditures | 1,332 | 350.2 | 0 | 8,366 | -920 | 302,000 |
| Number of EITC Eligible Dependents | 1,332 | 1.642 | 2 | 1.356 | 0 | 6 |
| % of CUs Having At Least 3 EITC Eligible Dependents | 1,332 | 0.264 | 0 | 0.441 | 0 | 1 |
| Dollar Amount of EITC Received | 1,332 | 210.1 | 0 | 825.3 | 0 | 5,657 |
| Monthly After-Tax Income | 1,332 | 2,706 | 2,383 | 2,137 | -2,235 | 18,083 |
| Total Liquid Wealth at Beginning of Month | 1,332 | 7,381 | 100 | 56,397 | -2,700 | 692,557 |
| Interaction of Having 3-or-More EITC Eligible Dependents & EITC Amount | 1,332 | 93.19 | 0 | 607.4 | 0 | 5,657 |
| CU Census Region of Residence (code) | 1,296 | 1.819 | 2 | 1.032 | 0 | 3 |
| Age of CU Reference Person | 1,332 | 42.84 | 42 | 15.41 | 18 | 87 |
| Age-Squared of CU reference person | 1,332 | 2,073 | 1,764 | 1,536 | 324 | 7,569 |
| % of CUs Living in Urban Areas | 1,332 | 0.939 | 1 | 0.239 | 0 | 1 |
| % of CUs Owning a Home | 1,332 | 0.510 | 1 | 0.500 | 0 | 1 |
| CU Education Level (code) | 1,332 | 1.825 | 2 | 1.551 | 0 | 6 |
| CU Reference Person's Race (code) | 1,332 | 1.095 | 1 | 1.276 | 0 | 6 |
| % of CUs That Are Married | 1,332 | 0.532 | 1 | 0.499 | 0 | 1 |
| % of CUs with Professional Occupation | 1,332 | 0.279 | 0 | 0.449 | 0 | 1 |
| % of CUs living in Poverty | 1,332 | 0.411 | 0 | 0.492 | 0 | 1 |
| Sex (% Female) | 1,332 | 0.549 | 1 | 0.498 | 0 | 1 |
|  |  |  |  |  |  |  |

Table 1 above lists the summary statistics for the variables included in the regression models for households receiving the EITC. There are 148 unique CUs receiving the EITC with 9 unique calendar-month expenditure observations (i.e. n=1,332). Of those 1,332 unique CU-month observations, 1,254 observations (approximately 94.1 percent) had a value of zero for social mobility expenditures. There were also two observations (approximately 0.2 percent) with negative social mobility expenditure values. The continuous variables—income, wealth, expenditures, and the credit amount—all have absolutely large standard deviations relative to their means and medians. Furthermore, income and wealth have suspect maximum values relative to the EITC population expectations.

However, after extensive line-item review of those observations with large observations of monthly income and total liquid wealth, those observations do not violate the imputation procedures for determining EITC recipients and the credits received. The after-tax income measure collected in the CES captures many forms of income, such as welfare benefits, Foodstamp benefits, and Supplemental Security Income (SSI), that are not counted towards receipt of EITC according to the IRS (2010). Furthermore, the measure in the CES includes all federal, local, and state tax net refunds. Both of these measures can inflate the measured after-tax income while still not violating the conditions of EITC receipt. For the individuals with extremely large amounts of liquid wealth, those individuals had large capital losses over the year and low levels of EITC-eligible income otherwise. Based on the instructions in the 2009 1040 Form (U.S. Internal Revenue Service, 2010), those capital losses should not push their AGI out of EITC-eligibility. These observations with extremely large relative income and wealth will be tested as outliers and influential observations as detailed above.

The median EITC credit was $1,569 (when excluding observations outside of the receipt months) and the median monthly after-tax income was $2,383. In the month the EITC was received, it represents a 66 percent increase in regular income. Thus, the potential to boost social mobility expenditures is large. There may be issues of purchase inertia however. The median monthly social mobility expenditures are $0.00 and the 90th percentile of social mobility expenditures is also $0.00. Thus, many EITC households are already spending nothing on social mobility and may simply not include the possibility of social mobility spending in their purchasing decisions. Nevertheless, the EITC provides a significant boost to disposable income and possible social mobility spending.

Social mobility expenditures and monthly after-tax income have negative values due to some of their components. For social mobility expenditures, the spending on savings and financial products can be negative if CUs withdraw any pre-existing value on those products. For example, if a CU liquidates stocks or withdraws from a savings account, then that represents negative social mobility expenditures. If a CU uses that liquidation to cross-subsidize other social mobility expenditures, for example drawing down savings to pay for college tuition, then this represents a net-zero effect on total social mobility expenditures and thus would not be counted as a negative net social mobility spending value. Monthly after-tax income can be negative if a CU paid more in taxes than earned or if a CU suffered asset-income losses. The next section will present and discuss the results of the regression analysis.

## Baseline Regression Results

Table 2a below displays the marginal effect estimates of the baseline model regression results. There are some very obvious issues with the baseline model. First, out of 1,332 potential observations, only 76 observations are included in the model. The reason for this being that 1,256 observations had either a zero or negative value for social mobility expenditures and thus had a non-existent natural log of social mobility expenditures value. This small sample size seriously diminishes the representativeness of the sample and its external validity. Second, the marginal effects are absolutely large with very large standard errors. This produces estimates that are all statistically insignificant from zero.

These small-sample issues make it difficult to substantively discuss the results as well as test for robustness of the estimates and data. To alleviate these issues, the baseline model will instead

|  |  |
| --- | --- |
| **Table 2a: Baseline Marginal Effects** |  |
| **Dep Var: Natural Log of Expenditures ($'s)** |  |
|  | (1) |
| VARIABLES | OLS |
|  |  |
| Interaction of Having 3-or-More EITC Eligible Dependents & EITC Amount | -1,730 |
|  | (2,634) |
| CUs Having At Least 3 EITC Eligible Dependents = 1, 3 or More EITC Eligible Dependents | 4.337e+06 |
|  | (6.595e+06) |
| Dollar Amount of EITC Received | 2,013 |
|  | (3,007) |
| CU Census Region of Residence = 1, Midwest | -4.359e+06 |
|  | (6.928e+06) |
| CU Census Region of Residence = 2, South | -1.582e+06 |
|  | (3.456e+06) |
| CU Census Region of Residence = 3, West | 612,463 |
|  | (2.770e+06) |
| Age of CU Reference Person | 189,144 |
|  | (400,772) |
| Age-Squared of CU reference person | -1,538 |
|  | (4,257) |
| CU Living in Urban Areas = 1, omitted | - |
|  |  |
| CU Owning a Home = 1, Owns Home | -619,158 |
|  | (1.785e+06) |
| CU Education Level = 1, High School | 2.525e+06 |
|  | (4.257e+06) |
| CU Education Level = 2, Some College | 199,414 |
|  | (1.737e+06) |
| CU Education Level = 3, Associate's | 5.947e+06 |
|  | (8.835e+06) |
| CU Education Level = 4, Bachelor's | 3.589e+06 |
|  | (5.749e+06) |
| CU Education Level = 5, Master's | -293,972 |
|  | (2.390e+06) |
| CU Education Level = 6, Professional/Doctorate | 1.041e+07 |
|  | (1.747e+07) |
| Monthly After-Tax Income | -174.9 |
|  | (574.4) |
| CU Reference Person's Race = 1, Black | 1.910e+06 |
|  | (3.023e+06) |
| CU Reference Person's Race = 2, Hispanic | 363,664 |
|  | (1.621e+06) |
| CU Reference Person's Race = 4, Asian | -1.454e+06 |
|  | (2.674e+06) |
| CU Reference Person's Race = 5, Other | 3.862e+06 |
|  | (6.420e+06) |
| CU Marital Status = 1, Married | 3.781e+06 |
|  | (5.509e+06) |
| CU with Professional Occupation = 1, Principal Occupation Professional | -487,181 |
|  | (1.318e+06) |
| Number of EITC Eligible Dependents | -2.187e+06 |
|  | (3.224e+06) |
| CU living in Poverty = 1, CU Living In Poverty | -333,546 |
|  | (1.116e+06) |
| CU Reference Person Sex = 1, Female | 2.868e+06 |
|  | (4.241e+06) |
| Total Liquid Wealth at Beginning of Month | 33.48 |
|  | (63.42) |
| Month of Expenditures = 2, February | -284,471 |
|  | (1.296e+06) |
| Month of Expenditures = 3, March | -747,478 |
|  | (1.576e+06) |
| Month of Expenditures = 4, April | 473,494 |
|  | (1.382e+06) |
| Month of Expenditures = 5, May | 131,914 |
|  | (1.126e+06) |
| Month of Expenditures = 6, June | 1.939e+06 |
|  | (3.087e+06) |
| Month of Expenditures = 7, July | 2.911e+06 |
|  | (4.396e+06) |
| Month of Expenditures = 11, November | -1.158e+06 |
|  | (2.397e+06) |
| Month of Expenditures = 12, December | -1.483e+06 |
|  | (2.618e+06) |
|  |  |
| Observations | 76 |

|  |  |
| --- | --- |
| **Table 2b: Marginal Effects** |  |
| **Dep Var: Expenditures ($'s)** |  |
|  | (1) |
| VARIABLES | OLS |
|  |  |
| Interaction of Having 3-or-More EITC Eligible Dependents & EITC Amount | -0.00138 |
|  | (0.576) |
| CUs Having At Least 3 EITC Eligible Dependents  = 1, 3 or More EITC Eligible Dependents | 362.2 |
|  | (988.0) |
| Dollar Amount of EITC Received | 0.0542 |
|  | (0.428) |
| CU Census Region of Residence = 1, Midwest | -457.8 |
|  | (906.4) |
| CU Census Region of Residence = 2, South | 388.5 |
|  | (755.3) |
| CU Census Region of Residence = 3, West | -370.8 |
|  | (819.5) |
| Age of CU Reference Person | 22.92 |
|  | (85.45) |
| Age-Squared of CU reference person | -0.322 |
|  | (0.877) |
| CU Living in Urban Areas = 1, Urban Area | -274.1 |
|  | (1,071) |
| CU Owning a Home = 1, Owns Home | -650.7 |
|  | (604.9) |
| CU Education Level = 1, High School | -129.3 |
|  | (753.4) |
| CU Education Level = 2, Some College | 29.00 |
|  | (759.4) |
| CU Education Level = 3, Associate's | -331.9 |
|  | (1,108) |
| CU Education Level = 4, Bachelor's | 69.99 |
|  | (969.2) |
| CU Education Level = 5, Master's | 407.7 |
|  | (1,374) |
| CU Education Level = 6, Professional/Doctorate | 14,420\*\*\* |
|  | (2,195) |
| Monthly After-Tax Income | -0.349\*\* |
|  | (0.144) |
| CU Reference Person's Race = 1, Black | -419.1 |
|  | (774.4) |
| CU Reference Person's Race = 2, Hispanic | -148.9 |
|  | (661.6) |
| CU Reference Person's Race = 4, Asian | 215.7 |
|  | (1,258) |
| CU Reference Person's Race = 5, Other | 73.64 |
|  | (1,774) |
| CU Marital Status = 1, Married | 571.7 |
|  | (617.8) |
| CU with Professional Occupation = 1, Principal Occupation Professional | -20.05 |
|  | (663.8) |
| Number of EITC Eligible Dependents | -302.4 |
|  | (358.0) |
| CU living in Poverty = 1, CU Living In Poverty | -701.4 |
|  | (549.5) |
| CU Reference Person Sex = 1, Female | -69.59 |
|  | (564.8) |
| Total Liquid Wealth at Beginning of Month | -6.94e-05 |
|  | (0.00452) |
| Month of Expenditures = 2, February | -2,081\*\* |
|  | (999.7) |
| Month of Expenditures = 3, March | -2,264\*\* |
|  | (1,017) |
| Month of Expenditures = 4, April | -1,999\*\* |
|  | (1,002) |
| Month of Expenditures = 5, May | -1,853\* |
|  | (985.4) |
| Month of Expenditures = 6, June | -2,110\*\* |
|  | (987.1) |
| Month of Expenditures = 7, July | -2,188\*\* |
|  | (985.6) |
| Month of Expenditures = 11, November | -2,176\*\* |
|  | (985.8) |
| Month of Expenditures = 12, December | -2,177\*\* |
|  | (985.8) |
| Constant | 3,798 |
|  | (2,497) |
|  |  |
| Observations | 1,294 |
| R-squared | 0.056 |
| Standard errors in parentheses |  |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 |  |

use the level amount of social mobility expenditures. Table 2b above displays the marginal effect estimates of the modified-baseline model regression results.

The effect of the primary research variable suggests that the MPC on social mobility expenditures is negative 0.0013. For each additional dollar of the EITC received by households with 3 or more eligible dependents relative to households with 2 or fewer eligible dependents, social mobility expenditures decrease by $0.0013. This effect, however, is statistically insignificant from zero. The timing effects are all statistically significant at least at the 10 percent level, with most significant at the 5 percent level. Their marginal effects suggest that the MPC of social mobility expenditures decreases in all months relative to January. The marginal effects of the dummy variable for doctorate/professional degree and monthly after-tax income were statistically significant at the 5 percent level. However, the negative effect of after-tax monthly income seems counterintuitive while the effect of the professional/doctorate degree dummy is rather large.

One of the major issues with using OLS for this data is that it treats zero expenditures equally to non-zero expenditures. Models that appropriately control for this censoring issue and their results will be discussed in the succeeding section. Next, this paper will discuss robustness checks on the regression sample. These robustness checks help remove imperfections and issues that otherwise may be biasing the results.

## Robustness Checks

Table 3 below presents the results of the multi-collinearity tests using the variance inflation factor (VIF) and condition number of the model. Per the criteria for multi-collinearity discussed in Baum (2006), Studenmund (2006) and Kennedy (2008), only age and age-squared have a concerning VIF above 5. However, this is to be expected given that age is a component of age squared. The collinearity of age and age-squared likely pulls the model condition number is above 30. Given the low VIF of most model variables and the possibility of omitted variable bias from variable deletion, no attempts to correct for multi-collinearity will be made.

Table 4 presents the results of the heteroskedasticity tests using White’s test and the Breush-Pagan/Cook-Weisberg test for heteroskedasticity. The null-hypothesis of these tests is that the error terms are homoskedastic. A rejection of the null hypothesis therefore suggests that the error

|  |  |  |
| --- | --- | --- |
| **Table 3: Multi-Collinearity Checks** |  |  |
|  | (1) | (2) |
| VARIABLES | Condition Number | Variance-Inflation Factor (VIF) |
| Condition Number for Model | 73.61 |  |
|  |  |  |
| Mean VIF |  | 3.67 |
|  |  |  |
| Interaction of Having 3-or-More EITC Eligible Dependents & EITC Amount |  | 2.16 |
|  |  |  |
| CUs Having At Least 3 EITC Eligible Dependents  = 1, 3 or More EITC Eligible Dependents |  | 3.45 |
|  |  |  |
| Dollar Amount of EITC Received |  | 2.28 |
|  |  |  |
| CU Census Region of Residence = 1, Midwest |  | 2.25 |
|  |  |  |
| CU Census Region of Residence = 2, South |  | 2.43 |
|  |  |  |
| CU Census Region of Residence = 3, West |  | 2.64 |
|  |  |  |
| Age of CU Reference Person |  | 32.12 |
|  |  |  |
| Age-Squared of CU reference person |  | 33.45 |
|  |  |  |
| CU Living in Urban Areas = 1, Urban Area |  | 1.25 |
|  |  |  |
| CU Owning a Home = 1, Owns Home |  | 1.69 |
|  |  |  |
| CU Education Level = 1, High School |  | 2.02 |
|  |  |  |
| CU Education Level = 2, Some College |  | 2 |
|  |  |  |
| CU Education Level = 3, Associate's |  | 1.72 |
|  |  |  |
| CU Education Level = 4, Bachelor's |  | 1.9 |
|  |  |  |
| CU Education Level = 5, Master's |  | 1.47 |
|  |  |  |
| CU Education Level = 6, Professional/Doctorate |  | 1.62 |
|  |  |  |
| Monthly After-Tax Income |  | 1.76 |
|  |  |  |
| CU Reference Person's Race = 1, Black |  | 1.59 |
|  |  |  |
| CU Reference Person's Race = 2, Hispanic |  | 1.72 |
|  |  |  |
| CU Reference Person's Race = 4, Asian |  | 1.36 |
|  |  |  |
| CU Reference Person's Race = 5, Other |  | 1.19 |
|  |  |  |
| CU Marital Status = 1, Married |  | 1.76 |
|  |  |  |
| CU with Professional Occupation = 1, Principal Occupation Professional |  | 1.62 |
|  |  |  |
| Number of EITC Eligible Dependents |  | 4.31 |
|  |  |  |
| CU living in Poverty = 1, CU Living In Poverty |  | 1.36 |
|  |  |  |
| CU Reference Person Sex = 1, Female |  | 1.46 |
|  |  |  |
| Total Liquid Wealth at Beginning of Month |  | 1.23 |
|  |  |  |
| Month of Expenditures = 2, February |  | 1.83 |
|  |  |  |
| Month of Expenditures = 3, March |  | 1.89 |
|  |  |  |
| Month of Expenditures = 4, April |  | 1.83 |
|  |  |  |
| Month of Expenditures = 5, May |  | 1.78 |
|  |  |  |
| Month of Expenditures = 6, June |  | 1.77 |
|  |  |  |
| Month of Expenditures = 7, July |  | 1.78 |
|  |  |  |
| Month of Expenditures = 11, November |  | 1.78 |
|  |  |  |
| Month of Expenditures = 12, December |  | 1.78 |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **Table 4: Heteroskedasticity Checks** |  |  |
|  | (1) | (2) |
| HETEROSKEDASTICITY TEST | χ Statistic | P-Value |
|  |  |  |
| White's Test | 722.57 | 0.0000 |
|  |  |  |
| Breusch-Pagan/Cook-Weisberg Test | 79.36 | 0.0000 |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **Table 5: Specification Checks** |  |  |
|  | (1) | (2) |
| SPECIFICATION TEST | F Statistic | P-Value |
|  |  |  |
| Ramsey RESET Test | 890.6 | 0.0000 |
|  |  |  |

terms are heteroskedastic. As seen in table 4, both tests conclusively show the present of heteroskedasticity in the model. To correct for this, all models in the sensitivity analysis will use cluster-robust standard errors, with the cluster variable being the unique CU. Table 5 above presents the results of the Ramsey RESET test which tests for general specification error in the model. The null hypothesis of this test is no omitted variables or no specification errors. Rejecting the null hypothesis implies that there is some specification error, whether that be the functional form of the variables or omitting relevant variables. The RESET test conclusively rejects the null hypothesis and suggests there is some specification error. However, it is expected that the null hypothesis of no specification error will be rejected in models with a large number of observations (Studenmund, 2006) (Kennedy, 2008). Thus, nothing will be changed in the sensitivity analysis regarding specification.

Table 6 below presents the results of the effect of potential outliers on the model. Outliers were determined based on Kennedy’s (2008) criteria: observations with residuals less than -2 or greater than 3. A dummy variable for if an observation was an outlier was created and social mobility expenditures was regressed on it and all other model variables. If the dummy variable for outliers was statistically significant, then further models will be corrected by dropping outliers. The results of table 6 do not include the coefficients of the other covariates for brevity’s sake. As seen in table 6, the coefficient on outliers is statistically insignificant. Therefore, no corrections for outliers will be made in subsequent models.

|  |  |
| --- | --- |
| **Table 6: Outliers** |  |
| **Dep Var: Expenditures ($'s)** |  |
|  | (1) |
| VARIABLES | OLS |
|  |  |
| Outliers | -1.237629 |
|  | (4969.086) |
|  |  |
| Constant | 3798.896 |
|  | (5475.337 |
|  |  |
| Observations | 1,294 |
| R-squared | 0.0563 |
| Standard errors in parentheses |  |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 |  |

|  |  |
| --- | --- |
| **Table 7: Influential Observations** |  |
| **Dep Var: Expenditures ($'s)** |  |
|  | (1) |
| VARIABLES | OLS |
|  |  |
| Influential Observations | 21520.24\*\*\* |
|  | (4412.838) |
|  |  |
| Constant | 1608.51 |
|  | (2514.827) |
|  |  |
| Observations | 1,294 |
| R-squared | 0.0738 |
| Standard errors in parentheses |  |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 |  |

Table 7 above presents of the effect of potential influential observations on the model. Influential observations were determined use Hamilton’s (2012) criteria for influential

observations: those with Pregibon Delta-Beta influence statistics greater than the value of 2 divided by the square root of the sample size (n=1,294). A dummy variable for if an observation was an influential observation was created and social mobility expenditures was regressed on it and all other model variables. If the dummy variable for influential observations was statistically significant, then further models will be corrected by dropping influential observations. The results of table 7 do not include the coefficients of the other covariates for brevity’s sake. As seen in table 7, the coefficient on influential observations is statistically significant at the one-percent level. Therefore, all subsequent models will drop influential observations. The next section will discuss the results of the alternative econometric specifications with the robustness checks implemented.

## Sensitivity Analysis

Table 8 below displays the results of all the econometric specifications with the robustness checks for heteroskedasticity and influential observations implemented. Out of 1,332 possible observations each model includes 1,279 observations. The models dropped 15 influential observations, 2 observations with negative social mobility expenditure values, and 36 observations where the value for region was missing. Across the different econometric specifications, the effect of the primary research variable (top row) is generally negative and relatively small. Furthermore, it’s statistical significant varies across the models. Examining just columns (2) through (5), the specifications that control for zero expenditure values (hereby referred to as zero-controlling models), the primary research variable is statistically significant at the 10 percent level in three out of four of those models. These models suggest that the MPC on social mobility expenditures ranges from -0.062 to 0.324. For each additional dollar of the EITC received by households with 3 or more eligible dependents relative to households with 2 or fewer eligible dependents, social mobility expenditures range from decreasing by $0.062 to increasing by $0.324.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 8: Marginal Effects** |  |  |  |  |  |
| **Dep Var: Expenditures ($'s)** |  |  |  |  |  |
|  | (1) | (2) | (3) | (4) | (5) |
| VARIABLES | OLS | GLM | Tobit | Zero Inflated Poisson (ZIP) | Cragg's Hurdle (CHurdle) |
|  |  |  |  |  |  |
| Interaction of Having 3-or-More EITC Eligible Dependents & EITC Amount | -0.0590 | -0.0617 | 0.324\*\* | -0.00136\*\*\* | -0.00120\* |
|  | (0.0809) | (0.0656) | (0.153) | (0.000509) | (0.000704) |
| CUs Having At Least 3 EITC Eligible Dependents = 1, 3 or More EITC Eligible Dependents | 62.22 | 183.5 | 1,362\*\*\* | -0.549 | 0.0141 |
|  | (128.1) | (425.7) | (368.7) | (1.517) | (2.956) |
| Dollar Amount of EITC Received | 0.0631 | 0.0535 | 0.183 | 0.00207\*\*\* | 0.00122\* |
|  | (0.0749) | (0.0439) | (0.123) | (0.000681) | (0.000721) |
| CU Census Region of Residence = 1, Midwest | 64.12 | 57.03 | 1,922\*\*\* | -1.211 | -0.580 |
|  | (86.37) | (82.30) | (334.0) | (1.243) | (2.993) |
| CU Census Region of Residence = 2, South | 54.93 | 25.36 | 5,158\*\*\* | -1.574 | -0.554 |
|  | (71.68) | (44.28) | (374.6) | (2.423) | (1.808) |
| CU Census Region of Residence = 3, West | 266.6\*\* | 551.0 | 6,314\*\*\* | 0.210 | 0.429 |
|  | (111.1) | (425.5) | (355.7) | (2.525) | (1.510) |
| Age of CU Reference Person | 16.51 | 38.14\*\* | 373.8\*\*\* | 0.281 | -0.0543 |
|  | (16.28) | (18.90) | (9.636) | (0.337) | (0.343) |
| Age-Squared of CU reference person | -0.181 | -0.435\*\* | -4.663\*\*\* | -0.00311 | 0.00114 |
|  | (0.165) | (0.215) | (0.154) | (0.00429) | (0.00412) |
| CU Living in Urban Areas = 1, Urban Area | 90.19 | 134.8\*\*\* | 36,460\*\*\* | -3.703 | -0.620 |
|  | (65.94) | (30.86) | (433.4) | (0) | (0) |
| CU Owning a Home = 1, Owns Home | -59.29 | -44.56 | 55.34 | -0.853 | -0.800 |
|  | (73.33) | (73.42) | (348.7) | (1.322) | (1.215) |
| CU Education Level = 1, High School | 103.1 | 1,486 | 3,650\*\*\* | 1.932 | 0.0773 |
|  | (84.16) | (4,722) | (351.8) | (1.735) | (2.752) |
| CU Education Level = 2, Some College | 101.6 | 2,054 | 4,548\*\*\* | 1.358 | -0.657 |
|  | (107.8) | (6,775) | (323.1) | (2.271) | (1.975) |
| CU Education Level = 3, Associate's | 357.7 | 10,985 | 6,456\*\*\* | 3.059\*\*\* | 0.129 |
|  | (216.6) | (38,138) | (322.9) | (1.180) | (4.066) |
| CU Education Level = 4, Bachelor's | 155.0 | 1,844 | 2,875\*\*\* | 1.142 | -0.0732 |
|  | (135.8) | (6,274) | (326.4) | (1.318) | (3.264) |
| CU Education Level = 5, Master's | -50.39 | 862.9 | 5,379\*\*\* | -0.950 | -1.440 |
|  | (108.3) | (3,214) | (334.4) | (3.417) | (2.201) |
| CU Education Level = 6, Professional/Doctorate | -470.0 | -134.6 | -37,246 | -0 | 0.820 |
|  | (309.5) | (393.5) | (0) | (0) | (0) |
| Monthly After-Tax Income | 0.00576 | 0.0388 | 0.137 | -0.000305 | -0.000119 |
|  | (0.0211) | (0.0338) | (0.112) | (0.000217) | (0.000378) |
| CU Reference Person's Race = 1, Black | -66.64 | -52.84 | -2,628\*\*\* | 1.107 | -0.192 |
|  | (70.15) | (49.27) | (324.1) | (1.884) | (1.575) |
| CU Reference Person's Race = 2, Hispanic | 32.36 | 127.5 | -1,567\*\*\* | -0.296 | 0.496 |
|  | (110.2) | (129.7) | (306.2) | (1.142) | (0.936) |
| CU Reference Person's Race = 4, Asian | 108.9 | 155.3 | 2,500\*\*\* | -0.140 | -0.461 |
|  | (343.1) | (160.5) | (437.7) | (1.203) | (1.244) |
| CU Reference Person's Race = 5, Other | 4.731 | 65.73 | -573.1\*\* | -1.276 | -1.046 |
|  | (146.1) | (165.6) | (291.5) | (2.587) | (3.795) |
| CU Marital Status = 1, Married | 126.2 | 254.0\* | -161.7 | 2.510\*\*\* | 0.578 |
|  | (96.95) | (147.5) | (338.9) | (0.686) | (1.893) |
| CU with Professional Occupation = 1, Principal Occupation Professional | 112.4 | 71.19 | 2,284\*\*\* | -0.0183 | 0.648 |
|  | (98.43) | (104.6) | (302.8) | (1.719) | (1.118) |
| Number of EITC Eligible Dependents | -48.52 | -95.59 | -60.02 | -0.291 | -0.444 |
|  | (58.92) | (69.25) | (146.8) | (0.381) | (1.084) |
| CU living in Poverty = 1, CU Living In Poverty | 99.57 | 326.4 | 2,935\*\*\* | -0.408 | -0.979 |
|  | (75.92) | (220.3) | (309.9) | (0.860) | (1.126) |
| CU Reference Person Sex = 1, Female | 8.139 | 167.0 | 600.0\* | 0.320 | 0.0286 |
|  | (77.49) | (175.6) | (344.3) | (0.734) | (1.867) |
| Total Liquid Wealth at Beginning of Month | -0.000572 | -0.00868 | -0.0113\*\*\* | -2.69e-05 | -3.28e-06 |
|  | (0.000394) | (0.00771) | (0.00151) | (2.23e-05) | (3.43e-05) |
| Month of Expenditures = 2, February | 24.45 | 0.384 | -1,039\*\*\* | 0.530 | -0.482 |
|  | (146.1) | (156.5) | (255.4) | (0.808) | (0.671) |
| Month of Expenditures = 3, March | -158.8\*\* | -160.1\*\* | -1,549\*\*\* | -1.286 | -0.766 |
|  | (76.01) | (72.61) | (263.2) | (0.831) | (0.715) |
| Month of Expenditures = 4, April | -1.249 | 19.11 | -1,679\*\*\* | -0.595 | -0.105 |
|  | (145.4) | (154.3) | (274.1) | (0.854) | (0.689) |
| Month of Expenditures = 5, May | 134.2 | 176.4 | -1,031\*\*\* | 0.812 | -0.716 |
|  | (227.6) | (250.6) | (256.7) | (0.713) | (0.881) |
| Month of Expenditures = 6, June | -128.9\* | -142.9\*\* | -3,620\*\*\* | 1.249\*\* | -0.0268 |
|  | (69.73) | (69.81) | (241.9) | (0.545) | (1.270) |
| Month of Expenditures = 7, July | -59.33 | -98.03 | -3,310\*\*\* | 1.971\*\* | -0.576 |
|  | (124.6) | (113.1) | (250.5) | (0.981) | (2.469) |
| Month of Expenditures = 11, November | -127.8\*\* | -145.9\*\* | -4,581\*\*\* | 0.645 | 0.00240 |
|  | (53.28) | (59.09) | (269.0) | (0.428) | (1.351) |
| Month of Expenditures = 12, December | -128.8\*\* | -147.0\*\* | -4,830\*\*\* | 0.484 | -0.503 |
|  | (53.31) | (59.20) | (253.2) | (0.370) | (0.893) |
|  |  |  |  |  |  |
| Observations | 1,279 | 1,279 | 1,279 | 1,279 | 1,279 |
| Standard errors in parentheses |  |  |  |  |  |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

The effect of the EITC alone is statistically significant across only two out of the four zero-controlling models and the MPC of the EITC ranges from 0.0012 to 0.0021 in those models. None of the other co-variates are generally statistically significant across the four zero- controlling models and the Tobit model seems to generate statistical significance indiscriminately.

# Discussion

## Policy Implications

Just examining the four zero-weighting models, the results generally disprove this paper’s central hypothesis that the MPC on the interaction of the EITC and households with 3 or more EITC eligible dependents is positive. Only the Tobit model found a statistically significant and positive MPC of 0.324. The other three zero-weighting models all found negative MPCs with practically small MPCs of -0.06 to -0.001. Outside of the Tobit model, these results suggest that there is almost a zero effect from the expansion of the EITC in 2009 on social mobility expenditures. Despite then-Senator Kerry’s (U.S. Congress, 2009) desire to use the EITC as tool to lift families out of poverty, it seems based on these results that the EITC expansion did little to prime social mobility spending. Looking at just the MPC of the EITC alone, the results are not encouraging. Only two of the four zero-weighting models had statistically significant results and the MPCs ranged from 0.001 to 0.002, suggesting a very small practical effect of the EITC in general on social mobility expenditures. These results suggest that the EITC lessens the burden of being poor more than it promotes upward social mobility and that the families with 3 or more eligible dependents use their EITC on fewer social mobility purchases than families with 2 or fewer eligible dependents.

Policymakers should view having more children as a significant constraint on upward social mobility and that simply increasing the EITC will not alleviate that burden in a significant way. The EITC may be useful as expansionary fiscal policy in regards to general consumption, but as an antipoverty tool it seems to provide little relief for large families in its current form. One option could be simply increasing the credit even more for larger families. There may be a threshold or tipping point for large families that is not yet met by the current EITC amounts. Another option could be to provide EITC recipients with more family-planning education or to remove the 3-or-more dependents category of the EITC. These results suggest that families with fewer dependents purchase more social mobility goods with their EITC. In theory, the larger credit amount for families with three or more eligible dependents incentivizes having a larger family which in turns reduces the ability for upward social mobility. Maintaining these increases from ARRA but eliminating the three-or-more category may change the incentive structure.

Overall, the ARRA EITC expansion provided a useful natural experiment that demonstrated in this case that additional EITC dollars to larger families generally does not increase social mobility purchases relative to smaller families. Policymakers should consider other alternatives for reducing poverty and promoting social mobility rather than simply increasing the EITC. This setback does not mark the ARRA and the EITC overall as failures, but it does raise concerns about the intended anti-poverty policy goals of the EITC.

## Issues for Future Research

The research conducted here was by no means perfect. The goods measured as social mobility goods (cars, property, education, etc.) may have unique purchasing times not properly captured by the model of this paper. For example, college tuition is typically paid for shortly before the start of each academic semester. If a semester starts in the fall, then payment might be due in August. The model used in this paper did not capture expenditures in August. The timing of some expenditures may have been missed and thus the effects measured here may have underestimated the true effect.

Having more data would also improve the model. Of the 1,332 CU-month observations, approximately 94 percent of those observations had zero social mobility expenditures. With so few non-zero observations there may not have been enough variation in the dependent variable to produce accurate and reliable results. Even using special econometric techniques that account for this censoring may not solve the issue of having data with little variation. One other issue is the effect of the EITC was only measured in the one month recipients actually received it. It is possible that EITC affects consumption decisions in months other than the one when it is received. Appropriately controlling for that is an area of future research.

The rotating panel method used in the CES limits the number of unique CUs for study. To minimize imputation error, this paper only used CUs surveyed such that their EITC qualification variables were all captured with minimal precision error as well as their expenditures outside of the modal months of EITC receipt. By examining expenditures only in the months of February through April, for example, more non-zero observations of spending and more unique CUs could have been studied, which should improve the accuracy and reliability of the results. While this alternative does not solve the issues discussed prior, it does potentially improve the number of non-zero values of social mobility expenditures.

Comparing the social mobility expenditures of EITC recipients to non-recipients may also provide useful evidence for the anti-poverty policy goals of the EITC. This line of study would be useful in determining what variables affect household spending on social mobility goods while also exploring how much of an anti-poverty effect the EITC has on its recipients compared to the general population.

# Conclusion

This research is important because it provides evidence on how the creation of a new EITC category—3 or more eligible dependents—affected spending on social mobility goods. The EITC is meant to help working individuals and families who have low to moderate incomes. It was structured to require recipients have earned income to combat the disincentive to work from a traditional negative income tax and spur labor supply decisions. Ideally, these labor force decisions combined with the benefit of the credit should reduce poverty rather than simply lessening the burden of being poor.

Thus, by looking at the effect of the EITC on social mobility spending we can learn if recipients are indeed spending on meritorious goods. The results of this paper show that the MPC on social mobility expenditures for each additional dollar of the EITC received by households with 3 or more eligible dependents relative to households with 2 or fewer eligible dependents ranges from -0.062 to 0.324. Policymakers should be cautious to view the EITC as lessening the root causes of poverty as it may not be providing the opportunity it might be thought to otherwise. The EITC for all recipients had an MPC of 0.001 to 0.002 on social mobility expenditures and showed signs of weakness in the sensitivity analysis. The EITC is an extremely popular policy and should be continually evaluated to ensure it is effective as it ages.

# Bibliography

Adams, F. Gerard, and Byron Gangnes. "The Employment Effects of Fiscal Policy." (2010).

Agarwal, Sumit, Chunlin Liu, and Nicholas S. Souleles. *The reaction of consumer spending and debt to tax rebates--evidence from consumer credit data*. No. w13694. National Bureau of Economic Research, 2007.

Angrist, Joshua D., and Jörn-Steffen Pischke. *Mostly harmless econometrics: An empiricist's companion*. Princeton university press, 2008.

Barrow, Lisa, and Leslie McGranahan. "The effects of the earned income credit on the seasonality of household expenditures." *National Tax Journal* (2000): 1211-1243.

Baum, Christopher F. *An introduction to modern econometrics using Stata*. Stata press, 2006.

Bertrand, Marianne, and Adair Morse. "What Do High-Interest Borrowers Do with Their Tax Rebate?" *The American Economic Review* 99, no. 2 (2009): 418-423.

Blinder, Alan S. "Temporary income taxes and consumer spending." (1978).

Cogan, John F., Tobias Cwik, John B. Taylor, and Volker Wieland. "New Keynesian versus old Keynesian government spending multipliers." *Journal of Economic dynamics and control* 34, no. 3 (2010): 281-295.

Cragg, John G.. 1971. “Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods”. *Econometrica* 39 (5). [Wiley, Econometric Society]: 829–44. doi:10.2307/1909582.

Drautzburg, Thorsten, and Harald Uhlig. "Fiscal stimulus and distortionary taxation." *Review of Economic Dynamics* 18, no. 4 (2015): 894-920.

Elmendorf, Douglas W., and Jason Furman. "If, when, how: A primer on fiscal stimulus." (2008).

Engelhardt, Gary V. "Consumption, down payments, and liquidity constraints." Journal of Money, Credit and Banking (1996): 255-271.

Federal Deposit Insurance Corporation. *Weekly National Rates and Rate Caps*. FIL-25-2009. Washington, DC, 2009. https://www.fdic.gov/regulations/resources/rates/ (accessed April 4, 2016).

Feyrer, James, and Bruce Sacerdote. *Did the stimulus stimulate? real time estimates of the effects of the american recovery and reinvestment act*. No. w16759. National Bureau of Economic Research, 2011.

Gao, Qin, Neeraj Kaushal, and Jane Waldfogel. "How have expansions in the earned income tax credit affected family expenditures." *Welfare reform and its long term consequences for America's poor* (2009): 104-139.

Hamilton, Lawrence. *Statistics with Stata: version 12*. Cengage Learning, 2012.

Hubbard, R. Glenn, Kenneth L. Judd, Robert E. Hall, and Lawrence Summers. "Liquidity constraints, fiscal policy, and consumption." *Brookings Papers on Economic Activity* 1986, no. 1 (1986): 1-59.

Ilienko, Andrii. "Continuous counterparts of Poisson and binomial distributions and their properties." *arXiv preprint arXiv:1303.5990* (2013).

Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles. *Household expenditure and the income tax rebates of 2001*. No. w10784. National Bureau of Economic Research, 2004.

Jones, Andrew M. "A double‐hurdle model of cigarette consumption." *Journal of applied econometrics* 4, no. 1 (1989): 23-39.

Kennedy, Peter. "A Guide to Modern Econometrics." (2008).

Lambert, Diane. "Zero-inflated Poisson regression, with an application to defects in manufacturing." *Technometrics* 34, no. 1 (1992): 1-14.

Lauderdale, Benjamin E. "Compound Poisson–Gamma regression models for dollar outcomes that are sometimes zero." *Political Analysis* 20, no. 3 (2012): 387-399.

Scott Long, J. "Regression models for categorical and limited dependent variables." *Advanced quantitative techniques in the social sciences* 7 (1997).Liebman, Jeffrey B. "The impact of the earned income tax credit on incentives and income distribution." In *Tax Policy and the Economy, Volume 12*, pp. 83-120. MIT Press, 1998.

Mendenhall, Ruby, Kathryn Edin, Susan Crowley, Jennifer Sykes, Laura Tach, Katrin Kriz, and Jeffrey R. Kling. "The role of Earned Income Tax Credit in the budgets of low-income families." *Social service review* 86, no. 3 (2012): 367-400.

Meyer, Bruce D., and Dan T. Rosenbaum. *Welfare, the earned income tax credit, and the labor supply of single mothers*. No. w7363. National Bureau of Economic Research, 1999.

Meyer, Bruce D. "The effects of the Earned Income Tax Credit and recent reforms." In *Tax Policy and the Economy, Volume 24*, pp. 153-180. The University of Chicago Press, 2010.

Modigliani, Franco, Charles Steindel, Saul H. Hymans, and F. Thomas Juster. "Is a tax rebate an effective tool for stabilization policy?" *Brookings Papers on Economic Activity* 1977, no. 1 (1977): 175-209.

Newman, Carol, Maeve Henchion, and Alan Matthews. "A double-hurdle model of Irish household expenditure on prepared meals." *Applied Economics* 35, no. 9 (2003): 1053-1061.

Parker, Jonathan A. "The reaction of household consumption to predictable changes in social security taxes." *The American Economic Review* 89, no. 4 (1999): 959-973.

Poterba, James M. "Are consumers forward looking? Evidence from fiscal experiments." *The American Economic Review* 78, no. 2 (1988): 413-418.

Rhine, Sherrie, Sabrina Su, Yazmin Osaki, and Steven Lee. "Householder response to the earned income tax credit: Path of sustenance or road to asset building." *New York, NY: Federal Reserve Bank of New York* (2005).

Romer, Christina, and Jared Bernstein. "The job impact of the American recovery and reinvestment plan." (2009).

Sahm, Claudia R., Matthew D. Shapiro, and Joel Slemrod. "Household Response to the 2008 Tax Rebate: Survey Evidence and Aggregate Implications." In *Tax Policy and the Economy, Volume 24*, pp. 69-110. The University of Chicago Press, 2010.

Salkever, David. “The Retransformation Problem.” Lecture, Public Policy 608 Class Applied Multivariate Regression from University of Maryland Baltimore County, Baltimore, MD, April 22, 2015.

Shapiro, Matthew D., and Joel Slemrod. "Did the 2001 tax rebate stimulate spending? Evidence from taxpayer surveys." In *Tax Policy and the Economy, Volume 17*, pp. 83-110. MIT Press, 2003.

Shapiro, Matthew D., and Joel B. Slemrod. *Did the 2008 tax rebates stimulate spending?*. No. w14753. National Bureau of Economic Research, 2009.

Shea, John. "Myopia, liquidity constraints, and aggregate consumption: a simple test." *Journal of money, credit and banking* 27, no. 3 (1995): 798-805.

Simpson, Nicole B., Jill Tiefenthaler, and Jameson Hyde. "The impact of the earned income tax credit on economic well-being: A comparison across household types." *Population Research and Policy Review* 29, no. 6 (2010): 843-864.

Smeeding, Timothy M., Katherin Ross Phillips, and Michael A. O'Connor. "The EITC: Expectation, knowledge, use, and economic and social mobility.” *Center for Policy Research Working Paper* 13 (2000).

Smets, Frank, and Rafael Wouters. "Shocks and frictions in US business cycles: A Bayesian DSGE approach." *National bank of belgium working paper* 109 (2007).

Souleles, Nicholas S. "Consumer response to the Reagan tax cuts." *Journal of Public Economics* 85, no. 1 (2002): 99-120.

Souleles, Nicholas S. "The response of household consumption to income tax refunds." *The American Economic Review* 89, no. 4 (1999): 947-958.

Spader, Jon, Janneke Ratcliffe, and Michael A. Stegman. *Transforming tax refunds into assets: A panel survey of VITA clients in Greenville, Henderson, and Raleigh, North Carolina*. Center for Community Capital, 2005.

Stephens, Melvin. "’3rd of the month’: Do Social Security recipients smooth consumption between checks?" *The American Economic Review* 93.1 (2003): 406-422.

Steuerle, C. Eugene. "Mobility, the Tax System, and Budget for a Declining Nation: Testimony Before the US Senate Finance Committee." (2012).

Studenmund, A. "H.(2006): Using Econometrics." *A Practical Guide, 5th ed., Boston et al* (2006).

Taylor, John B. "An empirical analysis of the revival of fiscal activism in the 2000s." *Journal of Economic Literature* (2011): 686-702.

U.S. Bureau of Labor Statistics. “2009 Consumer Expenditure Diary Survey Public Use Microdata User’s Documentation”. Washington, DC: GPO, 2010.

U.S. Bureau of Labor Statistics. “2009 Consumer Expenditure Interview Survey Public Use Microdata User’s Documentation”. Washington, DC: GPO, 2010.

U.S. Congress. *Congressional Record*. 111th Cong., 1st sess., 2009. Vol. 155, pt. 34.

U.S. Congressional Budget Office. “Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output in 2014.” CBO-49958 (Washington, DC, 2015), https://www.cbo.gov/publication/49958.

U.S. Internal Revenue Service. “ARRA and the Earned Income Tax Credit.” Washington, DC, 2016. https://www.irs.gov/uac/ARRA-and-the-Earned-Income-Tax-Credit (accessed February 29, 2016).

U.S. Internal Revenue Service. “1040 Instructions 2009.” Washington, DC, 2010. https://www.irs.gov/pub/irs-prior/i1040--2009.pdf (accessed February 29, 2016).

U.S. Internal Revenue Service. “EITC Eligibility Rules for 2009 Tax Year Outlined.” Washington, DC, 2015. https://www.irs.gov/uac/EITC-Eligibility-Rules-for-2009-Tax-Year-Outlined (accessed February 29, 2016).

Wendy, Carlin, and David Soskice. "Macroeconomics: Imperfections, Institutions & Policies." (2006).

“What Is the Difference Between AGI and MAGI on Your Taxes?” *Intuit Turbotax*. Accessed February 29, 2016. <https://turbotax.intuit.com/tax-tools/tax-tips/IRS-Tax-Return/What-Is-the-Difference-Between-AGI-and-MAGI-on-Your-Taxes-/INF22699.html>.

Yen, Steven T. "Working wives and food away from home: the Box-Cox double hurdle model." *American Journal of Agricultural Economics* 75, no. 4 (1993): 884-895.

Zandi, Mark, and Alan Blinder. "How the Great Recession was Brought to an End." *Economy. com, July* 27 (2010).

Zeldes, Stephen P. "Consumption and liquidity constraints: an empirical investigation." *The Journal of Political Economy* (1989): 305-346.

1. These multipliers are the average of each quarterly multiplier for the given years. [↑](#footnote-ref-2)
2. Although this simulation differs significantly from the specific policy mechanisms being studied, it helps to illustrate behavioral effects from a sudden increase in disposable income due to a change in tax policy. [↑](#footnote-ref-3)
3. Liquidity constraints are defined as the inability of households or consumers to borrow against future earnings in order to optimize consumption spending in the current period (Hubbard et al. 1986) (Zeldes, 1989) (Shea, 1995) (Engelhardt, 1996). [↑](#footnote-ref-4)
4. This was assuming that 25 percent of the population was liquidity constrained, or “rule of thumb” as called by the authors, and that these individuals received 25 percent of all ARRA transfers. For a more complete discussion on their sensitivity analysis regarding liquidity constrained individuals see pages 28 to 30 of Drautzberg & Uhlin (2011). [↑](#footnote-ref-5)
5. Of those individuals who participated in both the first and second surveys, 28.1 percent reported the tax rebate lead to mostly increased spending (Shapiro & Slemrod, 2003b). [↑](#footnote-ref-6)
6. Concerning the survey methodology, each month 300 new respondents are selected by random digit dial and 200 respondents are re-interviewed from six months earlier (Shapiro and Slemrod, 2008). [↑](#footnote-ref-7)
7. The tax rebates were primarily received in May and June 2008. The authors found no significant differences between responses provided prior-to and during rebate reception. [↑](#footnote-ref-8)
8. Although a positive labor supply effect from a change in EITC is helpful for growing an economy, the immediate need of the economy in the midst of the 2008-2009 recession was not more workers. Quite the contrary, employers were shedding workers at an alarming rate. [↑](#footnote-ref-9)
9. Improving social mobility included expenditures on general savings, paying off bank loans, car payments, credit card bills, medical bills, purchasing or repairing a car, sharing money with family members, fixing up a home, moving expenses, tuition/school expenses, child care bills, and paying off personal loans. [↑](#footnote-ref-10)
10. The percentages add up to greater than 100 percent because these categories are not mutually exclusive. [↑](#footnote-ref-11)
11. See previous section for a further discussion on Taylor’s (2011) methodological weaknesses. [↑](#footnote-ref-12)
12. BLS notes that adjustments to CUs based on the CPS are based on CU member composition and the CU as a whole. The weights are adjusted to meet CPS controls for age/race categories, regions, region/urban categories, and ownership of living quarters categories (U.S. Bureau of Labor Statistics, 2010a) (U.S. Bureau of Labor Statistics, 2010b). [↑](#footnote-ref-13)
13. All fields are eligible for imputation except fields related to assets. [↑](#footnote-ref-14)
14. See U.S. Internal Revenue Service (2010) for a full listing of EITC amounts by income, family structure, and number of children. [↑](#footnote-ref-15)
15. See U.S. Internal Revenue Service (2010) for a full listing of EITC amounts by income, family structure, and number of children. [↑](#footnote-ref-16)
16. Suppose a regression model with Y as its dependent variable and X and Z as independent variables. Assume that in the regression model Y is measured in its natural logarithmic form such that the model takes the form of ln(Y) = β0 + β1X + β2Z + µi. Suppose the results are used to estimate the marginal effect of X on the conditional expected value of Y (E[Y|X, Z]). However, unadjusted marginal effect estimates of X find the marginal effect of X on E[ln(Y)|X, Z] rather than E[Y|X, Z]. Since does not equal E[Y|X, Z], does not equal the marginal effect of X on E[Y|X, Y]: “exp” is the exponentiation factor or Euler’s number. Thus generally, E[Y|X] is equal to where Y is some dependent variable measured in logarithmic form, X is some independent variable, and µ is the residual for the ith observation of n total observations. [↑](#footnote-ref-17)