The Relationship between Parental Receipt of the Earned Income Tax Credit and Children's High School Dropout Status

By Galen Savidge-Wilkins

ABSTRACT

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The Earned Income Tax Credit was established to provide low-income families with relief from the payroll tax, but it has grown over time to become the largest means-tested cash transfer program in the United States and one of the most substantial federal supports for the working poor. Although the EITC has been studied extensively, the literature has largely focused on its ability to encourage work, particularly among mothers (Eissa and Liebman 1996; Eissa and Hoynes 1998; Meyer and Rosenbaum 2001). There is a growing research literature on other effects of the EITC, including its impact on child cognitive ability and maternal health (Dahl and Lochner 2011; Evans and Garthwaite 2011). However, there is little research into how this component of the safety net impacts a key outcome for children: high school graduation. Using data from the National Longitudinal Survey of Youth on mothers and their children to construct a rich personal history for each child, this study examines the relationship between parental receipt of the Earned Income Tax Credit and children's likelihood of graduating from high school on time. Within this study's sample, EITC receipt is found to be most strongly associated with on-time graduation when these benefits are received during two life stages: before the children enter school and when children are in middle school. The results indicate that a $1,000 increase in average yearly real EITC receipt before the children enter school is associated with a 6.80

percentage point increase in the likelihood of finishing high school on time, and with a 1.56 percentage point improvement when that same increase in average real EITC receipt occurs during middle school. Analyses of specific disadvantaged subgroups yield statistically significant results during the same life stages and a stronger positive relationship between EITC receipt and high school graduation.

I. INTRODUCTION

As the Great Recession eases for some and drags on for many more, it is becoming clear that the impacts of the downturn and prospects for recovery vary enormously across individuals. One of the widest divides, even prior to the economic downturn that began in the winter of 2007, was between adults who completed high school and their peers who dropped out. Failing to complete high school is associated not only with a negative cultural perception but also with important adverse outcomes that include poor labor market performance and an array of negative social issues ranging from imprisonment to poor health later in life (Amos 2008). When high school dropouts enter the workforce, they do so with lower cognitive abilities, fewer demonstrated academic skills, and

"When high school dropouts enter the workforce, they do so with lower cognitive abilities, fewer demonstrated academic skills, and more pronounced behavior problems ..."

more pronounced behavior problems that may impact soft skills in the work world (Sellers 2011). Average earnings for high school dropouts in 2009 were $19,540, as compared to $27,380, $36,190, and $46,930 for individuals with high school diplomas, associate's degrees, and bachelor's degrees, respectively (Amos 2008). As of 2011, with employment growth relatively stagnant, high school dropouts face 14.9 percent unemployment compared to 10.3 percent for high school graduates and 5.4 percent for bachelor's degree holders (Bureau of Labor Statistics 2011).

A wide variety of interventions are aimed at mitigating the effects of personal, academic, and family factors associated with dropping out of high school. This research focuses on identifying the relationship between high school graduation and the Earned Income Tax Credit (EITC), a significant family support policy that is not directly intended to enhance educational attainment or to prevent dropout among the children of the recipients, but can substantially boost the incomes of poor families. The Brookings Institution estimates that in 2010 $374 billion, or 11 percent of all federal expenditures, went to programs

Figure 1. 2010 Earned Income Tax Credit by Filing Status and Number of Children
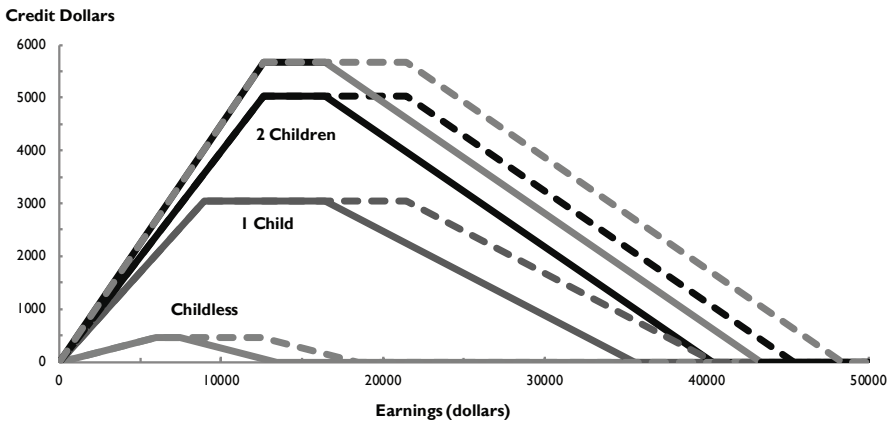
Source: EITC parameters taken from http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=36

or policies benefitting children (Isaacs et al. 2011). This includes $58 billion in expenditures on the EITC, the largest means-tested cash transfer program in the federal budget. Using data from the National Longitudinal Survey of Youth on mothers from the 1979 cohort and their children, I construct a rich personal history for each child and his or her family to examine the relationship between parental receipt of the Earned Income Tax Credit and their children's likelihood of graduating from high school on time.

II. BACKGROUND

The Earned Income Tax Credit

The Earned Income Tax Credit is a provision of the tax code that is designed to benefit low- and moderate-income workers. Established in 1975, the EITC was originally intended to be an offset to the payroll tax for low-income workers (Hotz and Scholz 2002). The program has since grown to be the single largest cash

assistance program targeted at low- and moderate-income workers in the United States, disbursing $58 billion in refunds and reduced tax liability in 2009 (Internal Revenue Service 2011). The EITC's benefit schedule functions through the tax code and is designed to encourage work. Its refundable structure means poor filers with little tax liability receive the balance of the credit in the form of a check from the IRS. The value of the credit varies by income, marital status, and number of dependent children, but the average refund check received in 2009 was $2,770 for a filer with children and $259 for a childless filer (Center on Budget and Policy Priorities 2011).

The structure of the EITC for every category of filer can be broken down into three primary pieces: the phase-in stage, the plateau stage, and the phase-out stage. Figure 1 depicts these stages for both single and married filers. The phase-out stages are shown as the solid lines on the left for single filers and the dashed lines on the right for married

"Estimates indicate that cash delivered through the EITC lifts millions of children and families out of poverty every year; this effect has grown during economic downturns, possibly shielding a generation of children from the potentially damaging long-term effects of poverty."

filers. During the phase-in stage, the credit increases in value as a percentage of every dollar earned, effectively acting as a wage subsidy, up to the maximum dollar amount of the credit. In the plateau region the credit remains constant until earned income reaches the phase-out point. Beyond this point, each additional dollar of earned income reduces the value of the benefit until the amount of the credit received reaches zero. The three-stage design and the variations that exist across the spectrum of tax filers receiving the EITC create a variety of incentives for beneficiaries of this conditional cash assistance program.

High School Dropout Rates

The National Center for Education Statistics at the US Department of Education tracks two important measures that fit the general perception of a high school dropout rate. The *status completion rate* tracks 18-24 year olds who have earned a diploma, irrespective of when it was earned. The *average freshman graduation rate* estimates the proportion of high school students who graduate with a diploma four years after starting the ninth grade (Chapman 2010). Nationally in 2008,

the status completion rate was 89.9 percent, and the average freshman graduation rate was 74.9 percent (Chapman 2010). According to the data, high school dropouts are more likely to be male than female, dropout rates are higher among Hispanics and African Americans than their white and Asian-American peers, low-income students are more likely to drop out than their more economically well-off peers, and students from the West and South drop out more frequently than students in the Midwest and Northeast (Rumberger 2004). The dropout rates by gender, race, socioeconomic status, and region all declined between the mid-1970s and 1990, rose slightly until 1995, and have declined steadily since then (Chapman 2010).

III. LITERATURE REVIEW

The focus on the EITC's potential to improve outcomes for the children of its recipients is motivated by a growing body of literature linking poverty during childhood to a range of negative outcomes later in life (Duncan 1998; Holzer et al. 2007; Moore 2009). Estimates indicate that cash delivered through the EITC lifts millions of children and families out of poverty every year; this effect has grown during economic downturns, possibly shielding a generation of children from the potentially damaging long-term effects of poverty (Eamon and Wu 2009). With the focus on the EITC, I hope to contribute to the understanding of how near-term increases in family income impact a

particular long-term outcome—high school completion—for children in low- and moderate-income families.

The EITC is designed to encourage work and to ensure that individuals, particularly parents, do not fall below a certain base income if they participate in the labor force. Research on the impact of the EITC has focused primarily on mothers' decisions to enter the labor force (Eissa and Liebman 1996; Eissa and Hoynes 1998; Meyer and Rosenbaum 2001). Other studies focus on the EITC's impact on various parental and child outcomes, such as maternal health and children's cognitive abilities, and hypothesize that the EITC can be beneficial for children and their families (Dahl and Lochner 2011; Evans and Garthwaite 2011).

Research surrounding the theoretical assumptions that encourage work generally exploits statutory changes to the EITC during major expansions as an exogenous source of variation to isolate the impact of the program (Eissa and Liebman 1996; Eissa and Hoynes 1998; Hotz and Scholz 2005). Comparing single mothers to other single women before and after the 1986 expansion, Eissa and Liebman find an increase in labor force participation among single mothers receiving the EITC and no measurable reductions in hours worked among those already in the labor force (1996). Additionally, Eissa and Nichols examine wage data around major expansion periods and find no clear evidence that increases in EITC benefits are offset by a reduction in wages among the recipients (2005).

In an attempt to provide insight into how EITC receipt changes behavior and outcomes among recipients and their children, there is a growing body of research examining how refund checks are spent. Families seem to treat the money delivered through the EITC differently than other sources of income. The literature shows that the EITC is largely received and spent during February and March, indicating that many families anticipate a tax refund (Goodman-Bacon and McGranahan 2008). The families receiving the credit generally spend the large infusion of income on durable home goods, transportation needs like auto repair, and payment of bills, debt, and rent (Goodman-Bacon and McGranahan 2008; Smeeding et al. 1999). These expenditures tend to increase economic stability or provide support when a family faces hardships that could adversely impact their children's education (Smeeding et al. 1999; Mendenhall et al. 2012).

A meta-analysis of existing research concludes that the major expansions of the EITC in the early 1990s were more important contributors to the increased labor market participation of single women than welfare reform or a booming economy in that decade (Hoynes 2008). Because the EITC plays such a major role in the economic lives of low-income mothers, researchers have sought to identify other aspects of life that the credit impacts. Increases in the credit have been linked to improvements in the self-reported mental and physical health when comparing mothers with one and two

children around the time of the 1993 expansion (Evans and Garthwaite 2011). Indirect relationships like this one are not limited to adults. Dahl and Lochner instrument for family income using exogenous changes in EITC benefit levels and find that additional income increases cognitive development as measured by reading and math scores among the children of recipients (2011).

The implications of child poverty are important to understanding the ways in which the EITC has the capacity to address educational outcomes as it boosts family incomes. Research indicates that poverty—measured through mediating factors such as physical and mental health, home environment, and educational resources—has a negative relationship with a range of child cognitive development measures (Yeung et al. 2002). The anti-poverty impact on children's outcomes could be substantial, given that the EITC reduced the child poverty rate by nearly 20 percent in 2005 (Eamon and Wu 2009). The hypothesis that the EITC will have a positive impact on the school achievement of recipients' children is based in the program's demonstrated ability to lift children out of poverty and increase family stability.

High School Dropout Rates

Examining the factors associated with high school completion provides more insight into my particular research question. Studies estimating the effects of income on children using sibling fixed-effects models find that

increased income, particularly during early childhood, is associated with higher levels of school completion (Duncan et al. 199; Levy and Duncan 1999). Increased family income is also associated with improvements in individual and household characteristics that are associated with school success such as stress, supportive parenting, and acquisition of developmentally stimulating home resources (Yeung et al. 2002). Individual student predictors, such as earlier academic performance and behavioral characteristics, combine with demographics, family resources, and school characteristics to provide a broad picture of what determines whether students will complete high school (Rumberger and Lim 2008). The general consensus within the literature is that failing to complete school is the result of an additive process in which multiple factors from early childhood through the teenage years (e.g., educational performance, school quality, and family characteristics) can push a child to drop out of school (Rumberger 2004).

IV. DATA & METHODS

I utilize data from the National Longitudinal Survey of Youth 1979 (NLSY79) and NLSY Child and Young Adult Survey (C-NLSY) to match information on mothers with information on their children. This allows me to build individual observations containing detailed family information that can be used to measure the relationship between the EITC and dropout status. I am

then able to construct a detailed cross section in which the unit of analysis is the child.

The NLSY79 is a nationally representative sample of non-institutionalized individuals who were between 14 and 22 years of age when the survey was first administered in 1979 (Bureau of Labor Statistics 2008). The survey collects detailed information about labor market activity, earnings, a range of family outcomes, and individual background data. The C-NLSY is composed of the children born to women in the original NLSY79 survey. The C-NLSY, which was first administered in 1986, asks questions similar to the questions asked in the NLSY79, but it includes more detail on parenting and individual developmental milestones for each child.

Matching all available data from NLSY79 and C-NLSY yields a full sample of 4,929 mothers and 11,495 children. The population of analysis is constructed from children who have valid information regarding high school completion and who have reached the age at which high school graduation is possible. On-time graduation in the model is defined as having completed 12th grade before the child's 20th birthday. This binary variable represents a close approximation of the average freshman graduation rate, the on-time graduation measure tracked by the National Center for Education Statistics (Chapman et al. 2010). Limiting the sample to those children and their parents, I retain 2,464 mothers with

"Studies estimating the effects of income on children using sibling fixed effects models find that increased income, particularly during early childhood, is associated with higher levels of school completion."

4,015 children. Because many mothers in this sample have more than one child tracked by the C-NLSY, parental and family characteristics are replicated for siblings in a given year.

The Earned Income Tax Credit is only tracked by the NLSY79 biennially starting in 1999. In order to create a consistent series of EITC benefits over the full range of time, data necessary to measure eligibility for the EITC—mother's income, spouse's income, qualifying child dependents, and marital status—are imputed for every year in the survey. Because the NLSY began interviewing biennially starting in 1994, personal income and spouse's income are both interpolated for years in which the survey was not conducted by using an average of income from the years surrounding that in which the value is missing.

In order to impute EITC information, I utilize the tax micro-simulation tool TAXSIM, administered by the National Bureau of Economic Research and maintained by Daniel Feenberg. TAXSIM utilizes data on income, marital status, and number of dependents to calculate each family's eligibility level for the EITC in a tax year (Feenberg and Coutts 1993). TAXSIM does not, however, determine the likelihood of filing a return or the

specific take-up of the EITC. Therefore, every value obtained in this imputation process is the level of EITC eligibility for a family in a given year and not necessarily an exact benefit amount received. Estimates of the take-up rate range from 80 to 87 percent, and there is insufficient evidence within the NLSY79 to distinguish recipients of the credit from non-recipients (Hotz and Scholz 2002). I utilize the approach taken by Dahl and Lochner, which is to use TAXSIM-generated eligibility values for the analysis and implicitly assume full take-up of the EITC (2011).

Model

I construct a linear probability model depicted below in which the dependent variable of interest is the categorical variable completed 12 years of education before the age of 20.

$Pr_{(1-0)}$ *On-Time High School Graduate$_i$ = β_0+ β_1 Parental EITC Receipt$_i$+ β_2Family Economic Measures$_i$ + β_3Maternal Background Characteristics$_i$ + β_4Child Background Characteristics$_i$ + e_i*

The key independent variable of interest is *Parental EITC Receipt.* In order to reduce omitted variable bias in the estimates of the relationship between EITC receipt and child educational attainment, I control for other variables that are plausibly correlated with receiving the credit and high school graduation. The personal history for each child is represented by three vectors of covariates: *Family Economic Measures, Maternal Background Characteristics,* and *Background Characteristics* of the children in the sample.

Table 1. Graduation Rates Among Children in Study Sample		
Characteristic	Number of Cases	Percent Graduated
Full Sample:		
Average Freshman Graduation Rate	4,015	47.8
Status Completion Rate	4,015	70.1
By Subgroup:		
Male	2,029	41.4
Female	1,986	54.4
White	1,751	51.3
Black	1,353	44.1
Hispanic	911	46.5
Parents in Poverty Before Birth	1,683	39.5
Father was not in Household at Birth	1,160	46.7
Attended Head Start School	890	37.5

AFGR computed using number of children completing 12 years of education before age 20.

SCR computed using number of children completing 12 years of education before age 25.

Rates given in subgroup analysis computed in AFGR.

Table 2. Mean Real EITC Levels by Life Stage				
Life Stage	Full Sample		Ever Received EITC	
	Average given year of receipt	Average total receipt in stage	Average given year of receipt	Average total receipt in stage
Lifetime EITC	$542.50	$9,140.80	$687.90	$11,592.00
	$(613.60)	$(10,542.60)	$(614.30)	$(10,608.40)
EITC in Early Childhood	$333.60	$3,181.10	$423.10	$4,034.10
	$(450.50)	$(4,311.30)	$(468.60)	$(4,486.70)
EITC in Late Childhood	$814.80	$5,959.70	$1,033.40	$7,557.90
	$(1,035.00)	$(7,822.30)	$(1,064.20)	$(8,094.40)
EITC Before School Years	$232.50	$1,358.50	$294.80	$1,722.80
	$(331.90)	$(1,945.50)	$(348.40)	$(2,042.60)
EITC in Elementary School	$484.90	$1,822.50	$614.90	$2,311.30
	$(782.60)	$(2,975.90)	$(834.80)	$(3,178.30)
EITC in Middle School	$747.10	$2,765.10	$947.40	$3,506.60
	$(1,103.90)	$(4,189.10)	$(1,164.40)	$(4,433.40)
EITC in High School	$859.20	$3,194.60	$1,089.70	$4,051.20
	$(1,260.40)	$(4,787.60)	$(1,328.00)	$(5,059.40)
	n=4015		n=3166	

Standard deviations in parenthesis.

Real values given in 2008 dollars, calculated from the CPI-U RS.

V. DESCRIPTIVE ANALYSIS

Table 1 contains a breakdown of the two distinct dropout rates: the average freshman completion rate and the status completion rate among the children in the sample. Specific rates are also listed among subpopulations of interest. Table 2 contains descriptive statistics on the EITC variables that are used as the independent variables of interest in later regression models. I present frequency distributions for a range of categorical background characteristics among the mothers in the sample in Table 3, and background characteristics specific to the children in the sample are illustrated in Table

4. Summary statistics for continuous variables used as background characteristics of both mothers and their children are presented in Table 5.

High school graduation data representing the dependent variable in later analyses are displayed in Table 1. The table shows that 47.8 percent of children in the sample reported that they had reached the equivalent of an on-time high school graduation, 12 years of education before age 20. This rate is well below the national Average Freshman Completion Rate, which was 74.9 percent in 2008 (Chapman et al. 2010). The substantially lower rate in the data is likely due to over sampling

of minorities and more economically disadvantaged mothers in the original NLSY79 cohort. On-time graduation rates among white, African American, and Hispanic children in the sample are lower than those of their peers nationally (Chapman et al. 2010).

The EITC measures used as the independent variables of interest in the multivariate analyses—real average yearly EITC receipt during various childhood life stages—are displayed in Table 2. Average total receipt is also presented to provide a reference point for the amount of EITC the families are receiving, given that many receive the credit in more than one year over these same stages. The simplest measure, average EITC receipt throughout childhood, is presented first. Average EITC is then broken into two groups: receipt over early childhood (years from birth through age 9) and late childhood (ages 10 through 17). Next, average EITC receipt is shown over four distinct child life stages whose lengths roughly approximate different stages in students' school lives. These stages include high school (ages 14 through 17), middle school (ages 10 through 13), elementary school (ages 6 through 9), and before school (birth through age 5). Lower real values of average EITC receipt in earlier stages of the child's life are likely due to the fact that, on average, changes in policy that increased the real value of the EITC came into effect later on average in these children's lives.

Tables 3, 4, and 5, found in the Appendix, display the comprehensive list of parental and child characteristics that are used as covariates in the analyses because of the plausible correlation with both high school graduation and EITC receipt. These variables represent measures of personal disadvantage and health, indicators of background and economic activity, and measures of personal ability. In one clear cross-generational comparison in the data, I include mother's years of educational attainment to gauge success in school and find that 74.3 percent of the sample completed at least 12 years of school. The comparable 70.1 percent status completion rate among the children in the sample represents a small decline from their mothers. However, that decline is much more notable considering that graduation rates have steadily increased over the last three decades. This surprising result could indicate that the children in this sample face more persistent disadvantages than their mothers.

VI. RESULTS

The analysis of the full sample begins with the simplest form of the independent variable of interest, average real EITC receipt. I then allow average real EITC receipt to vary over two and then four stages of a child's life. In Table 6, I present the first specification of the average annual real EITC received over the course of a child's life. I change the specification to two life stages, early and late childhood, in Table 7, and I allow the effect of average EITC receipt to vary over four stages of a child's life in Table 8. In Table 9, I display

Table 6. Full Sample: Lifetime Specification

Full Sample	(1)	(2)	(3)	(4)
	On-Time	On-Time	On-Time	On-Time
VARIABLES	Graduate	Graduate	Graduate	Graduate
Average EITC Lifetime	-0.0559***	0.0339**	0.0202	0.0532***
	(0.0129)	(0.0137)	(0.0141)	(0.0201)
Family Income		X	X	X
Maternal Characteristics			X	X
Child Characteristics				X
Constant	0.509***	0.307***	0.571***	0.558***
	(0.0105)	(0.0160)	(0.0619)	(0.0669)
Observations	4,015	4,015	4,015	4,015
R-squared	0.005	0.069	0.142	0.321

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

results in which I restrict the sample to specific populations of interest in order to directly control for unobserved heterogeneity associated with different forms of disadvantages. In each of these subgroup analyses, I use the four life stages EITC specification. In Table 9, I use the sample of children whose families lived in poverty two years before they were born, whose fathers were not present in their household the year that they were born, and who attended Head Start Preschool. I then use samples of male, white, African American, and Hispanic children. In order to ensure accurate estimates within all models, I utilize a linear probability model, and then I estimate a corresponding logit model to verify that there were no substantial changes from the ordinary least squares estimates in sign or significance.

Intuitively, the most likely explanation for a negative relationship between EITC receipt and graduating from high school in a naïve model is omitted

variable bias; a program designed to provide cash assistance potentially worth thousands of dollars to parents would likely not causally reduce their children's educational attainment. Therefore, when displaying estimates for every results table of the full sample and the subgroup analysis, I construct four models in which a progressively larger number of covariates are added. The first stage in each specification includes a basic regression of the independent variable of interest on the likelihood of on-time high school graduation. In the second model, basic income variables are added to control for family income during the specified period. The third model includes a vector of primarily maternal characteristics, including labor force participation, maternal background, family race, and experience during pregnancy. The most complex model adds child-specific measures such as family structure during the child's life, measures of cognitive ability, behavior

Table 7. Full Sample: Two Life Stage Specification

Full Sample	(1)	(2)	(3)	(4)
VARIABLES	On-Time Graduate	On-Time Graduate	On-Time Graduate	On-Time Graduate
Average EITC Late Childhood	-0.0326*** (0.00862)	0.00561 (0.00878)	0.00813 (0.00885)	0.0170* (0.00958)
Average EITC Early Childhood	-0.00562 (0.0197)	0.0478** (0.0198)	0.0157 (0.0204)	0.0643*** (0.0231)
Family Income		X	X	X
Maternal Characteristics			X	X
Child Characteristics				X
Constant	0.507*** (0.0106)	0.305*** (0.0160)	0.570*** (0.0619)	0.559*** (0.0669)
Observations	4,015	4,015	4,015	4,015
R-squared	0.005	0.069	0.142	0.322

Robust standard errors in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

problems, region of birth, childbearing, and neighborhood characteristics.

The basic bivariate regression in the first model of Table 6 follows the intuition that receiving a larger average benefit over the course of a child's life is highly statistically significantly associated with a decreased likelihood of graduating from high school due to the fact that eligibility is based on disadvantage. In the full model containing all control variables shown in Table 6, the coefficient of 0.0532 indicates that a $1,000 increase in the average EITC benefit received over the course of a child's life is associated with a 5.32 percentage point increase in the likelihood of a child graduating from high school on time.[1] With the baseline graduation rate within the overall

sample at 47.82 percent, a $1,000 increase in average EITC, holding all else constant, is associated with an 11.1 percent increase in graduation likelihood.

The full model in Table 7 shows a positive coefficient on early childhood EITC receipt of 0.0643 that is highly statistically significant at the $p<0.01$ level. This indicates that a $1,000 increase (in 2008 dollars) in the average EITC received during the period of birth through age 9 is associated with a 6.43 percentage point increase in on-time high school completion.[2] The coefficient on EITC receipt in late childhood is statistically

[1] A $1,000 increase in average real EITC over a child's life amounts to a 145.3 percent increase. This is calculated using average real EITC receipt

conditional on ever receiving the credit, shown in Table 2.

[2] A $1,000 increase in average real EITC during early childhood amounts to a 236.4 percent increase. This is calculated using average real EITC receipt conditional on ever receiving the credit, shown in Table 2.

Table 8. Full Sample: Four Life Stage EITC Specification

VARIABLES	(1) On-Time Graduate	(2) On-Time Graduate	(3) On-Time Graduate	(4) On-Time Graduate
Average EITC in High School	-0.0315*** (0.00715)	-0.00142 (0.00733)	0.000201 (0.00722)	0.00564 (0.00706)
Average EITC in Middle School	0.00206 (0.00916)	0.00957 (0.00914)	0.0105 (0.00903)	0.0156* (0.00863)
Average EITC in Elementary School	-0.0218* (0.0131)	-0.00659 (0.0132)	-0.0156 (0.0130)	0.0122 (0.0122)
Average EITC Before School Years	0.0262 (0.0278)	0.0868*** (0.0281)	0.0590** (0.0278)	0.0680** (0.0288)
Family Income		X	X	X
Maternal Characteristics			X	X
Child Characteristics				X
Constant	0.508*** (0.0107)	0.302*** (0.0164)	0.568*** (0.0621)	0.562*** (0.0669)
Observations	4,015	4,015	4,015	4,015
R-squared	0.008	0.070	0.143	0.322

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

significant at the p<0.1 level, but it is smaller in magnitude at 0.017.

Table 8 displays the results of allowing the relationship between average EITC receipt and high school graduation to vary over four life stages.[3] The full model in Table 8 indicates that, holding all else constant, a $1,000 increase in average real annual EITC in years prior to age 6 is associated with a 6.80 percentage point increase in the likelihood that a child will complete high school on time, and the same increase during middle school years is associated with a 1.56 percentage point increase.[4] The coefficient estimates on EITC receipt during high school years and elementary school years are not statistically significant in the full model.

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[3] Additional regressions were estimated using different specifications for the years that made up each life stage, e.g. middle school representing ages 11-13 and elementary school covering ages 5-10. There are some marginal changes to the magnitude of the coefficients for each life stage, but there are no substantive changes in significance and no changes in the sign of any life stage coefficient.

[4] A $1,000 increase in average real EITC before a child enters school amounts to a 339.2 percent increase, and a $1,000 increase in average real EITC during middle school amounts to a 105.5 percent increase. This is calculated using average real EITC receipt conditional on ever receiving the credit, shown in Table 2.

	1	2	3	4	5	6	7
	Poverty Pre-Birth	Father Not Present	Head Start	Male	White	Black	Hispanic
VARIABLES							
Average EITC in High School	0.00290 (0.00947)	-0.00419 (0.0105)	-0.00929 (0.0136)	0.00801 (0.0101)	0.0133 (0.0126)	0.00169 (0.0111)	0.00645 (0.0146)
Average EITC in Middle School	0.0194* (0.0114)	0.0247* (0.0135)	0.00902 (0.0162)	-0.00373 (0.0118)	0.0152 (0.0156)	0.0207 (0.0139)	0.0114 (0.0166)
Average EITC in Elementary School	0.0176 (0.0169)	-0.0156 (0.0208)	0.000477 (0.0222)	0.0105 (0.0164)	0.0577** (0.0201)*	-0.0224 (0.0203)	0.0162 (0.0252)
Average EITC Before School Years	0.0750* -0.043	0.114** (0.0469)	0.0234 (0.0579)	0.112*** (0.0400)	0.0232 (0.0502)	0.0829* (0.0466)	0.119* (0.0629)
Family Income	X	X	X	X	X	X	X
Maternal Characteristics	X	X	X	X	X	X	X
Child Characteristics	X	X	X	X	X	X	X
Constant	0.569*** (0.103)	0.508*** (0.113)	0.540*** (0.155)	0.470*** (0.0952)	0.609*** (0.128)	0.712*** (0.144)	0.419*** (0.147)
Observations	1,683	1,532	890	2,029	1,751	1,353	911
R-squared	0.321	0.319	0.358	0.319	0.299	0.387	0.359

Table 9. Sub-Sample Analyses: Four Life Stage EITC Specification

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Coefficient estimates of the relationship between average EITC receipt and high school graduation for the 1,683 child poverty before birth subsample in Table 9 are slightly larger in magnitude than the results from the full sample. A $1,000 increase in average EITC during middle school is associated with a 1.94 percentage point increase in graduation likelihood, and the same increase in EITC prior to entering school is associated with a 7.50 percentage point increase. This is a 24.4 and 10.3 percent increase, respectively, over the baseline relationship established in the full sample. Limiting the sample to children whose fathers did not live in the child's household during the first year of life, I obtain coefficient estimates for average EITC received during middle school and before entering school that are larger in magnitude than those in the full sample but at roughly the same significance levels. A $1,000 increase in average EITC is associated with an 11.4 percentage point increase in graduation likelihood when it occurs before school years, and the increase in EITC is associated with a 2.47 percentage point increase in on-time graduation when it occurs during middle school. Among this more disadvantaged subgroup, the rate of on-time high school completion is 46.7 percent. This increase of 11.4 percentage points amounts to a 24.4 percent increase in the likelihood of graduation. Only the estimates with fewer covariates yield statistically

significant results for the Head Start subsample. This may be due in part to the small sample size of this subgroup; the 890 Head Start attendees are just more than half the number of children whose families experienced poverty prior to their birth.

Focusing on the male subsample in Table 9, I estimate that a $1,000 increase in the average real EITC is associated with an 11.2 percentage point increase in the likelihood of graduating on time. Stratifying the sample by race and obtaining estimates from the full model yields different results for each subgroup. Among white children, a $1,000 increase in the EITC during elementary school is associated with a 5.8 percentage point increase in on-time graduation. This highly statistically significant (p<0.01) result is the first incidence in which EITC receipt during elementary school had a measurable relationship with graduation. Among African Americans the relationship more closely mirrors disadvantaged subgroups, as a $1,000 increase in EITC receipt prior to attending school is associated (p<0.10) with an 8.3 percentage point increase in on-time graduation. Results indicate that Hispanic children have a similarly statistically significant coefficient on EITC receipt before school years (p<0.10), but the magnitude is larger than any other significant estimate in the full sample or subgroup analysis. Among Hispanic children, a $1,000 increase in average EITC is associated with an 11.9 percentage point increase in the likelihood of graduation.

VII. DISCUSSION

The results of this study support the hypothesis that receipt of the Earned Income Tax Credit is associated with an increased likelihood of graduating from high school on time. I obtain robust results from a series of regressions in a linear probability model because the economic and demographic information available in the NLSY allowed me to include a rich set of covariates from the extensive personal history of each child and his or her family. The relationship between EITC receipt and on-time graduation is strongest when receipt occurs during early childhood, specifically before children enter school, and when the recipients are in more disadvantaged subgroups, including African Americans, Hispanics, children whose families lived in poverty before their birth, and children whose fathers were not living with them at birth. This analysis also indicates that increases in the real value of EITC receipt during middle school years are associated with an increased likelihood of graduation, but the magnitude of that relationship is smaller than during early childhood. The change in sign associated with the inclusion of a range of covariates supports the idea that the naïve bivariate correlation between EITC receipt and on-time graduation is influenced by significant omitted variable bias. Broadly speaking, these results contribute to the growing literature on the relationship between family economic interventions and school outcomes.

"... this analysis indicates that our safety net may have a greater ability than previously thought to address some of our nation's most persistent drivers of poverty and inequality."

Significance in the early childhood and middle school stages of children's lives substantively supports the existing literature because of the rich set of covariates utilized in the models and based on the fact that results are robust when controlling for different forms of unmeasured heterogeneity in the subgroup analyses. The results of this study support the hypothesis that increased income is most beneficial to long-term educational outcomes during early childhood years (Haveman and Wolfe 1995; Duncan et al. 1998; Levy and Duncan 2000). The estimates indicate that a $1,000 increase in average EITC receipt in the years before a child enters school is associated with an increase in on-time graduation of 6.80 percentage points in the full sample, 7.50 percentage points among children whose families lived in poverty before their birth, and 11.4 percentage points in the group whose fathers were not present at birth.

The approach of using life stages when measuring EITC receipt also supports recommendations from practitioners in the dropout prevention field. The National High School Center and the Annie E. Casey Foundation both cite the eighth and ninth grade transition point into high school as a crucial intervention point in reducing the dropout rate (Kennelly and Monrad 2007; Shore and Shore 2009). The

estimates indicate that a $1,000 EITC receipt during middle school is associated with an increase in on-time high school completion of 1.56 percentage points for the full sample, 1.94 percentage points in the family poverty sample, and 2.47 percentage points in the sample without fathers present.

Substantively, the analysis focuses on identifying the relationship between graduation and EITC receipt during children's life stages. Table 2 indicates that a $1,000 increase in EITC benefits amounts to just below one standard deviation in average EITC receipt during middle school, but it represents a roughly three-standard-deviations increase in EITC receipt before the child entered school. However, the real value of the EITC has grown significantly with statutory changes. Although a $1,000 increase in average EITC receipt in the years before a child enters school would represent a more than three-fold increase, a family receiving the maximum credit possible saw that credit increase more than $3,000 in real terms from 1979 to 2008. Understanding the substantive implications of a $1,000 increase in average EITC is important within each life stage, but when comparing results from different life stages it may be more important to look at the significance of the coefficients than at the magnitude.

Careful cost-benefit analysis should be conducted to determine whether increases in real value of the EITC are economically beneficial. The long-term social costs associated with higher dropout rates suggest that

increases in EITC spending could be offset by reductions in other public expenditures in areas such as criminal justice, public benefits, and health care (Alliance for Excellent Education 2011). Similarly, the adverse labor market consequences associated with failing to complete high school appear to be increasing, indicating that the costs of EITC expansion could be offset by increases in economic output and tax revenue (Holzer et al. 2007). However, if increasing the EITC is to be used as an anti-dropout policy tool, more careful analysis should be conducted to determine whether statutory changes should involve a change to the real value of the credit as took place in 1986, or a change to the real value for parents with a certain number of children as in 1993 and 2009. Non-statutory changes, such as outreach and education for low income families about the importance of filing tax returns or assistance in properly claiming the credit, could also be viable approaches for entities that seek to improve outcomes for families through interventions outside of the school. Beyond specific programmatic implications, this analysis indicates that our safety net may have a greater ability than previously thought to address some of our nation's most persistent drivers of poverty and inequality.

VIII. REFERENCES

Alliance for Excellent Education. 2011. The high cost of high school dropouts: What the nation pays for inadequate high schools. Issue Brief, October. www.all4ed.org/files/archive/publications/HighCost.pdf.

Amos, Jason. 2008. Dropouts, diplomas, and dollars: US high schools and the nation's econothe. Alliance for Excellent Education, August. http://www.all4ed.org/files/Econ2008.pdf.

Bureau of Labor Statistics. 2008. The NLSY79 sample: An introduction. http://www.nlsinfo.org/nlsy79/docs/79html/79text/79sample/introsample_1_a.html.

Bureau of Labor Statistics. 2011. Education pays... US Department of Labor. http://www.bls.gov/emp/ep_chart_001.htm.

Center on Budget and Policy Priorities. 2011. Policy basics: The Earned Income Tax Credit. http://www.cbpp.org/cms/index.cfm?fa=view&id=2505.

Chapman, Chris, Jennifer Laird, and Angelina KewalRamani. 2010. Trends in high school dropout and completion rates in the United States: 1972–2008. US Department of Education, National Center for Education Statistics, Compendium Report.

Duncan, Greg, W. Jean Yeung, Jeanne Brooks-Gunn and Judith Smith. 1998. How much does childhood poverty affect the life chances of children? *American Sociological Review* 63, no. 3.

Dahl, Gordon, and Lance Lochner. 2011. The impact of familyincome on child achievement: Evidence from the Earned Income Tax Credit. Working paper no. 14599, National Bureau of Economic Research.

Eamon, Mary Keegan, and Chi-Fang Wu. 2009. Effectiveness and limitations of the Earned Income Tax Credit for reducing child poverty in the United States. *Children and Youth Services Review* 31: 919-926.

Eissa, Nada, and Hilary Hoynes. 1998. The hours of work response of married couples: Taxes and the Earned Income Tax Credit. National Bureau of Economic Research.

Eissa, Nada, and Jefferey Liebman. 1996. Labor supply response to the Earned Income Tax Credit. *The Quarterly Journal of Economics* 111.

Eissa, Nada, and Austin Nichols. 2005. Tax-transfer policy and labor market outcomes. Urban Institute Publications.

Evans, William, and Craig Garthwaite. 2011. Giving mom a break: The impact of higher EITC payments on maternal health. Russell

Sage Foundation.

Feenberg, Daniel, and Elizabeth Coutts. 1993. An introduction to the TAXSIM Model. *Journal of Policy Analysis and Management* 12.

Goodman-Bacon, Andrew and Leslie McGranahan. 2008. How do EITC recipients spend their refunds. *Economic Perspectives* 2Q.

Haveman, Robert, and Barbara Wolfe. 1995. The determinants of children's attainments: A review of methods and findings. *Journal of Economic Literature* 33.

Holzer, Harry, Diane Whitmore Schanzenbach, Greg J. Duncan, and Jens Ludwig. 2007. The economic costs of poverty in the United States: Subsequent effects of growing up poor. Center for American Progress.

Hotz, Joseph, and John Karl Scholz. 2002. The Earned Income Tax Credit. In *Means tested transfer programs in the United States*, edited by Robert Moffitt, 141–198. Chicago: University of Chicago Press.

Hotz, Joseph and John Karl Scholz. 2005. Examining the effect of the Earned Income Tax Credit on the labor market participation of families on welfare. Working Paper #11968, National Bureau of Economic Research.

Hoynes, Hilary. 2008. The Earned Income Tax Credit, welfare reform, and the employment of low-skilled single mothers. Revised draft of paper prepared for Chicago Federal Reserve Bank Conference, November 2007.

Isaacs, Julia, Eugene Steuerle, Stephanie Rennane, and Jennifer Macomber. 2011. Kids share: Report on federal expenditures on children through 2010. The Brookings Institution, The Urban Institute, http://www.brookings.edu/research/reports/2010/07/14-kids-share-isaacs.

Internal Revenue Service. 2011. EITC statistics. US Department of the Treasury, http://www.eitc.irs.gov/central/eitcstats/.

Kennelly, Louise, and Maggie Monrad. 2007. Approaches to dropout prevention: Heeding early warning signs with appropriate interventions. National High School Center.

Levy, Dan, and Greg Duncan. 2000. Using sibling samples to assess the effect of childhood family income on completed school. Working paper, Institute for Poverty Research.

Mendenhall, Ruby, Kathryn Edin, Susan Crowley,

Jennifer Sykes, Laura Tach, Katrin Kriz, and Jeffrey Kling. 2012. The role of the Earned Income Tax Credit in the budgets of low-income families. *Social Service Review*.

Meyer, Bruce, and Dan Rosenbaum. 2001. Welfare, the Earned Income Tax Credit and the labor supply of single mothers. *The Quarterly Journal of Economics* 116.

Moore, Kristen Anderson, Zakia Redd, Mary Burkhauser, Kassim Mbwana, and Ashleigh Collins. 2009. Children in poverty: Trends, consequences, and policy options. *Child Trends* 2009-11.

Morris, Pamela, Greg Duncan, and Christopher Rodrigues. 2004. Does money really matter? Estimating impacts of family income on children's achievement with data from random-assignment experiments. Next Generation Project, MDRC Evaluation.

Rumberger, Russel. 2004. Why students drop out of school. In *Dropouts in America: Confronting the graduation rate crisis*, edited by Gary Orfied, 131–155. Cambridge, MA: Harvard Education Press.

Rumberger, Russel. 2004. What can be done to reduce school dropouts? In *Dropouts in America: Confronting the graduation rate crisis*, edited by Gary Orfied, 243–254. Cambridge, MA: Harvard Education Press.

Rumberger, Russel, and Sun Ah Lim. 2008. Why students drop out of school: A review of 25 years of research. Policy Brief 15, California Dropout Research Project.

Sellers, Kacy. 2011. National graduation rate rebounds; 1.2 million sudents still fail to earn diplomas. Editorial Projects in Education Research Center.

Shore, Rima, and Barbara Shore. 2009. Kids count indicator brief: Reducing the high school dropout rate. Annie E. Casey Foundation.

Smeeding, Timothy, Katherine Ross Phillips, and Michael O'Connor. 1999. The EITC: Expectation, knowledge, use, and economic and social mobility. Paper 147, The Center for Policy Research.

Yeung, Jean, Miriam Linver, Jeanne Brooks-Gunn. 2002. How money matters for young children's development: Parental investment and family processes. Child Development 73, no. 6.

IX. APPENDIX

Table 3. Background of Mothers in Study Sample			
Demographic Characteristic		Number of Cases	Percentage of sample
	Total Children:	4,015	100
	Total Mothers:	2,464	100
Race:	White	1,106	44.9
	Black	826	33.5
	Hispanic	532	21.6
Early Life Experiences:	Born in US	3,691	91.9
	Born Outside of US	324	8.1
	Spoke English at Home	2,972	74.1
	Spoke Another Language	1,043	24.9
	Non-South	2,480	61.7
	South	1,535	38.3
	Non-SMSA	1,157	28.8
	SMSA	2,858	71.2
	Central City (of SMSA)	868	21.6
Education:	Did Not Complete High School	1,035	25.7
	High School Grad or More	2,980	74.3
Pregnancy:	Had a Child as a Teen	354	8.8
	Had a Child >19 y/o	3,661	91.2
Marital Status:	Ever Married	3,438	85.6
	Never Married	577	14.4
	Ever Widowed or Divorced	1,861	46.4
	Never Widowed or Divorced	2,154	53.6

Race is measured as number of mothers in each group.

The unit of analysis in this and every other case is children whose mothers have these characteristics.

Table 4. Background of Children in Study Sample			
Demographic Characteristic		Number of Cases	Percentage of Sample
	Total:	4,015	100
Gender:	Male	2,029	50.5
	Female	1,986	49.5
Race:	White	1,751	53.1
	Black	1,353	27.7
	Hispanic	911	19.2
Region:	Born in Northeast	577	14.4
	Born in South	1,565	39
	Born in West	763	19
	Born in Midwest	984	24.6
Birth Outcomes	Born to Teen Mom	354	8.8
	Mom >19 y/o	3,661	91.2
	Received Prenatal Care	11,311	98.4
	Mom Drank During Pregnancy	4,897	42.6
	Mom Smoked During Pregnancy	3,759	32.7
	Born Underweight	1,058	9.2
	Born Healthy Weight	10,437	90.8
Parents 2 Years Before Birth:	In Poverty	1,683	41.9
	Receiving Public Benefits	709	17.6
Life Outcomes	Attended Head Start	890	22.2
	Lived in an Unsafe Neighborhood	986	24.6
	Had a Sibling who Dropped Out	1,653	41.2
	Had a Child as a Teen	663	16.5

Table 5. Summary Statistics of Continuous Variables for Mothers and Their Children

Demographic Characteristic		Mean	Median	Std. Dev.
Mothers	Number of Children	3.1	3	1.3
	Age at First Birth	20.8	20	3.2
	AFQT Percentile	32.9	27	25.7
	Highest Grade Completed	12.7	12	2.7
	Years Receiving Public Assistance	6.5	3	8.2
	Average Yearly AFDC/TANF	$441.80	$1,758.50	$2,634.80
	Average Yearly SNAP	$688.50	$1,371.80	$1,675.30
	Average Yearly SSI	$692.70	$ 0.00	$1,389.80
Children	PIAT Math Percentile	48.4	48.4	22.8
	PIAT Reading Percentile	54.1	54.1	26.1
	Behavioral Problems Index	61.8	63.8	22.3
	Highest Grade Completed	12.5	12	2.1

Average yearly public assistance is in 2008 real dollars and is calculated conditionally on a family ever receiving benefits.

Children's highest grade is taken from the highest reported level of educational attainment achieved irrespective of when it was achieved.