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The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit†

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Using an instrumental variables strategy, we estimate the causal effect of income on children's math and reading achievement. Our identification derives from the large, nonlinear changes in the Earned Income Tax Credit. The largest of these changes increased family income by as much as 20 percent, or approximately $2,100, between 1993 and 1997. Our baseline estimates imply that a $1,000 increase in income raises combined math and reading test scores by 6 percent of a standard deviation in the short run. Test gains are larger for children from disadvantaged families and robust to a variety of alternative specifications. (*JEL* H24, H31, I21, I38, J13)

In 2008, 13.2 million children in the United States under the age of 18, or more than one in six children, were living in poverty (US Census Bureau 2009). Given such a high poverty rate, the consequences of growing up poor on child well-being and future success has emerged as an important research topic. Of particular interest is whether income support programs like the Earned Income Tax Credit (EITC) can improve child development. The extent to which income maintenance programs, and family income more generally, impact children is not easily estimated, however.

The major challenge faced by researchers attempting to estimate the causal effect of family income on children's outcomes has been the endogeneity of income. Children growing up in poor families are likely to have adverse home environments or face other challenges that would continue to affect their development even if family income were to increase substantially. Furthermore, year-to-year changes in family circumstances like parental job loss or promotion, illness, or moving to a new neighborhood may

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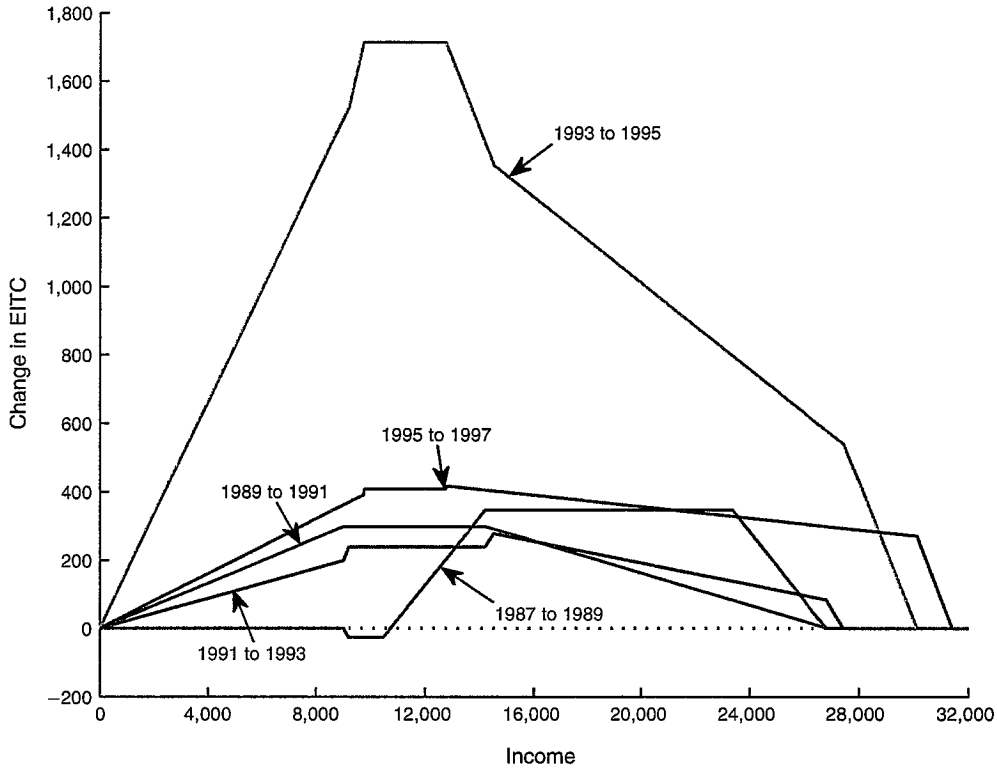

FIGURE 2. TWO-YEAR CHANGES IN EITC SCHEDULES FOR FAMILIES WITH TWO OR MORE CHILDREN
(*Year 2000 dollars*)

this period were sizeable and primarily benefitted low- to middle-income families. Not only did the maximum benefit amount increase substantially, but the range of family income that qualified families for EITC benefits also expanded. The figures show that two-child families with pretax incomes ranging from \$12,000–\$16,000 would have seen their EITC payments increase by as much as \$900 from 1987 to 1993, and another \$2,100 between 1993 and 1997.[2] The maximum subsidy rate for low-income families with 2 children doubled from 19.5 percent to 40 percent of earned income over the latter period. Expansions for single-child families were quite similar to those for two-child families prior to 1993; however, they have been more modest since.

We estimate the impact of changes in family income (resulting from the EITC expansions) on child cognitive achievement. Our estimation strategy is based on the fact that low- to middle-income families benefitted substantially from expansions of the EITC in the late-1980s and mid-1990s while higher-income families did not.

[2] All dollar amounts are reported in year 2000 dollars, using the Consumer Price Index for all Urban Consumers (CPI-U) to adjust for inflation. The Tax Reform Act of 1986 began to adjust maximum credit amounts and phase-in/phase-out regions for cost-of-living changes in years that did not specifically legislate changes in the EITC schedule. The federal tax adjustment, however, is based on the CPI from the previous year (rather than the current year, as used in our calculations). This explains why the reported maximum credit in our figures is about \$30 less in 1989 than it was in 1987.

depression, compared to 14 percent for other kindergartners (Child Trends and Center for Child Health Research 2004). Low-income parents also report a higher level of frustration and aggravation with their children, and these children are more likely to have poor verbal development and exhibit higher levels of distractability and hostility in the classroom (Parker et al. 1999). Two recent papers examine income transfer programs in Canada and the US and find evidence that income transfers improve a family's emotional well-being. Milligan and Stabile (2011) find significant positive effects on self-reported child and maternal mental health, and Evans and Garthwaite (2010) find lower levels of self-reported maternal stress and a drop in the probability of risky levels of biomarkers associated with stress. Extra family income might also matter if parents use the money for child-centered goods like books, for quality daycare or preschool programs, for better dependent health care, or to move to a better neighborhood.[3]

Until very recently, empirical studies linking poverty and income to child outcomes have done little to eliminate biases caused by the omission of unobserved family and child characteristics. Most studies employ regressions of an outcome variable (such as scholastic achievement) on some measure of family income and a set of observable family, child, and neighborhood characteristics. While these studies reveal the correlations between income and child outcomes, they do not necessarily estimate a causal relationship, as Mayer (1997), Duncan and Brooks-Gunn (1997), and others have pointed out. Children living in poor families may have a worse home environment or other characteristics that the researcher does not observe. These omitted variables may be part of the reason for substandard achievement and may continue to affect children's development even if family income were to rise.

Duncan et. al (1998), Blau (1999), and Levy and Duncan (1999) use fixed effects estimation strategies to eliminate biases caused by permanent family or child characteristics. All three studies use differences in family income levels across siblings to remove fixed family factors when estimating the impacts of income on child outcomes. Using Panel Study of Income Dynamics data, both Duncan et al. (1998) and Levy and Duncan (1999) find that family income at early ages is more important for determining educational attainment whether they control for fixed family effects or not. Using data from the Children of the NLSY, Blau (1999) reaches somewhat different conclusions. He estimates larger effects of "permanent income" when he controls for "grandparent fixed effects" (i.e., comparing outcomes for the children of sisters) than when he does not. He finds smaller and insignificant effects of current family income on achievement and behavioral outcomes, however, when he uses fixed effect strategies (regardless of whether he uses comparisons of cousins, siblings, or repeated observations for the same individual) rather than OLS. While these studies represent a significant step forward, they do not control for endogenous transitory shocks (e.g., parental job loss or promotion, family illness, residential moves) and likely suffer from severe attenuation bias, since growth in income is typically measured noisily.

A few recent studies attempt to address these problems in a variety of ways. Two quasi-experimental studies estimate the impacts of government income transfers

[3] Children in poor families spend less time reading with their parents, are less likely to receive adequate health care and nutrition, and attend underfunded public schools, all of which are negatively associated with academic performance (Child Trends and Center for Child Health Research 2004).

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conducive to development, current and lagged family income have the potential to affect child outcomes at any particular age. In this section, we model how changes in family income (through such policies as the EITC) affect child achievement.

Let $\mathbf{x}_i$ reflect observable permanent characteristics and μ_i reflect unobserved permanent "ability" for child i (i.e., a child fixed effect). These measures can also incorporate unobserved long-run differences across families. Let $\mathbf{w}_{ia}$ reflect time-varying characteristics and I_{ia} total family income (net of any taxes and transfers, including EITC payments) for child i at age a. Finally, let ε_{ia} denote any time-varying unobserved shocks to the child or family. Using this notation, a general model for child outcome y_{ia} as a function of the child's family characteristics and income history is $y_{ia} = f_a(\mathbf{x}_i, \mathbf{w}_{i0}, \ldots, \mathbf{w}_{ia}, I_{i0}, \ldots, I_{ia}, \mu_i, \varepsilon_{ia})$. For empirical purposes, it is useful to simplify the child outcome equation as follows:

$$(1) \quad y_{ia} = \mathbf{x}_i'\alpha_a + \mathbf{w}_{ia}'\beta + I_{ia}\delta_0 + I_{i,a-1}\delta_1 + \ldots + I_{i,a-L}\delta_L + \mu_i + \varepsilon_{ia},$$

assuming that the effects of income on child achievement last for L years.[6]

To focus on the role of income, equation (1) abstracts from the effects of past time-varying characteristics; however, these can easily be incorporated in the same way as past income. Equation (1) also abstracts from the possibility that income has different effects at different ages (i.e., effects depend only on the time elapsed between when income is earned and when child achievement is measured) or at different points in the income distribution (i.e., linearity in income is assumed). We explore these issues empirically below.

The specification in equation (1) allows for different effects of permanent characteristics at all ages (i.e., α_a). In our empirical analysis, we allow $\mathbf{x}_i$ characteristics (e.g., race, gender, and age of the child) to affect both the level and growth of child achievement. Taking first differences of equation (1) to eliminate the unobserved fixed effect μ_i yields

$$(2) \quad \Delta y_{ia} = \mathbf{x}_i'\alpha + \Delta\mathbf{w}_{ia}'\beta + \Delta I_{ia}\delta_0 + \Delta I_{i,a-1}\delta_1 + \ldots + \Delta I_{i,a-L}\delta_L + \Delta\varepsilon_{ia},$$

where $\alpha \equiv \alpha_a - \alpha_{a-1}$ is the effect of $\mathbf{x}_i$ on achievement growth (assumed to be age-invariant).

A common achievement specification in the child development literature assumes that there are only contemporaneous effects of family income on children, ignoring any long-run effects. That is, $L = 0$ in equations (1) and (2), which yields the following estimating equation in first differences:

$$(3) \quad \Delta y_{ia} = \mathbf{x}_i'\alpha + \Delta\mathbf{w}_{ia}'\beta + \Delta I_{ia}\delta_0 + \Delta\varepsilon_{ia}.$$

This "contemporaneous effects" model serves as our baseline and receives empirical support in our analysis. It is difficult empirically to estimate more general models

[6] One commonly used achievement model assumes that current achievement depends on current income and lagged achievement (e.g., $y_{ia} = \mathbf{x}_i'\alpha_a + \mathbf{w}_{ia}\beta + I_{ia}\delta + y_{i,a-1}\rho + \mu_i + \varepsilon_{ia}$). Recursively substituting in for lagged values of achievement on the right-hand side yields a specification very similar to equation (1) in which all lagged income measures and other time-varying characteristics would also be included.

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of lagged pretax income, taking into account the fact that income evolves over time in a predictable way and that the EITC schedule changes in some years.[9] By holding fixed the type of EITC schedule (one versus two+ children) $s_{i,a-1}$ in generating our instrument, we only exploit variation in predicted EITC income due to government changes in EITC schedules over time and not due to changes in family structure.

Of course, simply estimating equation (3) using $\Delta\chi_a^{IV}$ as an instrument is likely to yield biased estimates for δ_0, since changes in families' simulated EITC payments are a function of age $a-1$ pretax family income $(P_{i,a-1})$, which is likely to be correlated with the subsequent change in income due to such factors as measurement error, regression to the mean, and serially correlated income shocks. Therefore, based on the insight of Gruber and Saez (2002), we augment the outcome equation with a flexible function of $P_{i,a-1}$ when instrumenting. Letting $\Phi(P_{i,a-1})$ reflect a flexible function of lagged pretax income, we estimate

$$\Delta y_{ia} = \mathbf{x}_i'\alpha + \Delta\mathbf{w}_{ia}'\beta + \Delta I_{ia}\delta_0 + \Phi(P_{i,a-1}) + \eta_{ia} \tag{4}$$

using $\Delta\chi_a^{IV}$ as an instrument for ΔI_{ia}. Empirically, we employ the same functional form for $\Phi(P_{i,a-1})$ as we use in estimating $\hat{E}[P_{i,a}|P_{i,a-1}]$: we include an indicator for positive lagged pretax income and a fifth-order polynomial in lagged pretax income. This ensures that the variation in our instrument used to identify δ_0 comes from changes in the EITC schedule and not from the level of lagged pretax income. Intuitively, this strategy estimates the extent to which the differential income boosts associated with the EITC expansions (as determined by past income levels) are met with increases in child achievement. If income has a positive effect on achievement, we should observe greater increases in test scores among children from low-income families relative to high-income families when the EITC expands.[10]

One can think of the polynomial $\Phi(P_{i,a-1})$ in equation (4) as a control function. It is, therefore, important that $\Phi(\cdot)$ be flexible enough to capture the true expected relationship between child development shocks and lagged pretax income—we use a very flexible polynomial in lagged pretax income. In the most general case, the control function should equal $E[\Delta\varepsilon_{ia}|P_{i,a-1},\mathbf{x}_i,\Delta\mathbf{w}_{ia}]$. As such, if the evolution of income over time differs systematically with $\mathbf{x}_i$ or $\Delta\mathbf{w}_{ia}$ or if the relationship between $\Delta\varepsilon_{ia}$ and pretax income depends on $\mathbf{x}_i$ or $\Delta\mathbf{w}_{ia}$, then the control function should be generalized to account for these relationships. Recognizing this possibility, we consider alternative specifications using a more general control function that interacts $\Phi(P_{i,a-1})$ with all $\mathbf{x}_i$ and $\Delta\mathbf{w}_{ia}$ regressors.[11]

[9] The ideal (i.e., most efficient) instrument would be $E[\chi_a^{s_{i,a-1}}(P_{i,a})|P_{i,a-1}] - \chi_{a-1}^{s_{i,a-1}}(P_{i,a-1})$. In practice, age a EITC income is difficult to predict based on lagged income due to nonlinearity and discontinuities in the EITC schedule. An intuitive approach would simply use lagged pretax income $P_{i,a-1}$ in place of $\hat{E}[P_{i,a}|P_{i,a-1}]$ in creating our instrument. This strategy (when incorporating the control function as discussed below) yields consistent but much less precise estimates compared to the approach taken here.

[10] Figure 2 makes clear that the largest changes in our instrument occur for low- to moderate-income families. If $\hat{E}[P_{i,a}|P_{i,a-1}] = P_{i,a-1}$, then the value of the instrument over time (as a function of pretax income) would be as illustrated in Figure 2. For very low-earnings families, however, $\hat{E}[P_{i,a}|P_{i,a-1}] > P_{i,a-1}$ since their earned income is predicted to rise. The time-invariant control function accounts for the fact that the value of the instrument varies by income even when the EITC schedule does not change. As discussed below, our approach requires that the EITC schedule itself must change over time to identify the effect of income on child achievement.

[11] The Appendix provides a more detailed discussion of these issues. See Heckman and Robb (1985) for a general treatment of control functions. Linear spline functions yield results similar to those presented in the paper.

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thereafter. The survey reports many components of family income, which we aggregate into three categories of pretax/EITC income: earned income, unearned income, and nontaxable income. See the online Appendix for a description of these income categories and how we impute missing observations.

While the NLSY contains a broad array of income questions, it does not ask an individual how much they received in EITC payments or paid in taxes. Both the Internal Revenue Service (IRS) (2002) and Scholz (1994) estimate that roughly 80 to 87 percent of eligible households receive the credit. We implicitly assume full take-up and impute each family's state and federal EITC payment and tax burden using the TAXSIM program (version 9) maintained by Daniel Feenberg and the National Bureau of Economic Research (see Feenberg and Coutts 1993 and http://www.nber.org/taxsim).

In our analysis, we focus on measures of scholastic achievement in math and reading based on standardized scores on Peabody Individual Achievement Tests (PIAT). The assessments measure ability in mathematics, oral reading, and word recognition ability (reading recognition), and the ability to derive meaning from printed words (reading comprehension). From 1986 to 2000, the tests were administered biennially to children ages 5 and older; 92 percent of our estimation sample is between the ages of 8 and 14. Children took each individual test at most five times due to the age restrictions. See the online Appendix for details.

To make the PIAT test scores more easily interpretable, we create normalized test scores with a mean of zero and a standard deviation of one based on the random sample of test takers (i.e., excluding the poor, military, and minority oversamples). We also create a combined math-reading score, which takes the average of our normalized math and reading scores. This is then renormalized to have a mean of zero and standard deviation of one in the random sample. Our full sample that includes oversamples of blacks and Hispanics has negative average normalized test scores, since children in the oversamples are more disadvantaged on average.

We restrict our main sample to children observed in at least two consecutive (even-numbered) survey years between 1988 and 2000 with valid PIAT scores, family background characteristics, and family income measures, since our primary analysis estimates models with child fixed effects.[12] Because changes in family income are likely to mean something very different when there is a change of marital status relative to when there is not, we also limit our sample to children whose mothers did not change marital status during two-year intervals when test scores are measured. Our main sample includes 4,412 interviewed children born to 2,401 interviewed mothers, with children observed 2.2 times on average. Table 1 provides information on family income and EITC eligibility over time for this main sample. The table reveals that median after-tax family income rose in real terms from $23,463 reported in 1988 to $38,390 reported in 2000. The time trend in family income, which outpaced inflation, is largely attributable to the aging of mothers in the sample. The

[12] We exclude the 1986 survey year and survey years 2002 onward to focus our analysis on changes in the EITC, rather than the large changes in the tax code associated with the Tax Reform Act of 1986 and the two "Bush" tax cuts in 2001 and 2003. To focus on EITC changes, we also exclude observations with family income levels above $100,000; although including these observations has negligible effects. To minimize the influence of outliers and obvious measurement error, we also trim observations with very large changes in income or large and unusual changes in reported welfare income. See the online Appendix for details.

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IV. The Effect of Income on Cognitive Achievement

In this section, we discuss the estimated impact of family income on children's math and reading achievement. We first report standard OLS and differenced estimates of outcome equations (1) and (2) under different assumptions about the dynamic effects of income. We also briefly discuss estimates for a few additional specifications employed previously in the literature. We then turn to our IV estimation strategy, which accounts for measurement error, permanent unobserved heterogeneity, and temporary unobserved shocks. We explore whether income changes have lasting effects on child achievement, whether the effects vary across different demographic groups, and whether income differentially affects younger versus older children. To establish the robustness of our findings, we examine a number of different specifications, including regressions that account for time-varying state policies, more general control functions, and maternal labor market participation.

A. *OLS and Differenced Estimates*

We begin by presenting OLS and differenced estimates of the effects of family income on our combined math-reading measure of cognitive achievement. As a reminder, the differenced estimates are based on two-year differences, since children are only administered the PIAT tests every other year. Compared to most studies, we estimate more general models of child achievement, exploring whether income has lasting effects on children.

Table 2 reports estimates of equations (1) and (2) under different assumptions about the persistence of income effects. In the levels models, we regress child achievement on total income and include all the variables reported in Table A1 as controls. The specification we estimate in differences is slightly more general, since we allow achievement growth to vary by the child characteristics listed in panel A of Table A1. Column 1 assumes the "contemporaneous effects" model used by many previous studies. Estimated in levels, we find that a $1,000 increase in family income raises math-reading test scores by 0.005 standard deviations. Estimated in differences, the effect is less than one-fourth as large and no longer significant. These estimates are similar to corresponding estimates in Blau (1999).

There are two reasons to expect a discrepancy between difference (or fixed effects) and cross-sectional OLS estimates. First, measurement error is greater for income measured in differences than in levels, so attenuation bias will be greater for difference estimators. Second, a correlation between unobserved fixed effects (μ_i) and family income will bias cross-sectional OLS estimates. The first bias is greater for difference estimates while the second only affects cross-sectional OLS, so there is no a priori reason to prefer one type of estimator over the other. More importantly, both approaches suffer from additional bias if unobserved transitory shocks to families and children are correlated with family income.

Columns 2–4 estimate more general models that allow for the possibility that income effects persist for up to two years into the future. Column 3 reveals the difficulty in identifying the persistence of income effects beyond one year due to the high degree of collinearity in earnings over time. To improve precision but still allow for a difference between contemporaneous and past income, column 4 imposes $\delta_1 = \delta_2$

achievement on average income rather than income received in any particular period. Because income is measured with error, standard OLS level and differenced estimators will tend to be biased towards zero, and averaging may alleviate this problem. In practice, previous studies tend to estimate larger effects of average income than of current income (e.g., Blau 1999). We find the same pattern: the relationship between long-run average income and test scores is 70 percent larger compared to the relationship between current income and achievement. One concern with using average long-run family income is the difficulty in accounting for unobserved long-run heterogeneity using fixed effects strategies. Since average family income is likely to be more strongly correlated with unobserved family characteristics than is income for any particular period, estimates using long-run averages of family income may be subject to greater omitted variable bias.

B. *IV Estimates*

We now turn to our IV approach to estimate the effects of family income on child achievement. We begin with our simple "contemporaneous effects" model in differences (equation 3) using simulated changes in the EITC (based on lagged income) as instruments for changes in actual after-tax/EITC total family income. As a practical matter, identification comes primarily from the substantial expansion of the EITC schedule between 1993 and 1995; however, other smaller changes in the EITC schedule also aid in identification. The approach reveals whether achievement scores systematically increased more for families who were predicted to receive a greater boost in EITC payments during years when the schedule expanded.

Our approach requires the inclusion of a flexible function of lagged pretax income as detailed in equation (4). We explored different-ordered polynomials and found the estimates to be very similar for orders four and above if we also include an indicator for positive lagged pretax income. To be conservative, we use a fifth-order polynomial in lagged pretax income and an indicator for positive lagged pretax income as our baseline "control function." Our baseline specification allows for differential growth in achievement based on a child's gender, age, number of siblings, and race. Below, we show that the results are similar for specifications with additional controls (i.e., other factors affecting growth in test scores) and with more general control functions that interact included regressors with the polynomial in income.

Table 3 reports baseline IV estimates for our combined math-reading achievement measure, as well as each of the individual PIAT subject test measures. The results in column 1 imply that a $1,000 increase in family income raises math-reading achievement by 6 percent of a standard deviation, a modest effect, but much larger than the comparable OLS estimates in column 1 of Table 2.[13] To place this estimate in perspective, in the OLS levels specification, having a mother who is a high school graduate (versus a high school dropout) is associated with an increase of 17 percent of a standard deviation in achievement. Looking at columns 2–4 in Table 3, the estimated effects

[13] Since we use two-year differences in income and child outcomes, these estimates reflect the effects of increasing annual income by $1,000 for up to 2 years. As we show below with dynamic achievement specifications, these estimates largely identify the impact of increasing income in the current year by $1,000, since earlier increases in income appear to have small lasting effects. The estimates could also be inflated by about 15–20 percent to account for the fact that EITC take-up rates are estimated to range from 80 to 87 percent (IRS 2002; Scholz 1994).

TABLE 4—IV ESTIMATES OF "CONTEMPORANEOUS EFFECTS" MODEL ACCOUNTING FOR TIME TRENDS AND TIME-VARYING STATE POLICIES
(Math-Reading Achievement)

	Effect of current income	First stage coefficient on instrument
A. Year dummies	0.0694*	0.745**
	(0.0390)	(0.348)
B. Linear time trend	0.0863**	0.847**
	(0.0379)	(0.334)
C. Linear time trend interacted with control function	0.0805**	1.115**
	(0.0399)	(0.485)
D. State school accountability policies interacted with control function	0.0533**	1.299**
	(0.0221)	(0.406)
E. State welfare policies interacted with control function	0.0670**	1.311**
	(0.0268)	(0.436)
F. Time trend, accountability, and welfare policies interacted with control function	0.0630*	1.193**
	(0.0338)	(0.513)

Notes: Child achievement is a normalized average of math and reading scores. Income is measured in $1,000 of year 2000 dollars. All specifications control for "baseline variables" listed in Appendix Table A1. All specifications are estimated in two-year differences to account for unobserved child fixed effects. Sample size is 8,609 for all specifications. Standard errors are reported in parentheses and are clustered at the family level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

standard error increases by two-thirds. Specifications B and C in the table allow for a linear time trend in test score growth; specification C also interacts the time trend with the control function $\Phi(P_{i,a-1})$ (i.e., the polynomial in lagged pretax income and an indicator for positive lagged pretax income). These specifications yield larger (and less precise) estimates when compared with our baseline estimate in Table 3. By interacting the time trend with the control function, we address the concern that the relationship between child outcomes and pretax income is changing over time.

The next two specifications in Table 4 address changes in state policies that might directly affect the relationship between child outcomes and family income or characteristics: school accountability policies and welfare regulations. A few states introduced student testing/accountability measures and welfare reforms in the early 1990s, which some studies have linked to improvements in state test scores (e.g., Hanushek and Raymond 2005 and Miller and Zhang 2009).[15] To account for these reforms, we add an annual indicator for whether the child's state has a "consequential" accountability policy (i.e., required testing with consequences for school performance) to our baseline specification. The next specification examines whether accounting for welfare reforms taking place in the 1990s (associated with statewide AFDC waivers and TANF) affects our results. This specification includes

[15]Most states did not introduce school accountability policies or welfare reforms prior to 1996. A number of states received Aid to Families with Dependent Children (AFDC) waivers in the early 1990s; however, most states introduced welfare reforms with the introduction of the Temporary Assistance for Needy Families (TANF) program in 1996. See the online Appendix for a detailed description of our school accountability and welfare policy measures.

TABLE 5—IV ESTIMATES OF ACHIEVEMENT MODELS WITH LASTING INCOME EFFECTS

	(1)	(2)	(3)
Current income	0.0436*	0.0551	0.0515**
	(0.0236)	(0.0478)	(0.0226)
Lagged income (a-1)	0.0216	0.0135	
	(0.0408)	(0.0733)	
Lagged income (a-2)		0.0206	
		(0.0381)	
Sum of (a-1) and (a-2) lagged income			0.0186
			(0.0254)
Medium-term effect of increasing income by $1,000/year for three years	0.0651*	0.0892	0.0888
	(0.0349)	(0.0604)	(0.0598)
F-statistics from first stage	6.17, 3.59	3.98, 1.39, 2.16	5.53, 1.77
Sample size	6,543	5,019	5,019

Notes: Child achievement is a normalized average of math and reading scores. Income is measured in $1,000 of year 2000 dollars. All specifications control for "baseline variables" listed in Appendix Table A1, an indicator for positive lagged pretax income, and a fifth-order polynomial in lagged pretax income. All models are estimated in two-year differences to account for unobserved child fixed effects. "Medium-Term Effect" is given by the sum of current and all estimated lagged income coefficients in columns 1 and 2 and the sum of the coefficient on current income plus twice the coefficient on the sum of lagged income measures in column 3. *F*-statistics are for tests that all instruments equal zero in first-stage equations. See the online Appendix for all other first- and second-stage coefficient estimates. Standard errors are reported in parentheses and are clustered at the family level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

therefore, a smaller instrumented change in income on average. This is reflected in the fact that the first-stage estimates for high-SES groups typically have standard errors that are twice as large as those for low-SES groups.

Except for the final two columns, the table is organized such that estimates for more economically disadvantaged groups are reported at the top while estimates for more advantaged groups are at the bottom. Achievement for children with low-educated mothers increases significantly with income, while achievement for children whose mothers attended at least some college is largely unresponsive to income changes. One should exercise caution in interpreting the latter, however, since the first stage is quite weak for children with more educated mothers. Changes in EITC schedules do not provide a very good source of income variation for these families. We also estimate strong and statistically significant effects of family income on the achievement of minority children; in contrast, our estimates for whites are substantially smaller and the first stage is imprecise. Point estimates also suggest that income raises test scores more among children in unmarried households relative to married households, and more for children whose mother's AFQT score is below the median compared to above the median; however, these estimates are fairly imprecise. Overall, these estimates suggest that the effects of family income are greater for more disadvantaged children, although the difference is only statistically significant by maternal education.

A number of recent studies (e.g., Duncan and Brooks-Gunn 1997; Duncan et al. 1998; Levy and Duncan 1999) suggest that income at early ages may have greater effects on development than income received at later ages. In the second to last

Table 7 presents several additional specifications for the "contemporaneous effects" model (combined math-reading measure) to explore the robustness of our baseline results. Specification A includes additional control variables such as the mother's age and education, her family background, and her spouse's characteristics in the differenced child outcome equation, while specification B removes all control variables (except the control function) from our baseline specification. Neither change in control variables has much impact on the estimated effect of family income. We next explore a more general control function in specification C, interacting all of the baseline control variables with lagged pretax income and the polynomial in lagged pretax income. These interactions address the concern that the relationship between child outcomes and lagged income differs based on the baseline controls. This more general control function does not change the estimate appreciably.

Our estimates exploit variation in both state and federal EITC schedules when constructing our instruments. Specification D shows that the inclusion of state fixed effects in our specifications has little impact on the coefficient of interest. This is true regardless of whether we use the state EITCs to construct our instruments. Because few states had EITC provisions during our sample period (five states by 1996 and ten states by 1999), the results are very similar when using only federal changes in EITC schedules to construct our instruments.

Specification E in Table 7 uses NLSY-created weights for the initial sample of mothers to weight observations. These estimates indicate a slightly smaller effect of family income on achievement; however, the standard error is 12 percent larger than that of our baseline estimates without weights.[18]

Table 6 suggests that the effects of income may be stronger for more disadvantaged children. Under this assumption, some researchers have preferred to measure income in logs rather than levels. For comparison and as a check on the robustness of our findings, specification F of Table 7 uses log total family income as the right-hand side variable rather than income measured in levels.[19] This specification implies that a ten percent increase in family income raises achievement by 6.4 percent of a standard deviation. For families with income of $12,000, an extra $1,000 would raise child math-reading scores by 0.053 of a standard deviation, similar to our baseline IV estimate that uses income measured in levels.

It is natural to question whether the large changes in the EITC generated important labor supply responses among mothers that may have affected children separately from the direct effects of income we aim to measure. In principle, an EITC expansion may affect children in three ways. First, holding earnings constant, it increases family income. Second, it may affect earnings through family labor supply

[18] Two arguments are often made for using sampling weights. First, they can produce more efficient estimates. This is not generally true, however, in the case of IV estimation and does not appear to be true in our application based on a comparison of standard errors. A second argument sometimes made for using sampling weights is based on heterogeneous "treatment effects" and the desire for estimating a population average effect. Since blacks and Hispanics are overrepresented in our sample, one might want to use sampling weights to obtain a population "average" effect of family income on achievement. However, IV does not generally yield a population average effect, except in rare cases (see, e.g., Heckman and Vytlacil 1998; Imbens and Angrist 1994; Wooldridge 1997). In our context, estimates using the sampling weights should place a larger weight on the effect for whites versus minorities. Thus, the slightly smaller estimate for specification D relative to our baseline estimate in Table 3 is consistent with the finding in Table 6 that income effects are larger for minorities than for whites.

[19] In this specification, we use $\ln(\hat{E}[P_{i,a}|P_{i,a-1}] + \chi_a^{s_{i,a-1}}(\hat{E}[P_{i,a}|P_{i,a-1}])) - \ln(P_{i,a-1} + \chi_a^{s_{i,a-1}}(P_{i,a-1}))$ as an instrument for $\Delta\ln(I_{ia})$.

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increase in the number of hours a mother works has small negative estimated effects on children, whereas participation changes have statistically insignificant effects. Most important, accounting for changes in mother's labor market participation and hours of work does not affect our main conclusion about the importance of family income.[20]

Recall that total income increased by $1.27 for a $1 increase in predicted EITC payments in the first stage of the baseline specification. The fact that the coefficient is slightly larger than one (although not significantly so) is consistent with a modest bonus impact through increased labor supply. Indeed, once labor supply is controlled for in panel G, the first stage coefficient drops to 0.90.

C. *Interpreting IV Estimates*

Our IV results indicate modest but encouraging effects of family income on children's scholastic achievement. Our baseline estimates imply that a $1,000 increase in income raises combined math and reading test scores by 6 percent of a standard deviation. Although modest in an absolute sense, our estimates are large relative to much of the literature and relative to the OLS and differenced estimates reported in Table 2. Duncan, Morris, and Rodrigues (2011) also report IV estimates of the effect of family income on child achievement that are much larger than their OLS estimates. Their IV strategy exploits randomly assigned variation in family income supplements from ten different income support and welfare experiments to identify the causal effect of income. Looking at expansions in the Canadian child benefit program, Milligan and Stabile (2011) find even larger effects of extra income on children's test scores than we do. Like our approach, these two papers use exogenous variation in income and focus on relatively disadvantaged families.

We speculate that a variety of factors may be responsible for our larger IV estimates relative to traditional OLS and fixed effects or differenced estimates. A first possibility is that measurement error produces attenuation bias for standard methods. Fixed effects and differenced estimators are particularly affected by this problem, since changes in income are noisier than income measured in levels. Measurement error alone, however, is unlikely to explain most of the gap between our IV estimates and more traditional estimates. As reported in Section IVA, the estimated effect of average income (which should have less measurement error) is 70 percent larger compared to the estimated effect of contemporaneous income in OLS specifications (0.0080 versus 0.0047) but still much smaller than our IV estimates.

A second potential explanation is that income matters more for disadvantaged families and that our IV estimates capture the effects of income for disadvantaged families who are affected by the EITC expansions. Table 6 offers some support for this explanation. Furthermore, Løken, Mogstad, and Wiswall (2010) argue that nonlinear effects explain why OLS and FE estimators find little evidence that family

[20]The endogeneity of which mothers work and how much they choose to work is an obvious concern. We attempted to treat participation as endogenous by using changing parameters of the EITC schedules (e.g., maximum credit amounts, phase-in and phase-out rates) over time as additional instrumental variables for maternal labor market participation (an approach similar in spirit to Blundell, Duncan, and Meghir 1998, and Eissa and Hoynes 2006). This approach yields statistically significant estimates for family income that are very similar to our baseline estimates; however, it produces imprecise estimates for maternal labor force participation. Unfortunately, the first stage for maternal labor supply indicates the instruments are weak in our sample.

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V. Conclusion

Understanding the consequences of growing up poor for a child's well-being is an important research question, but one that is difficult to answer due to the potential endogeneity of family income. The question is particularly interesting to policymakers, since part of the explicit rationale for income support programs (such as the EITC) is to improve the lot of children. Past estimates of the effect of family income on child development have often been plagued by omitted variable bias. That is, children growing up in poor families are likely to have home environments or face other challenges that would continue to affect development even if family income rose substantially.

In this paper, we use an IV strategy to estimate the causal effect of income on children's math and reading achievement. Using a panel of 4,412 children matched to their mothers allows us to address problems associated with both unobserved heterogeneity and endogenous transitory income shocks. Our IV approach exploits the large nonlinear changes in the EITC in the late 1980s and 1990s as an exogenous source of variation in family income levels. The largest of these EITC changes doubled benefit amounts for some families between 1993 and 1997, accounting for as much as $2,100 in extra income (measured in year 2000 dollars). Over the time period in our sample, the EITC expansions raised average family income by more than ten percent for EITC eligible families with two or more children.

We find that extra family income has a modest, but encouraging, causal effect for children growing up in poor families. Our IV results indicate that current income has significant effects on a child's math and reading test scores. The baseline estimates imply that a $1,000 increase in income raises contemporaneous math and reading test scores by 6 percent of a standard deviation. Over the entire sample period (1987–1999), the median EITC payment for eligible two-child families increased by $1,670 (in year 2000 dollars), implying an average test score increase of 10 percent of a standard deviation for this group.

Our estimates also suggest that the effects are larger for children growing up in more disadvantaged families, younger children, and boys. The results are robust to a variety of alternative specifications, including regressions that account for time-varying state policies, general control functions, and maternal labor market participation. Simple dynamic models suggest that contemporaneous income has the largest effect on achievement, with smaller effects from past income. An interesting avenue for future research would be to explore why income has modest contemporaneous effects but small long-run effects on achievement.

Appendix: Methodological Issues

A. *Details on EITC, Tax, and Net Total Income Measures*

We create three family income categories based on the many income components in the NLSY: *earned income*, *unearned income*, and *nontaxable income*. *Earned income* includes income from wages and salary. *Unearned income* includes reported income from a business or farm, unemployment compensation, and a residual catch-all question referring to interest income, social security payments, net rental income, and income from other regular sources. *Nontaxable income* includes income from

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TABLE A1—SAMPLE CHARACTERISTICS FOR CHILDREN, THEIR MOTHERS, AND THEIR FAMILIES

	Entire sample (1)	Eligible for EITC (2)	Not eligible for EITC (3)	Difference (2) − (3) (4)
Panel A. Baseline variables				
Male	0.50	0.49	0.50	0.00
Age	11.00	11.23	10.88	0.35**
No siblings	0.10	0.13	0.09	0.05**
One sibling	0.40	0.35	0.42	−0.07**
Two or more siblings	0.50	0.52	0.50	0.02
Black	0.35	0.47	0.29	0.19**
Hispanic	0.19	0.20	0.19	0.01
Panel B. Additional variables				
Mother's age	33.44	33.23	33.55	−0.32**
Mother a high school dropout	0.21	0.29	0.17	0.11**
Mother a high school graduate	0.53	0.54	0.52	0.01
Mother attended some college	0.20	0.17	0.22	−0.05**
Mother graduated college	0.06	0.01	0.08	−0.07**
Mother's AFQT score (normalized and age adjusted)	−0.47	−0.77	−0.32	−0.46**
Mother lived with both natural parents at age 14	0.64	0.57	0.68	−0.11**
Mother's father present in household	0.03	0.05	0.02	0.03**
Mother's mother present in household	0.06	0.10	0.05	0.05**
Number of adults in household	1.86	1.67	1.96	−0.29**
Highest grade completed by mother's father	8.42	7.35	8.96	−1.63**
Highest grade completed by mother's mother	9.65	8.94	10.01	−1.07**
Mother married last year	0.65	0.37	0.78	−0.41**
Age of mother's spouse	35.39	35.25	35.43	−0.18
Mother's spouse a high school dropout	0.16	0.31	0.13	0.18**
Mother's spouse a high school graduate	0.50	0.52	0.50	0.02
Mother's spouse attended some college	0.20	0.14	0.21	−0.07**
Mother's spouse a college graduate	0.14	0.03	0.16	−0.14**
Year	1993	1993	1993	0.13
Missing observation indicators:				
Mother's AFQT score	0.03	0.02	0.03	−0.01*
Mother lived with both natural parents at age 14	0.00	0.01	0.00	0.00*
Mother's father present in household	0.00	0.00	0.00	0.00
Mother's mother present in household	0.00	0.00	0.00	0.00
Number of adults in household missing	0.02	0.01	0.02	0.00
Highest grade completed by mother's father	0.08	0.10	0.07	0.03**
Highest grade completed by mother's mother	0.03	0.03	0.02	0.00
Age of mother's spouse	0.00	0.00	0.00	0.00
Mother's spouse's education	0.00	0.00	0.00	0.00
Number of child-year observations	9,796	3,286	6,510	
Number of children	4,412	2,019	3,249	

Notes: Unit of observation is a child-year, where children and parents can appear repeatedly in the sample. The sample is restricted to observations used in our IV analysis: children must have valid math and reading PIAT scores, child control measures (in panel A), and family income measures in a year to be included. Children must also have at least two years of valid observations to be included. Race of the child is based on the reported race of the mother. Mother's education variables represent completed education when the mother is age 23. Average spousal education and age are reported for the sample of married mothers (sample sizes are 6,334, 1,228 and 5,106 for columns 1, 2, and 3, respectively).

**Significant at the 5 percent level.

*Significant at the 10 percent level.

flexible function $\Phi(\cdot)$. Note there is nothing inherently special regarding the use of lagged pretax income in this approach; one could reverse the roles played by current and lagged pretax income and include a flexible function of current income as the control function.

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Center on Budget and Policy Priorities

A HAND UP:

How State Earned Income Tax Credits Help Working Families Escape Poverty in 2011

By Nicholas Johnson and Erica Williams

April 2011

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SUMMARY

The federal Earned Income Tax Credit, which began in 1975 and has been expanded several times since then, is often heralded as the most effective anti-poverty program in the United States, particularly for children in working families. In 2009 alone, it lifted 6.5 million working families, including 3.3 million children, out of poverty.

The credit effectively boosts the income of working families earning low wages by offsetting their income and payroll taxes and increasing their workforce participation. In other words, it makes work pay by allowing low- and moderate-income families to keep more of what they earn.

State EITCs build on the success of the federal credit. They reduce state income taxes and help families pay for state and local sales and property taxes, which hit lower-income households hardest. They enhance the federal EITC's positive effects on workforce participation and boost the after-tax incomes of working families, further reducing poverty.

The first state EITC was offered in 1987 in Maryland. Since that time, 22 additional states plus the District of Columbia have followed suit, creating their own EITCs. They are effective and straightforward to design and administer. And over the years, they have received support from Republican and Democratic leadership and have been championed by business, labor, faith-based, and social service advocacy groups.

Today, with working families battered by economic problems as never before, state EITCs play a particularly important role. Families use EITCs to fill in for the loss of wages that can result from reductions in hours or layoffs. As long as they are still working at least some hours a year, families can benefit from the EITC.

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Table 1
Number of Families And Individuals That Received The Federal EITC For Tax Year 2008, By State

State	EITC Recipients	State	EITC Recipients
Alabama	524,097	Montana	78,427
Alaska	38,488	Nebraska	122,890
Arizona	487,002	Nevada	196,012
Arkansas	301,909	New Hampshire	70,926
California	2,730,012	New Jersey	535,511
Colorado	308,255	New Mexico	210,347
Connecticut	190,504	New York	1,622,113
Delaware	66,152	North Carolina	864,536
District of Columbia	50,144	North Dakota	40,669
Florida	1,852,940	Ohio	896,168
Georgia	1,022,957	Oklahoma	329,642
Hawaii	97,062	Oregon	258,435
Idaho	120,054	Pennsylvania	856,884
Illinois	954,070	Rhode Island	75,871
Indiana	504,631	South Carolina	477,905
Iowa	194,022	South Dakota	60,067
Kansas	195,577	Tennessee	626,531
Kentucky	386,058	Texas	2,417,062
Louisiana	516,934	Utah	164,055
Maine	94,901	Vermont	42,141
Maryland	375,444	Virginia	552,941
Massachusetts	353,061	Washington	399,088
Michigan	758,244	West Virginia	152,595
Minnesota	308,262	Wisconsin	347,667
Mississippi	398,579	Wyoming	33,807
Missouri	489,968		

Source: Internal Revenue Service, *SOI Tax Stats - Historic Table 2, 2008.*

Credit Design and Value

The federal EITC is designed to offset federal income taxes and Social Security payroll taxes, supplement earnings, and encourage and reward work. The EITC's design also reflects the reality that larger families face higher living expenses than smaller families. To accomplish these goals, the credit phases in as a family's income rises (at a rate higher for larger families), hits a maximum limit as a family's earnings approach the poverty line, and then phases out at a gradual rate as a family's earnings continues to rise.

Working families with incomes below the federal poverty line receive the largest benefits.[4] Because the EITC phases out gradually as income rises, many families with incomes above the poverty line also benefit.[5] Families with three or more children receive larger benefits than one- or two-child families, and married couples receive more than single parents.

[4] The EITC is available to both single-parent and two-parent families with children. Two-parent families can receive the EITC whether both parents work or whether one parent works while the other parent stays home to care for the children, so long as the family's income is below the EITC limit.

[5] The 2011 federal poverty line is about $23,000 for a family of four.

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How the Federal EITC Achieves Its Goals

The federal EITC accomplishes several policy goals -- reducing taxes, supplementing wages, and reducing poverty for low- and moderate-income working families. With the passage of the American Recovery and Reinvestment Act of 2009, the federal EITC and a number of other credits were expanded to provide additional aid to low-income workers and their families. Combined with an increased federal minimum wage of $7.25 that phased in between 2007 and 2009, these expansions have enhanced the federal government's ability to meet the EITC's policy goals. The following examples illustrate how the EITC achieves these goals[6]:

- The federal EITC **reduces taxes** on low- and moderate-income families both by offsetting federal income taxes and by offsetting some or all of the federal payroll taxes that finance the Social Security and Medicare programs.

  Example One. A single parent with one child, working full time throughout the year at a wage of $12 per hour, earns $24,960 per year. This worker owes $886 in 2011 federal income taxes which are withheld from the paycheck during the year. The family also qualifies for an EITC of $1,824. The EITC allows the family to get back the $886 it paid in income taxes and to receive an additional refund of $938. The EITC refund serves to offset some of the worker's $1,909 in payroll taxes that also were paid during the year.[7]

- For many recipients, especially families just entering the workforce and those with very low earnings, the EITC goes beyond offsetting taxes paid. In so doing, it effectively acts as a **wage supplement**.

  Example Two. A single parent with one child working full-time at the minimum wage of $7.25 per hour earns $15,080 annually. This worker does not owe any federal income tax, but qualifies for a 2011 EITC of $3,121. The parent pays $1,154 in payroll taxes, so the EITC refund offsets those taxes and provides an additional $1,967 as a wage supplement.[8]

- The EITC **lifts families out of poverty** and reduces the extent of poverty and economic hardship. For instance, a minimum-wage job plus the EITC provides enough cash income to support some families at a level above the poverty line.

  An example of how the EITC lifts a family out of poverty may be provided by the full-time minimum-wage worker with one child described above. Without the federal EITC, this family

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[6] The Recovery Act expanded a number of tax credits for working families. Congress extended the Recovery Act's expansions of the EITC and Child Tax Credit (CTC); as a result, the expansions will remain in place through 2012. If the expansions are not made permanent, the effectiveness of the federal EITC in reducing poverty and supplementing wages will be lessened.

[7] The calculations of payroll tax in this analysis do not include the portion of the payroll tax paid directly by the employer that matches the employee's share; the employee and employer each pay 7.65 percent of earnings. Although the employer share of the tax is not reflected in workers' nominal earnings — in this case $12 an hour — economists generally hold that both the employer and employee share of the payroll tax are in effect reductions in employee wages. The history of the EITC indicates it was designed specifically to offset both shares of the payroll tax.

[8] As in the preceding example, the calculation of payroll taxes does not include the employer share of payroll taxes.

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- Research indicates that tax refunds, including federal and state EITC refunds, can be used to promote asset building in low-income families.[13] Data from various studies indicate that many low-income individuals value saving and assets. For example, research suggests that low-income individuals can save and accumulate assets in Individual Development Accounts (IDAs).[14] IDAs are special savings accounts designed to help low-income individuals build assets to reach certain goals such as buying a home, pursuing post-secondary education, or starting a business. In addition, there is evidence that some low-income families save part of their tax refunds. The Chicago study described above, for instance, found that 33 percent of EITC recipients planned to save a portion of their tax refunds. This suggests that tax refunds might be effectively linked to a variety of asset-building initiatives.

Research Findings on the Effectiveness of the EITC

Several recent studies indicate that the EITC has positive effects in inducing more single parents to go to work, reducing welfare receipt, and moderating the growing income gaps between rich and poor Americans. According to this research, the EITC:

- **Increases Work Among Single Parents** – The 1990s expansions to the federal EITC increased the employment of single parents substantially, according to a number of studies. For example, Harvard economist Jeffrey Liebman conducted a series of studies on the EITC. He noted that workforce participation among single women with children has risen dramatically since the mid-1980s.[a] In 1984, some 72.7 percent of single women with children worked during the year. In 1996, some 82.1 percent did. The increase has been most pronounced among women with less than a high school education. During this same period there was *no* increase in work effort among single women *without* children.

  A number of researchers have found that the large expansions of the EITC since the mid-1980s have been a major factor behind the trend toward greater workforce participation. Studies by Liebman and University of California economist Nada Eissa find a sizable EITC effect in inducing more single women with children to work.[b] In addition, a study by Northwestern University economists Bruce Meyer and Dan Rosenbaum finds that a large share of the increase in employment of single mothers in recent years can be attributed to expansions of the EITC. They find that the EITC expansions explain more than half of the increase in employment among single mothers over the 1984-1996 period. Of note, Meyer and Rosenbaum found evidence that *state* EITCs also contributed to workforce participation increases in states where credits were available.

  A recent study confirms a very strong connection between the size of a family's EITC benefit and its likelihood of employment. Authors V. Joseph Holtz, Charles H. Mullin, and John Karl Scholz examined administrative data and IRS records for several hundred thousand California welfare recipients during the 1990s. They found that families with two or more children experienced noticeably faster rates of employment growth than families with one child because the larger families were eligible for greater EITC payments. The study found that an EITC increase of roughly $400 increased rates of employment by 3.2 percentage points. "Our paper shows that the EITC can be an important tool in efforts to increase employment of welfare recipients," the authors concluded.[d]

(Continued on next page)

[13] For more information see *"Promoting Asset Building Through the Earned Income Tax Credit,"* State IDA Policy Briefs, Vol. 1, No. 1, Center for Social Development and Corporation for Enterprise Development.

[14] M. Schreiner, M. Clancy, & M. Sherraden, *Saving performance in the American Dream Demonstration,* St. Louis, MO: Washington University in St. Louis, Center for Social Development, 2002.

II. WHY NEARLY HALF OF STATES HAVE FOLLOWED IN THE FEDERAL GOVERNMENT'S FOOTSTEPS

Just as the federal EITC helps offset *federal* taxes paid by low-income working families, state Earned Income Tax Credits can help relieve the substantial burden of *state and local* taxes levied on working-poor and near-poor families in every state. State EITCs also help advance the same goals as the federal EITC by further encouraging work and lifting additional working families out of poverty.

Twenty-three states and the District of Columbia have enacted their own EITCs to supplement the federal program by boosting the incentive to work, boosting low wages, and reducing poverty. In addition, San Francisco[15], New York City, and Maryland's Montgomery County also offer local EITCs available to residents along with the state and federal programs.

Over the years, EITCs have been enacted in states with Republican and Democratic leadership and the credits are supported by business groups, labor, faith-based organizations, and social service advocates.

The national recession has slowed, but not stopped, the expansion of state EITCs. Some states recently have expanded their EITCs: New Mexico and North Carolina in 2008, and Michigan and Kansas in 2010. Washington in 2008 became the first of the nine states without a broad-based income tax to enact a state EITC, but benefits have been postponed until tax year 2012. Just one state--New Jersey--has reduced the size of its credit, to 20 percent of the federal credit from 25 percent, effective in 2011. (As of March 2011, four states--Illinois, Iowa, Maine, and Oregon--were considering credit increases; Connecticut was considering a new credit. A small number of additional states – Kansas, Michigan, North Carolina, and Wisconsin -- were considering reducing their credits.)

The EITC is playing an important part in fighting poverty during the current downturn. State EITCs, in concert with the federal credit, are helping to provide relief and support to working families that have seen their wages eroded, hours cut back, or that have lost a family wage earner due to recession.

State EITCs Provide Needed Tax Relief

State EITCs play an important role in providing relief from state and local taxes paid by low-income working families, just as the federal EITC offsets federal income and payroll taxes. In every state, low-income working families pay a substantial share of their income in state and local taxes. State EITCs thus can help ensure that state taxes do not push working families closer to or deeper into poverty.

In 2009, 13 of the 42 states with a personal income tax levied the tax on below-poverty married couple families of four and 11 states taxed the income of single parent families of three. The average tax burden in these states was $174 for a two-child family of four and $129 for a two-child

[15] San Francisco's credit eligibility is based on federal eligibility guidelines, but the credit is a flat amount per filer ($100).

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States have demonstrated a strong policy interest in subsidizing the efforts of welfare recipients to enter and remain in the workforce. During the welfare-to-work reforms of the mid-to-late 1990s, the vast majority of states adopted policies to gradually phase out welfare benefits for families as their earnings increased. These policies helped ease the transition for families moving from welfare to work. Many states also expanded access to child care and to health insurance for working-poor families. Despite some recent retrenchment due to recession, states have by and large supported policies that help make work pay.

States also have an interest in supporting the work efforts of low- and moderate-income families who have left the welfare rolls or who have never received welfare benefits. EITCs help families meet the ongoing expenses associated with working — such as transportation — and may allow families to cope with unforeseen costs that otherwise might drive them onto public assistance.

Federal policies encourage use of a state EITC to assist families as parents enter the workforce and to support the work efforts of lower-income families. The federal rules for the Temporary Assistance to Needy Families program, the welfare block grant to states enacted in 1996, allow the refundable portion of state EITCs to be financed with federal TANF funds or with the "maintenance of effort" (MOE) funds states must spend to access the federal TANF funds. Using TANF or MOE funds to help finance state EITCs is discussed in greater detail in Chapter V.

State EITCs Lift Additional Families Out of Poverty and Boost Living Standards

Despite the success of the federal EITC in reducing poverty among working families, wages plus the EITC do not guarantee an escape from poverty for all families.

One problem is that the wages of low-earning U.S. workers have been stagnant for some time; the wages of workers at the 20th percentile, for instance, grew at an average annual rate of 0.5 percent from 1979 to 2007, after adjusting for inflation. Low wages lead to low household income. The modest income growth for the bottom fifth of households contrasts starkly with the gains for the wealthiest households. Between 1979 and 2007, the after-tax income of the poorest American households grew just 16 percent overall, compared with 281 percent for the top one percent of households.[19]

- Full-time, year-round work cannot be relied upon to bring a family above the poverty line even after the federal EITC is taken into account.[20]

  Example Three. A family of four with two children and a full-time, year-round worker earning $8.00 per hour has earnings of about $16,000 per year. After subtracting the employee share of

[19] CBPP calculations of Congressional Budget Office data.

[20] Full-time work is defined here as 40 hours per week, 50 weeks per year.

III. DESIGNING A STATE EARNED INCOME TAX CREDIT

Twenty-three states as well as the District of Columbia have enacted state EITCs that build on the strengths of the federal EITC. Table 2 describes the structures of existing state EITCs; Table 3 provides recent participation data.

Twenty-two state EITCs piggyback on the federal EITC; these states use federal eligibility rules for families with children and express the state credit as a specified percentage of the federal credit. Minnesota follows federal eligibility rules but does not express its credit as a percentage of the federal credit. For families with children, the Minnesota benefit structure is slightly different from the structure of federal credit; families in Minnesota use a separate tax table in their state tax forms to determine their EITC amount. (See box on page 24 for discussion of the Minnesota EITC.)[24]

An EITC that piggybacks on the federal credit is relatively easy for a state to administer and also is easy for families to claim. To determine its state EITC benefit, a family need only write its federal benefit on its state return and then multiply the federal amount by the state EITC percentage.

A state that chooses to piggyback on the federal credit has four decisions to make in designing a state EITC.

- Should the credit be refundable or non-refundable? That is, will taxpayers be able to receive the credit even if they have little or no state income tax liability?
- At what percentage of the federal credit will the state credit be set?
- Will low-income workers without children, who presently receive a small federal credit, be eligible for the state credit?
- Will the state credit be adjusted for family size beyond the federal family-size adjustment?

[24] Unlike other states, Iowa uses 2008 federal guidelines (adjusted for inflation) to determine eligibility for the state credit. This means that the EITC changes enacted under the Recovery Act (described in Chapter II above) do not carry through to this state's EITC.

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Each of these decisions will affect the cost of the credit; financing a state credit is discussed in the next chapter.

Table 3
State EITC Participation

State with EITC	Number of EITC Claims	Amount of Credit Claimed (millions)	Tax Year
Delaware	66,152	$6,000,000	2008
District of Columbia	50,677	$36,700,000	2008
Illinois	946,867	$78,903,000	2006
Indiana	465,945	$58,765,170	2008
Iowa	206,300	$25,000,000	2008
Kansas	197,810	$62,368,216	2007
Louisiana	516,934	$42,819,000	2007
Maine	50,000	$4,149,911	2009
Maryland	375,444	$180,593,500	2008
Massachusetts	366,914	$94,200,000	2008
Michigan	782,000	$338,000,000	2009
Minnesota	308,262	$179,800,000	2009
Nebraska	122,890	$21,350,000	2008
New Jersey	535,511	$209,859,800	2008
New Mexico	210,347	$42,662,600	2008
New York	1,439,375	$811,117,000	2008
North Carolina	864,536	$90,933,150	2009
Oklahoma	329,642	$30,243,000	2007
Oregon	226,358	$25,000,000	2008
Rhode Island	75,682	$9,428,414	2008
Vermont	38,943	$20,295,601	2007
Virginia	387,692	$96,201,482	2007
Washington	399,088	$72,516,900	2008
Wisconsin	236,691	$95,900,000	2008

Source: Most recent published and unpublished data and estimates available from state revenue offices and data from the IRS Statistics of Income for tax year 2008.

Refundable Versus Non-Refundable EITCs

If a state EITC is refundable, a family receives a refund check for the amount that the EITC exceeds the taxes that family owes. For example, if a taxpayer owes $80 in state income taxes and qualifies for a $200 state EITC, the EITC wipes out the $80 owed and the remaining $120 is sent to the taxpayer in the form of a refund check. (If the $80 of income tax were withheld during the year, the taxpayer would receive the entire $200 as a check. Nevertheless, the EITC would offset $80 in tax liability and provide a $120 income supplement.)

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The distinction between refundable and non-refundable credits is important because families with very low earnings, such as most families moving off welfare, owe little or nothing in state income taxes in many states. These families thus would receive little or no benefit from a non-refundable EITC. Moreover, because it only can offset taxes owed, a non-refundable EITC does not supplement a family's income above its earnings and thus does not lift any families with below-poverty wages out of poverty. A refundable EITC, by contrast, can be used to boost the incomes of low-income working families, including those making the transition from welfare to work, as the federal EITC does. Making a state EITC refundable also allows it to be used to offset sales and excise taxes paid by low-income families. In addition, a refundable credit can be financed in part with federal welfare block-grant funds; this option is discussed in the next chapter.

The importance of refundability is reflected in the decision of most states to make their EITCs refundable. Only three of the states with an EITC — Delaware, Maine, and Virginia — have enacted non-refundable credits.

Setting the Size of a State EITC

Choosing the percentage of the federal EITC at which the state credit is set should be based on several considerations. One consideration is the cost to the state treasury. Another is the level of state income tax relief desired. A third factor is the size of the desired income boost for poor families that qualify for a refund. The state may wish, for example, to enact a credit that lifts particular types of families above the poverty line.

EITCs in states with refundable credits generally range from 3.5 percent to 40 percent of the federal credit. The two exceptions are the credits in Wisconsin and Minnesota. The Wisconsin EITC, as discussed below, ranges from 4 percent of the federal credit for families with one child to 43 percent of the federal credit for families with three or more children. The Minnesota EITC, which is structured in part independently of the federal credit, effectively ranges from 25 percent to 45 percent of the federal credit, averaging about 33 percent.

Table 6 shows the benefit to families at various levels of earnings of a refundable EITC set at 15 percent or 25 percent of the federal credit. For example, a family of four with two children and one minimum-wage worker qualifies for a federal EITC of $5,160 in 2011. If the family lives in a state with a 25 percent state EITC, the family receives a state credit of $1,290 ($1,290 equals 25 percent of $5,160). If the state credit is set at 15 percent of the federal credit, the family's state credit is $774 (15 percent of $5,160).

Adjustments for Family Size

A state EITC may be designed to provide greater adjustment for family size than is provided by the federal credit. Under the Recovery Act and the recent extension of its EITC provisions, the federal EITC provides a higher maximum benefit to families with three or more children than to families with two children, about $700 higher. The federal EITC benefit for families with two children is about $2,000 higher than that for families with just one child. If the Recovery Act expansions to the federal EITC are not made permanent, families with three or more children will be treated the same as families with two children, despite their higher levels of poverty and costs of living.

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Local Earned Income Tax Credits

Like states, local governments may enact Earned Income Tax Credits. Three major local governments — Montgomery County, Maryland, San Francisco, California and New York City — presently are offering such credits.

- **Montgomery County, Maryland** – A large suburban county adjoining the District of Columbia, Montgomery County enacted a refundable EITC in 1999. The credit was enacted in response to growing concerns about the large number of working poor families in the county and the difficulty of making ends meet in a jurisdiction with a high cost of living. The credit equals the state's refundable credit, which in 2005 equaled 20 percent of the federal credit.

  Unlike most localities nationwide, Maryland's counties levy their own income taxes. It should be noted, however, that having a local EITC does not depend on the local jurisdiction having an income tax. Initially, the state sent EITC checks to Montgomery County residents who claimed the state credit and the county reimbursed the state. Currently, the credit is administered as part of the state's tax form. These methods could work for any county or city in a state that has a state EITC. In FY2005, 20,700 Montgomery County taxpayers received credits for an average credit of $380.

- **San Francisco, California** – Available starting in tax year 2004, the City of San Francisco launched a city-level, refundable EITC. The credit was set between 10% and 12% of the federal credit depending on the amount of funding available. Eligible recipients complete a short form that is sent to City Hall. Recipients receive their credits through the mail. In its first year of the credit, almost 11,000 persons applied for the credit, totaling about $2.25 million. The credit was later reduced to a flat benefit of $100 regardless of income or family size. However, eligibility for the credit continues to be based on federal guidelines (Note that the state of California does not have an EITC.)

- **New York City** – Available starting in tax year 2004, the City of New York offers a tax credit applied to New York City income tax. The tax credit is set at 5% of the federal credit and is refundable. Eligible taxpayers complete a city EITC form as part of their city income tax filing.

workers without a qualifying child may not make the effort to claim the credit if they owe no state income tax and are not otherwise required to file a state tax return. Because their benefits are small, however, the cost of including workers without qualifying children in a state EITC also is likely to be small. For people struggling to get by, even a small credit can be helpful.

Ease of administration is another factor in the decision of whether or not to include workers without a qualifying child in a state EITC. Excluding such workers requires additional instructions on state tax forms, and increases the likelihood of confusion among childless filers, who may claim the credit based on their eligibility for the federal credit. At the same time, states may face an increase in the number of returns they must process if a refundable state EITC is extended to these residents, since federal EITC recipients without qualifying children have very low incomes and in many states owe no income tax.

At present, Wisconsin is the only state in which workers without qualifying children are excluded by statute from the refundable EITCs.

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Step 2: Multiply the expected value of the state's federal EITC claims by the percentage at which the state credit is to be set.

Most states' EITCs provide benefits as a set percentage of what the federal program pays. This percentage generally ranges from 3.5 percent to 40 percent, depending on the state. To estimate the cost of a state EITC, multiply the federal EITC cost for the state, as determined in Step 1, by the percentage at which the state EITC is to be set. This calculation yields an estimate of what the state credit would cost in a given fiscal year if everyone who received the federal credit also received the state credit.

Step 3: Adjust the estimate for the fact that not all federal EITC claimants will claim the state credit.

In practice, a substantial portion of those who receive the federal EITC fail to claim state EITCs. This is especially true in the first few years after a state credit is enacted, when awareness of it may be limited.[27] In addition, some eligible families have the IRS compute their federal credit and may not receive a state EITC if the state does not compute the state credit amount for them. For these and other reasons, the cost of a refundable state EITC, especially in its initial years, is likely to be lower than the full cost of the federal credit multiplied by the state percentage. To account for this, the cost estimate should be reduced by at least 10 percent.

The Results

The estimated fiscal year 2012 costs to states of implementing a refundable EITC for tax year 2011 set at 5, 10, or 20 percent of the federal credit are shown in the last three columns of Table 1. Other percentages may be calculated based on those numbers (for instance, the cost of a 15 percent credit would be one-and-a-half times the cost of a 10 percent credit) and the methodology outlined above may be used for other years using the projections of federal cost presented in Table 1.

None of these figures includes the costs of changing tax forms to include a space to claim an EITC, or the costs of processing and administering EITC claims; these are likely to increase the overall cost of the credit by less than 1 percent. The estimates presented here apply only to credits that are refundable and that are set at a flat percent of the federal EITC.

[27] Compared to the cost each state would have incurred if every family claiming the federal credit also claimed the state credit, the actual cost of a newly enacted state EITC in its first year of availability was about 81 percent in Vermont, 83 percent in New York, 85 percent in Wisconsin, 88 percent in Oklahoma, 90 percent in Kansas and Minnesota, 91 percent in Colorado, and 97 percent in Massachusetts. In the second year of availability in each state, the cost in Vermont rose to 85 percent, the cost in New York rose to 90 percent, and the cost in Minnesota rose to 93 percent relative to the full-participation cost.

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Financing State EITCs through the Temporary Assistance for Needy Families Block Grant

One-third of states finance a portion of the cost of their state EITC's by using federal funds from the Temporary Assistance for Needy Families block grant, or by counting some state funds expended for an EITC toward meeting the "maintenance of effort" (MOE) required under TANF. For 2009, the most recent year for which data are available, 17 states and the District of Columbia used TANF or MOE funds (or both) for some of the refundable portion of the state's EITC. This number is higher than in past years.[28]

How It Works

Under federal regulations, states may use TANF or MOE funds only for the portion of an EITC that provides a refund in excess of tax liability and only for families with children. EITC benefits financed with TANF funds are not considered "assistance" under TANF rules; this means the federal "time limit" (the requirement that most adult welfare recipients may not receive federally-funded welfare payments for more than 60 months in their lifetimes) and the requirement that families assign their child support rights do not apply to EITC benefits funded with TANF. In addition, the TANF work participation requirements do not extend to those receiving only TANF-funded EITC payments and, thus, when a state's TANF work participation rate is calculated to determine if the state has the required proportion of TANF assistance recipients engaged in work activities, families receiving only TANF-funded EITC payments are not considered.

Some states have used the surplus TANF funds that became available when welfare caseloads declined in the late 1990s to create or expand EITC's to help families enter and remain in the workforce. At that time, financing a portion of a refundable EITC with TANF or MOE funds was an attractive option.

But the situation now has changed, because today, very few states have TANF surpluses. This is because, with very minor exceptions, each state gets the same TANF block grant today as it received in the mid-1990s. Since then, inflation has eroded the value of the TANF block grant, joblessness resulting from the recession has made more people in need of cash assistance and other services, and states have committed portions of their TANF grants to other purposes such as child care and child welfare. There are more demands on a shrinking pot of funds.

In other words, the fact that refundable EITCs are a *permissible* use of welfare funds under the federal law does *not* mean that TANF funds are always an *appropriate* financing mechanism for states considering new EITCs or EITC expansions.

Maintaining Funding in the Face of Shrinking Federal Funds

The number of states that are using TANF or MOE funds to provide a portion of the EITC has grown in recent years. Some states created a new refundable EITC; others expanded the amount of the benefit; and some newly claimed their existing EITC as state MOE or TANF spending. The

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[28] These states include Illinois, Indiana, Iowa, Kansas, Maryland, Massachusetts, Minnesota, Michigan, Nebraska, New Jersey, New Mexico, New York, North Carolina, Rhode Island, Vermont, and Wisconsin. Colorado also counts back-filed EITC claims toward its MOE requirements (the state's credit was suspended in 2002).

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