Family Income and Child Cognitive Development: Estimating the Short-run and Long-run Impact of Family Income on Achievement Test Scores

---

A Thesis Presented to the Faculty of the Economics Department of Cornell University in Partial Fulfillment of the Requirements for the Degree of Bachelor of Arts in Economics with Honors

by Nivedita Kutty Vatsa

May 2017

Abstract

This study investigates the relationship between family income and child cognitive development. The impacts of income are estimated using an instrumental variable approach in which earned income tax credit (EITC) benefits serve as an instrument for family income. Using data from the National Longitudinal Survey of Youth Child Supplement during 1986 to 2012, this study estimates the income effects on scores from the Peabody Individual Achievement Tests (PIAT) for Math, Reading Recognition, and Reading Comprehension. This study conducts two sets of analysis. First, this paper examines the effect of income in the short-run at different ages. Second, it evaluates how income received at different points in childhood affects long-run outcomes measured in early adolescence. The results provide little evidence for a significant, positive income effect. There is some support for income improving reading recognition test scores in the short-run among children of married mothers. Results further suggest that cognitive ability is most highly associated with household characteristics, particularly mother's test performance. Overall, this paper does not find a plausible income effect on test scores. However, it must be acknowledged that it remains possible that income transfers administered in alternate ways or to different target populations might have a more promising effect on child development.

Acknowledgments

This thesis would not have been possible without the guidance and encouragement of my thesis advisor, Professor Rachel Dunifon. I would also like to express my gratitude to Professor Gregory Besharov for his support and advice at every step of this project. I thank the Bureau of Labor Statistics for granting me access to their data, and the Cornell Restricted Access Data Center and the Cornell Office of Sponsored Programs for facilitating my use of the data. Special acknowledgment is due to Professor Jordan Matsudaira for his helpful comments in the early stages of this project. Finally, I thank my mother and father for their constant love and support.

Table of Contents

1. Introduction 1
2. Review of Literature 3
3. Research Methods 8
4. Data 18
5. Results 23
6. Discussion 40

1. Introduction

In 2015, approximately one in five children under the age of 18 in the United States lived in poverty (Jiang et al. 2017). In response to the high rate of child poverty, considerable research has emerged in the past several decades discussing what it means for a child to grow up poor in the US. One of the questions considered is whether family income contributes to child cognitive development through channels that are independent of inherent child and family characteristics. Understanding the determinants of child cognitive ability is especially important as child and adolescent performance on cognitive tests are known to be effective predictors of adult life outcomes such as wage earnings (Murnane et al. 1995), market productivity, and skill acquisition (Heckman et al. 2006).

Early adolescence in particular is a crucial phase of cognitive transition. At this point in life, children demonstrate overall improvements in their ability to reason deductively and process information (Steinberg 2005). Therefore, understanding the development inputs that raise cognitive ability in this period can be important for making a lasting impact on children's lives.

This study investigates the causal relationship between family income and child cognitive development. An empirical challenge that arises is that income is endogenous to unobserved child, parent, and family characteristics. In an attempt to address this concern, this study adopts an instrumental variable (IV) approach, which uses federal earned income tax credit (EITC) benefits as an instrument for family income. Using this method, this study first explores the effect of income received at different ages, particularly in early adolescence, on short-run cognitive outcomes. This study then

considers how the amount of income received by a child's family at each stage of child development affects long-run measures of cognitive ability.

Establishing the short-run and long-run effects of income at different ages has meaningful implications from a policymaking perspective. Of the various potential contributors to child development, income is arguably one of the easier measures to influence through policy intervention. If research can provide evidence for a significant income effect at a certain age, then there is potential for cash transfer programs to serve as an effective method of promoting child development.

The results of this study provide little evidence that income has a positive, non-zero effect on child development outcomes. There is some support for the possibility that income improves reading ability in the short-run by 7.9 percent of a standard deviation, but only for children who have married parents. For the general sample of children, a significant income effect is absent across all ages and cognitive ability tests, for both the short-run and long-run. Instead, factors associated with mother's cognitive ability and household structure appear to account for most of variation in test scores. These findings differ from those presented in previous studies, which find small, but positive and significant income effects. However, these results are consistent with the idea put forward by Guo and Harris (2000) that the effect of poverty on child development is "mediated completely by the intervening mechanisms," particularly cognitive stimulation at home and parenting style.

2. Review of Literature

Over the past 25 years, a growing body of research has evaluated the effects of income on child development outcomes, examining whether income transfers can boost child achievement. There are various explanations for why income may have an impact on child wellbeing and specifically, child cognitive achievement. Yoshikawa et al. (2012) discuss three "levels" on which the pathways between income and child outcomes may operate. The first is the individual level, which accounts for child health and nutrition. For example, Duncan and Brooks-Gunn (1997) noted that poor children are up to 3.5 times more likely to be affected by lead poisoning and twice as likely to be briefly hospitalized, compared to non-poor children. These negative health effects associated with poverty translate to brain development and overall cognitive development (Paxson and Schady 2007).

The second level is the relational level where interactions with peers and parents take effect. An example of this is that economic hardship can have an indirect effect on children through its mental health effects on their parents. Depression and demoralization, which are associated with poverty, can have adverse effects on parenting methods, thus adversely affecting adolescent children (Conger et al. 1997; Conger et al. 1992). Research finds that postpartum depression in mothers can have a small negative effect on the early cognitive development of male offspring, while chronic or recurrent depression can have adverse effects on children even at older ages (Grace et al. 2003).

The third level is the institutional level where a child's relationship with her environment influences her outcomes. Results from the famous Gautreaux Project demonstrate this by showing the effects of living in certain types of neighborhoods

(Leventhal and Brooks-Gunn 2003). One example of this is that children who grow up in more affluent suburban areas are more likely than less affluent city-dwelling children to complete high school and attend college (Rosenbaum and DeLuca 2008).

The discussion about the relationship between family income and child cognitive achievement is given a new dimension when considering how the timing of poverty relates to child outcomes. Children interact with their parents and peers in different ways as they transition through various ages. In early childhood, children interact with their home environment by reacting to or demanding certain developmental inputs. This may imply that younger children are more likely to be most affected by the characteristics of their home, which are determined largely by their parents. However, older children are able to seek out new environments outside the home, which may be better suited to their individual interests. In these new discovered contexts, children might find new sources of intellectual stimulation, which could potentially have a stronger influence on cognitive ability than those found in the home (National Institute of Child Health and Human Development Early Child Care Research Network 2005, Bradley et al. 2001). This section reviews the previous literature on the relationship between family income and child development, as well the existing research on how the timing of poverty affects child outcomes.

Early research on the subject of income and child cognitive outcomes examines mostly the association between these variables. Korenman et al. (1995) estimate a series of ordinary least squares (OLS) models, which regress cognitive scores on family income and a vector of other child-specific and household-specific characteristics. They compare the coefficient of income measured in a single year to that of income measured over

many years and find that the association of the latter measure with cognitive ability is nearly twice as large as that of the former. Blau (1999) also finds a significant and positive effect of income. However, he further notes that the magnitude of the coefficient of long-term income is too small to justify income transfer policies as a means of improving child development outcomes. Instead, he finds that family characteristics have a stronger association with child outcomes.

Guo (1998) addresses whether the timing of poverty leads to varied results in child performance. He hypothesizes that there is a difference in the income effect across measures of cognitive development depending on whether the child experiences poverty in early childhood or early adolescence. He argues that poverty in early childhood affects a child's "ability," which is the rate at which a child learns new concepts. Poverty in early adolescence is believed to affect a child's "achievement," which is a measure of what the child has learned and how she performs.

The studies discussed above estimate the associations between income and child achievement. More specifically, the observed level of family income or a categorical variable based on observed income is used as a predictor of child outcomes. Although the studies that use such an approach reveal important associations with child development, they might fail to shed light on the causal links between family income and child outcomes. Family income as a direct measure may be correlated not only with cognitive outcomes, but also other factors that may independently affect cognitive outcomes in ways that cannot be controlled for. The possible association between income and unobservable child and family characteristics might cause omitted variable bias in the results. In other words, the results would fail to isolate the effects of income.

Blau (1999) acknowledges this concern and attempts to address it by specifying a model with fixed effects for the children of sisters in the sample; i.e., children with cousins included in the sample who share the same maternal grandparents. In doing so, the author aims to capture some of the correlation between permanent income and unobservable family characteristics. More recently, empirical research has turned to other methods to correct for the endogeneity of income. Milligan and Stabile (2011) examine the effects of Canadian government benefits on child outcomes. Instead of using observed benefits, they simulate the amount of benefits received using a tax calculator and use this simulated amount as an instrumental variable for the actual benefits for which a family is eligible. They find that a $1,000 increase in benefits leads to a significant increase in math scores by 6.9 percent of a standard deviation. Chetty et al. (2011) find that a $1,000 increase in tax credits raises test scores by 8 percent of a standard deviation, and in the most conservative case, by 6 percent. Instead of instrumenting for benefits, their analysis features an ordinary least squares (OLS) model with the maximum amount of credit possible as the predictor of interest, which also controls for income with a fifth-order polynomial. This study also briefly addresses whether the timing of tax credit receipt produces different results. This is achieved by estimating the effect of tax credits on test scores measured at different grade levels in school. They find a larger effect for older children, while the effects were varied at younger ages. While the authors note this variation by age, they do not provide a specific theory to explain it. Duncan et al. (2011) also evaluate the effect of family income on child performance. They use data from various previously executed studies, which implemented an antipoverty or welfare program as part of an experiment. Their

estimation strategy uses a family's random assignment to one of these programs as an instrument for income. They find results that are comparable to those of Milligan and Stabile (2011), and Chetty et al. (2011), showing that a $1,000 increase in income leads to a test score increase of 5 to 6 percent of a standard deviation.

Dahl and Lochner's (2012) work is one of the earlier studies to employ an instrumental variable approach to the estimation of income effects on child development. In a two-stage least squares approach, they estimate income by predicting changes in earned income tax credits (EITC) as a polynomial function of lagged pre-tax income. Predicted income is then used to estimate the contemporaneous effects of a change in income on children's reading and math test scores. The study finds that income "has a modest, but encouraging, causal effect for children growing up in poor families." Specifically, they find that $1,000 of additional income would raise math and reading test scores by approximately 6 percent of a standard deviation. This result is similar to those discussed above. The study further notes that this effect is larger for more disadvantaged children, younger children, and boys.

This research provides a useful framework for studying the various linkages between poverty and time child development. However, it does not indicate whether the immediate effects of income are sustained over a child's life. This study builds on existing research by asking whether the effect of income on cognitive ability extends beyond the short-run into early adolescence and if so, which period in a child's life would result in the most effective cash transfer intervention. In recent work, Bastian and Michelmore (2015) model the effects of family income on long-run outcomes, which include the completion of high school, enrollment in college, completion of college, and

earnings in adulthood. They use the estimated amount of tax credits received during different phases in a young adult's life as an instrument for family income received in the corresponding periods. This method allows for the effect of income to be tested on future outcomes. This study adopts an approach similar to that used in Bastian and Michelmore (2015) to estimate the long-run effects of income received at different stages in a child's life. Similar to Dahl and Lochner (2012), this paper also evaluates the short-run causal relationship between family income and child cognitive development. However, it extends this work by considering whether the timing of an income transfer has varied effects on child performance. This is estimated by assessing the effects of income on test scores at different ages from early childhood to early adolescence.

3. Research Methods

3.1 Short-run effects of income

A standard approach to modeling the effects of family income on child cognitive achievement would be to regress a measure of child outcome against family income, while controlling for potentially confounding factors. These factors would include characteristics associated with the child, her household, her neighborhood, as well as the time when her achievement is measured. Based on this method, cognitive development scores at a certain age may be modeled as follows:

$$Y_{i,a} = \beta Inc_{i,(a-1)} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (1)$$

In this OLS model, i, a, j, s, and t are subscripts for an individual child, the child's age, the child's household, the state of residence, and the year respectively. The response variable, $Y_{i,a}$ is the cognitive development score of child i at age a. The coefficient of interest, β, represents the effect of post-tax income received in the previous year at age

$(a-1)$. In other words, β represents the short-run effects of income on cognitive development. It should be noted that in equation (1), it is assumed that all children sampled are the same age. X'_i is a vector of child-specific characteristics, which includes sex, race, birth weight, and current weight. W'_j is a vector of household specific characteristics, which includes mother's marital status, family size, number of hours worked, and a measure of mother's intellectual ability (discussed further in section 4), among other factors. These variables are intended to control for between-household variation as well as any genetic ability inherited from the mother. $Z'_{s,t}$ is a vector of state-level, time-varying policies and economic indicators, which may be associated with the generosity of government assistance programs such as the EITC. These variables include the state average unemployment rate, the state per capita GDP, and the state minimum wage. The model also includes fixed effects for state, μ_s, and fixed effects for year, α_t, which are discussed in further detail in section 5. ε_i is the error term for each child.

Equation (1) models the effect of income only at age a. This study will mostly take a to be 13 or 14 years, thus estimating how income affects cognitive ability in early adolescence. The reason for selecting two possible ages is discussed in section 4. To estimate an average income effect across all ages, this study relaxes the assumption that all children in the sample are the same age and introduces a child age dummy variable to the vector, X'_i.

3.2 Income effects over a child's lifetime

Section 3.1 describes how income at a given age may child affect cognitive development in the following year. However, it does not reveal whether this effect is sustained over time. More importantly, if income improves test scores by improving various child

development inputs, then it is important to understand which periods in a child's lifetime are most crucial for improving cognitive ability in the long run. The long-run effects of family income on cognitive ability can be modeled as follows:

$$Y_{i,a} = \sum_{k=1}^{n} \beta_k \, Inc_{i,phase\,k} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (2)$$

In this equation, $Y_{i,a}$, the test score of child i at age a, is modeled as a function of family income received in k different phases of the child's life prior to age a. The coefficient of interest, β_k, represents the effect of income received in phase k on long-run cognitive outcomes measured at age a. The vectors, X'_i, W'_j, and $Z'_{s,t}$ represent the same controls as described in equation (1), while μ_s, and α_t are state and year fixed effects. In keeping with the practice mentioned in section 3.1, this study will take age a to be 13 or 14 years. The phase-wise income effects will be estimated across 3 periods of a child's life. The first phase is early childhood, which spans ages 0 to 5. The second is the years of elementary school education, which covers ages 6 to 10. The third is early adolescence, which includes ages 11 to 14. Equation (2) may therefore be rewritten as follows:

$$Y_{i,age=13\ or\ 14} = \beta_1 Inc_{i,age=(0-5)} + \beta_2 Inc_{i,age=(6-10)} + \beta_3 Inc_{i,age=(11-14)} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (3)$$

In equation (3), coefficients β_1, β_2, and β_3 measure how family income at ages 0-5, 6-10, and 11-14 respectively, affect cognitive ability at age 13 or 14.

A crucial challenge to the approach outlined in this section and section 3.1 is that households with varying levels of income may differ from one another in unobservable ways that, by definition, cannot be controlled for. Therefore, the use of observed income as a predictor of child outcomes would yield biased estimates.

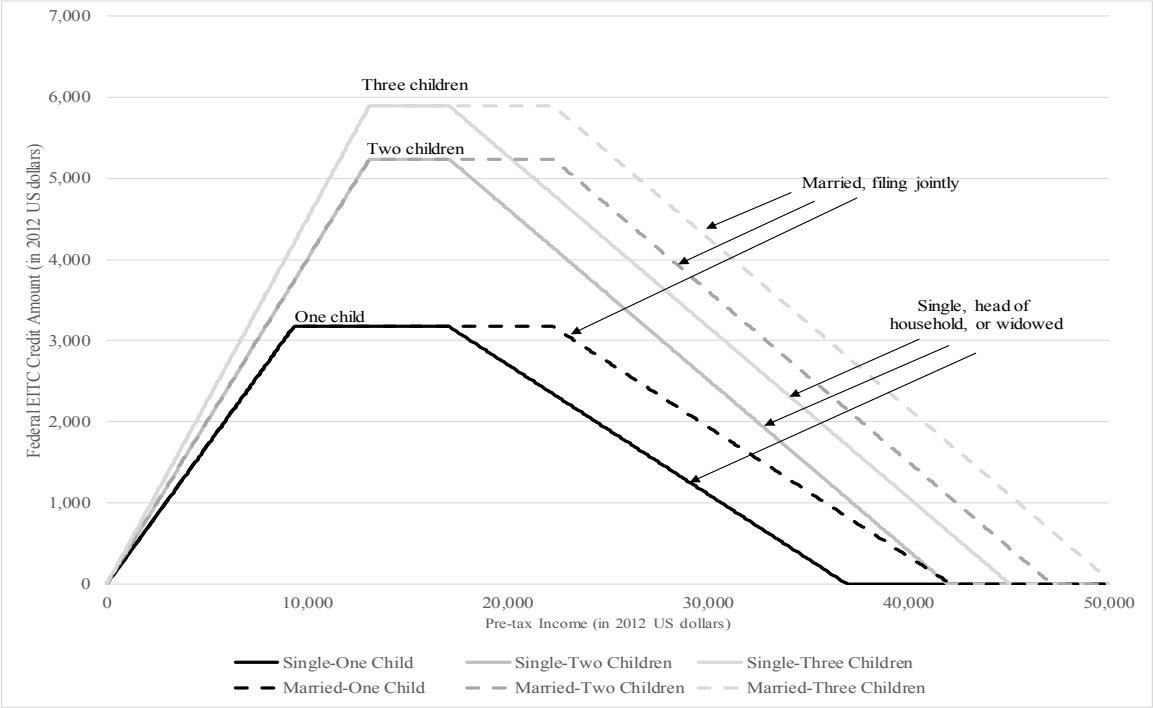
To overcome this challenge, this study adopts a method that exploits legislation-induced variation in family income, which is arguably uncorrelated with unobserved child and household characteristics. This is achieved by instrumenting observed family income with an income transfer of an amount that is determined independently of the household. In this case, the EITC benefit may be considered as an exogenous transfer of income.

3.3 The EITC as an instrument

The EITC is a refundable tax credit for working individuals in low-income households. It is estimated that for the 2015 tax year, filed in 2016, more than 27 million families benefited from the EITC, receiving a collective total of approximately $67 billion ("About EITC," 2016). The EITC schedule allows households to claim tax credits equal to a certain percent of their family income, but only up to the maximum credit amount. For a given income range, households may continue to claim this maximum credit. After exceeding the upper limit of this range, the households are "phased out" of the program. They are granted reduced credits up until their income equals the maximum income for EITC eligibility. The exact credit rates and eligibility thresholds for EITC granted at the federal level in a given year vary by the number of children, the taxpayer's filing status, the year in which a taxpayer is filing, and the taxpayer's annual income (Hotz et al. 2003). This is illustrated in Figure 1, which describes the federal EITC benefit available to different types of households for the year 2012.

According to the Internal Revenue Service (IRS), a household with one child may claim between $9 and $3,169 based on its income and whether the taxpayer is filing jointly ("Earned Income Tax Credit for 2012; Do I Quality?" 2013). This is shown in

Figure 1 – Federal EITC 2012 schedule for families with one, two, and three children with married or single parents

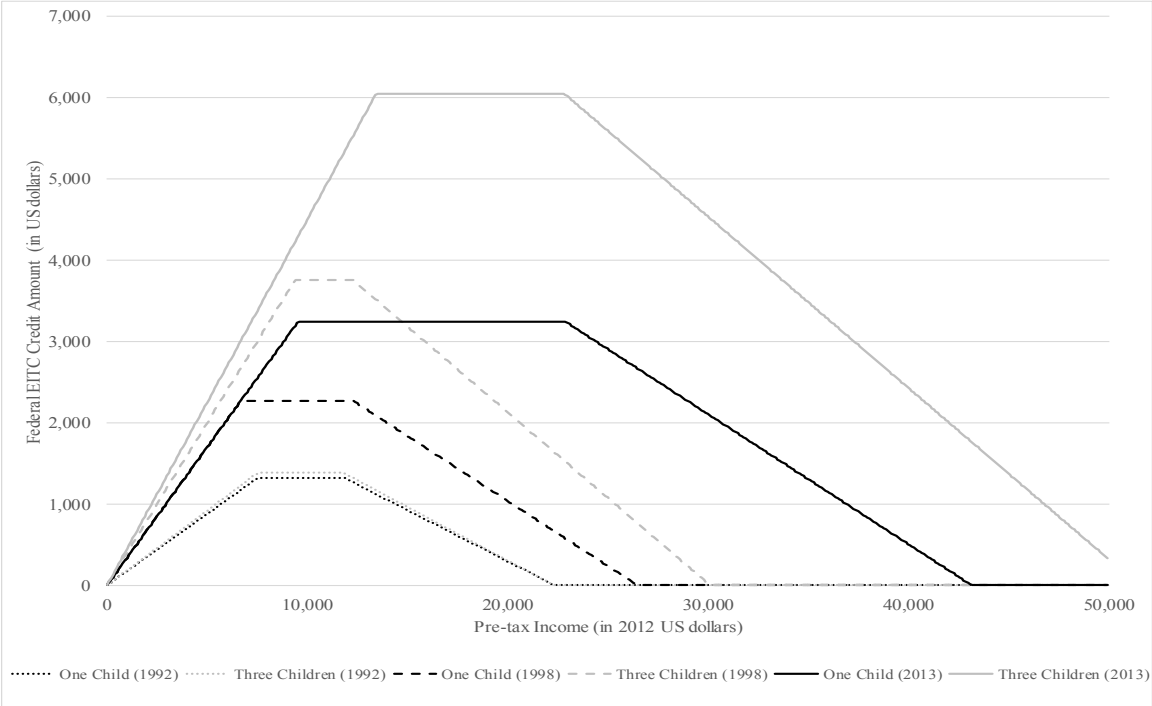


Source: Calculations using TAXSIM.
Notes: It is assumed that all families receive a standard tax deduction.

Figure 1. Similarly, it can be seen that households with two children and three or more children may claim credits in the range of $10 to $5,236 and $11 to $5,891, respectively. The maximum income for EITC eligibility until the household is completely phased out of the program is higher for households filing taxes jointly. For single taxpayers, the maximum income for eligibility is $36,920 for one child, $41,952 for two children, and $45,060 for three or more children. For taxpayers filing jointly, the maximum is $42,130, $47,162, and $50,270 for one, two, and three or more children respectively.

Since its initiation in 1975, the EITC went from being a temporary program to a permanent one and has since undergone several waves of expansion (Falk and Crandall-Hollick 2016). Early among these expansions was the 1986 Tax Reform Act, which raised EITC benefits and effectively made it the largest cash-assistance program for

Figure 2 – Federal EITC schedule for families with one or three children in years 1992, 1998, and 2013



Source: Calculations using TAXSIM.
Notes: Calculations assume that all households have married parents who file taxes jointly. It is also assumed that all families receive a standard tax deduction.

families with children (Eissa and Hoynes 2006). In 1993, under the Omnibus Budget Reconciliation Act (OBRA), the government expanded the EITC once again as part of its pledge to eliminate poverty among full-time workers receiving the minimum wage. This expansion was particularly generous to families with two more children. The changes in EITC generosity over time can be seen in Figure 2.

The revisions to the EITC schedule have been effective in reducing poverty nationwide. In fact, in 2013, the program, along with the Child Tax Credit, was estimated to have lifted 9.4 million individuals out of poverty of whom 5 million were children (Marr et al. 2014). To date, it is one of the largest government cash-transfer programs in the United States (Hotz et al. 2003).

The expansions to the program, in addition to its tiered structure, creates considerable variation in the amount of tax credits received and by extension, generates variation in

family income. These changes in EITC generosity across time, household composition, and income level are largely determined by legislative factors and are therefore largely independent of family-level decisions that cannot be controlled for. Therefore, this study is able to identify variation in post-tax family income induced by the variation in the federal EITC, which is driven by variation in family size, tax filing status, the year of filing, and the pre-tax level of income.

This study uses a two-stage least squares method to isolate the causal effect of income on cognitive development. Using federal EITC payments as an instrument for family income, the first stage is modeled as follows:

$$Inc_{i,a} = \beta EITC_{i,a} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (4)$$

In equation (4), $Inc_{i,a}$ represents post-tax income, which equals the pre-tax income net of government benefits, tax credits, and tax liabilities. $EITC_{i,a}$ measures the EITC benefit received by child i at age a. Using predicted family income, $\widehat{Inc}_{i,a}$, the second stage equation allows for a causal interpretation of the estimated income effects:

$$Y_{i,a} = \beta \widehat{Inc}_{i,(a-1)} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (5)$$

Similarly, the income effects over a child's lifetime, as discussed in section 3.2, may also be estimated by a two-stage least squares model. The first stage includes the following three equations:

$$Inc_{i,age=(0-5)} = \beta_1 EITC_{i,age=(0-5)} + \beta_2 EITC_{i,age=(6-10)} + \beta_3 EITC_{i,age=(11-14)} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (6)$$

$$Inc_{i,age=(6-10)} = \beta_1 EITC_{i,age=(0-5)} + \beta_2 EITC_{i,age=(6-10)} + \beta_3 EITC_{i,age=(11-14)} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (7)$$

$$Inc_{i,age=(11-14)} = \beta_1 EITC_{i,age=(0-5)} + \beta_2 EITC_{i,age=(6-10)} + \beta_3 EITC_{i,age=(11-14)} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (8)$$

In the first stage, $EITC_{i,age=(0-5)}$, $EITC_{i,age=(6-10)}$, and $EITC_{i,age=(11-14)}$ are the average EITC benefit received by child i in early childhood, the elementary school years, and early adolescence respectively. Using the estimated income from equations (6), (7), and (8), the causal effects of income on cognitive development can be modeled as follows:

$$Y_{i,age=13\ or\ 14} = \beta_1 \widehat{Inc}_{i,age=(0-5)} + \beta_2 \widehat{Inc}_{i,age=(6-10)} + \beta_3 \widehat{Inc}_{i,age=(11-14)} + \gamma X'_i + \phi W'_j + \theta Z'_{s,t} + \mu_s + \alpha_t + \varepsilon_i \quad (9)$$

The equations (1)-(3) presented in sections 3.1 and 3.2 can be referred to as naïve OLS models, while the equations discussed in section 3.3 are models that employ an instrumental variable approach.

By using the EITC as an instrument for family income, it is assumed that the amount of EITC benefit received is independent of family decisions that cannot be controlled for, and it is assumed that the EITC affects child outcomes only through its effect on income. There are several considerations, which would weaken these assumptions. According to Averett and Wang (2014), the EITC can affect child outcomes in two ways aside from the direct income channel.

First, the EITC program is designed to aid the *working* poor, which means that it incentivizes taxpayers to work or increase their working hours until a household becomes eligible for the maximum benefit. Research shows that the EITC has a positive effect on labor market participation (Dickert et al. 1995). However, in the phase-out range, the EITC has little effect on the decision to work or the hours spent working (Meyer 2002).

The labor force participation response to the EITC suggests that families are able to directly influence the amount of EITC benefit received. This response may also affect child cognitive outcomes outside of the income channel. For example, the EITC might indirectly limit the amount of time available for parental interaction with children by encouraging parents to seek employment or work longer hours. This is an important drawback of using the EITC as an instrument.

Ideally, EITC benefits would affect no predictor of child test scores other than post-tax family income, i.e., it would be completely exogenous to all other variables used to model test scores. However, since it is known that the EITC has non-income effects, it is necessary that the regression models control for these additional effects in order to ensure that the EITC is uncorrelated with the error term. One way in which this study attempts to do this is to control for part of the EITC labor response using the number of hours a mother worked in a given year. However, it is not possible to control for other potential non-income pathways through which the EITC affects child test scores; e.g., the effects of increased work effort on parent and child wellbeing. It is therefore acknowledged that the EITC might not entirely satisfy the exclusion restriction that is required of an instrumental variable.

Previous research suggests that the EITC raises labor force participation primarily in married fathers and single mothers (Eissa and Hoynes 2004; Meyer and Rosenbaum 2001). Since the effects of the EITC on labor force participation are likely to be more dramatic for households with single mothers, this paper presents additional analysis, which estimates the income effects on cognitive development using data from households with married parents only. For a model based on this subsample, the unobserved EITC

effects might possibly be smaller and therefore the instrument would be less correlated with the error term. This approach is also not entirely unproblematic as married couples, who file taxes jointly are eligible for a higher EITC benefit, which results in less variation in EITC payments. Moreover, it has been estimated that married couples show a net *decrease* in their labor participation in response to the EITC, for which mostly the mothers drive the negative participation effect (Eissa and Hoynes 2004). In other words, the non-income EITC effects for these families might not be much smaller than those for the general population. If this is true, then the coefficients estimated from this subsample would suffer from biases similar to those discussed earlier in this section as the EITC would still be correlated with the error term containing unobservable determinants of child cognitive ability. Despite these possible limitations, the analysis for married couples is presented in Appendix C and the results for this set of analyses gives broadly similar results to that of the general sample.

The second non-income channel identified by Averett and Wang (2014) through which the EITC can affect child development is its indirect effect on the health of parents. Previous research has found that the EITC has a positive effect on mothers' mental and physical and health (Evans and Garthwaite 2014), which can improve the overall quality of childcare. It can be argued that this health effect is associated with the overall EITC income effects. Unlike the labor supply effects, which are a response to the policy, the parental health effect highlights one of the pathways through which income improves child outcomes.

Another argument against using the EITC as an instrument for family income is that the EITC generosity and child cognitive ability may share certain unobservable causes.

These causes may be associated with the political climate of the time and other social policies (Pega 2016). For example, under the Bill Clinton administration, the EITC was expanded in 1993 and brought into effect between 1994 and 1996. This was soon followed by the introduction of the Temporary Assistance for Needy Families (TANF) program in 1996. It must therefore be acknowledged that this is an important limitation of the instrumental variable approach applied in this study. Although the models described in this section attempt to control for any confounding from changing social policies, it would not be possible to control for all possible measures.

4. Data

The data are taken from the National Longitudinal Survey of Youth (NLSY-79) and the Children of the NLSY (NLSY-C). The Bureau of Labor Statistics initiated the NLSY program in 1979, sampling young males and females between the ages of 14 and 22 and subsequently following them over the course of their lives. The survey asks detailed questions about the respondents' income, education, family, health, and lifestyle. Starting in 1986, the children of females in the NLSY-79 cohort were sampled under the NLSY-C project. This project tracks children's emotional, cognitive, and physical development. It also records the children's health and academic performance. These children are sampled biennially from birth until the age of 14, after which they are inducted into the NLSY Young Adult cohort. NLSY-79 data is available annually from 1979 to 1992, after which it is available biennially. Information about households' state of residence is recorded in the restricted NLSY geocode datasets. As of 2014, over 10,000 children have been surveyed under the program at least once. Since the data are collected biennially, the exit age of an NLSY-C respondent may be either 13 or 14 years. As a result of this, the age at

which cognitive outcomes are measured i.e., a takes on the value of either 13 or 14 in equations (1)-(9).

The joint use of the NLSY-79 and NLSY-C datasets allows for information about children to be linked to that of their mothers. This creates a fuller picture of a child's family background, thus allowing the model to control for various aspects of a child's life that may influence cognitive development. More importantly, the NLSY oversamples black and Hispanic or Latino youths, in addition to low-income white youth, which are the groups that are mostly likely to be EITC-eligible.

Although the NLSY datasets contain a rich set of mother and child variables, information about the mother's co-parents is noticeably lacking. The data about the co-parents' background is less extensive than that of the mother with a considerably higher level of non-response. This shortcoming becomes particularly problematic in the analysis of children with married parents described in section 5. Another limitation of these data is that respondent attrition is inevitable and almost certainly non-random. Research finds that attrition is higher among children in families, which earned higher incomes in the first three years of the child's life. In addition, mothers who had never been married at the time when the child was first surveyed have a lower tendency to leave the study (Aughinbaugh 2004). Non-random attrition is problematic because as respondents who are more likely to leave the survey withdraw, respondents who are more likely to stay form a greater share of the sample. The sample will therefore overrepresent the characteristics that are unique to the group that continues with the survey. As a result of this, the estimated income coefficients would be biased, reflecting the effect for the

respondents who remain as opposed to the general population. Despite these limitations, it is assumed for the purpose of this study that missing values are missing at random.

The NLSY measures child cognitive ability with three subtests associated with the Peabody Individual Achievement Test (PIAT). First, the PIAT Math test gauges a child's mathematical ability as taught at the school level. It tests basic numeral recognition skills as well as more advanced subjects such as geometry and trigonometry. Second, the PIAT Reading Recognition test assesses a child's ability to recognize and pronounce individual words. Third, the PIAT Reading Comprehension test measures a child's capacity to find meaning in written passages. All three tests are administered from age 5 until the child reaches young adult age i.e., 14 years. The raw scores for the tests are standardized based on the age of the test-taker and have a mean of approximately 100 points and a standard deviation of 15 points (see Table 1).

The data contain various child- and household-related factors, which are summarized in Table 1. Among these variables, the Armed Forces Qualification Test (AFQT) score is used as a measure of mother's intellectual ability. The test was administered to the NLSY-79 respondents at the time of the initial survey. It is a weighted composite of various tests that measure mathematical knowledge, arithmetic reasoning, word knowledge, and paragraph comprehension. The test scores may vary from 0 to 10,000. In this study, the AFQT test scores are used as a control for a mother's inherent cognitive ability, which may be genetically, culturally, or environmentally linked to that of her children.

The dataset contains the family's pre-tax income earned in the calendar year prior to the survey year. However, the NLSY does not record the exact EITC benefit received or

Table 1 – Summary statistics of continuous variables

	All		Age 14	
	Mean	SD	Mean	SD
Math score	99.52	14.05	98.55	14.32
Comprehension score	100.23	13.99	95.29	13.41
Recognition score	103.13	14.92	101.78	16.38
Birthweight (oz)	115.85	22.93	115.65	22.02
Weight (lbs)	67.49	40.89	127.99	35.27
Mother's child birth age	25.03	5.84	24.61	5.57
Mother's AFQT score	36,006	27,375	34,853	26,841
Hours work in a year	1,226	1,009	1,324	1,024
Family size	3.81	1.70	4.22	1.58
Observations	20,5246		10,327	

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured in US dollars adjusted for inflation to year 2015.

the taxes paid in the corresponding timeframe. Further, the surveys do not ask whether a family filed to receive the EITC. Therefore, in this study, it assumed that all EITC-eligible families received their due benefit and the size of this benefit is imputed using the TAXSIM software (version 9) of National Bureau of Economic Research (NBER). In reality, the Internal Revenue Service and the Census Bureau estimate that only 80 percent of the eligible individuals claim the tax credit ("About EITC," 2016). The EITC benefit, among other tax credits and liabilities, is estimated on the basis of a household's pre-tax income from salary, the year in which taxes were filed, the number of children in a family, and the taxpayer's filing status based on marital status. It should be noted that the state in which taxes were filed is not used as an input and therefore, the estimated values correspond to federal tax credits and liabilities. Since this calculation ignores state benefits, this study is unable to treat state-level differences in EITC benefits as a source of variation. Instead, the EITC variation is driven only by pre-tax income, filing status, and family size, in addition to variation over time.

The TAXSIM outputs are also used to determine a household's post-tax income. The estimated measure of post-tax income comprises observed income data from the previous calendar year and imputed benefits and taxes from the survey year. Post-tax

Table 2 – Estimated family income and EITC benefits by age

	(1) Number of Children	(2) Mean family income	(3) Fraction of EITC eligible households in the sample	(4) Mean EITC benefit (if eligible)	(5) EITC benefit as a fraction of family income
13 or 14 years	3,420	41,366	0.30	2,370	0.10
11 or 12 years	4,427	40,966	0.30	2,117	0.09
9 or 10 years	4,886	39,981	0.29	1,888	0.08
7 or 8 years	5,229	39,147	0.28	1,694	0.08
5 or 6 years	5,682	37,737	0.26	1,483	0.07
Total	23,644	39,642	1,876	0.28	0.08

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured in US dollars adjusted for inflation to year 2015.

income, also referred to as family income in this study, is computed by adding imputed EITC benefit, child tax credits, general tax credits, and gross social security income to observed pre-tax income, and then subtracting the imputed federal income tax liability, employee Federal Insurance Contributions Acts (FICA) payments, and federal regular tax. Table 2 summarizes this measure of family income by age and the EITC benefits are summarized alongside family income. Since many children in the sample reached early adolescence when the OBRA 1993 was enacted, children at older ages receive higher average EITC benefits. However, it also appears that the fraction of EITC benefits relative to total income is similar across ages.

Ideally, the NLSY would measure income data a full year before a child's cognitive ability was tested. However, this is not possible as child data are measured biennially in even years and so are income data, following 1992. This creates the possibility of an overlap in the period in which family income was earned and a child's cognitive ability is measured. For the majority of the analysis presented in section 5, it assumed that the children were administered the cognitive development test after their post-tax family income was earned and recorded. However, to address this concern, this study replicates models (4) and (5) using post-tax family income that is lagged by 2 years. In doing so,

the study allows for a sufficiently large window of time in which income can take its effect on cognitive test scores. Both sets of analyses yield broadly similar results.

For the purpose of imputing EITC benefits and other determinants of post-tax income in a consistent manner, the sample only includes respondents residing in the 50 United States and the District of Columbia. The sample is further restricted to children in families that earn no more than $80,000 in post-tax income measured as 2015 US dollars. Mothers who gave birth between the ages of 10 and 14 years are also excluded from the sample.

The state by year economic indicators and policy variables are taken from a range of publicly available sources. Monthly unemployment rate data were made available by the Bureau of Labor Statistics. These rates are averaged across the 12-month calendar year to generate an average annual state-wise unemployment rate. Data on minimum wage were obtained from the Tax Policy Center, while per capita GDP by state information was collected from the Bureau of Economic Analysis.

5. Results

This section discusses the estimated impact of family income on children's cognitive ability as measured by test scores. Section 5.1 presents the short-run IV estimates of the effect of income at age 13 or 14. These effects are modeled by equations (4) and (5). This section then discusses the short-run income effects at ages younger than 13. Finally, it presents the short-run income effects as an average over all ages. Section 5.2 then explores whether family income received over a lifetime has a lasting effect on cognitive ability measured in early adolescence. These long-run effects are estimated using equations (6) to (9). Throughout these sections, this paper discusses results from two

alternate specifications discussed in sections 4 and 5. The first uses 2-year lagged family income and EITC payments in equations (4) and (5) to estimate the short-run effects. The second estimates equations (4), (5), and (6)-(9), while restricting the sample to children of mothers who are married either to the child's biological parent or a step-parent.

Using these regression models, this study estimates a set of 7 income coefficients for each cognitive outcome variable. The first regression model uses post-tax income as the sole predictor of child cognitive test scores.[1] The following models sequentially introduce sets of conceptually related control variables. In doing so, this paper first presents the simple correlation between measures of income and cognitive ability, and then reveals how other child and family characteristics might mediate the relationship between these measures.

The second set of controls adds time-invariant exogenous child characteristics, namely, race and sex. The third group of controls includes further child characteristics such as the child's birth weight, the child's current weight, and an interaction term between weight and sex. These variables are used to control for differences in child physical health. The following set of independent variables comprises time-invariant characteristics of the mother, which include her age at the time of her child's birth and her AFQT score. The addition of these controls is important as they demonstrate the extent to which maternal influence accounts for child cognitive ability. This study then introduces more maternal and household characteristics in the fifth set of controls. These include a dummy variable for the mother's highest grade of education achieved, her total number of hours worked in the previous year, her marital status, and the size of the

[1] To estimate the average income effect on child cognitive test scores across all ages, the first set of controls includes a dummy variable for child age in addition to post-tax income.

family. These variables further show how controlling for the existing home environment alters the income-test score association.

The sixth estimated coefficient of income is a result of adding fixed effects for a child's state of residence and the year when she was surveyed. In general, the fixed effects control for various consequences associated with living in a certain year or state. For example, children in states that experience heavy rain might participate in different developmental activities than children in arid states. Similarly, children sampled at times of economic downturn might develop differently than children living in relatively stable periods. In a naïve OLS model, these fixed effects also account for factors that affect income levels and expenditure such as the cost of living. The fixed effects control for these types of variation in the first stage of the IV model as well. For the second stage of the model, the year fixed effects also control for the changes in federal EITC generosity observed over time.

The addition of the state and year fixed effects in column (6) introduces approximately 65 new parameters to the model. It can be argued that by estimating these many new parameters for a sample of approximately 3,000 children would greatly reduce the variation available in the data. Although this is a valid concern, it is seen throughout subsections 5.1 and 5.2 that the coefficient standard errors estimated by models controlling for fixed effects remain fairly consistent with the preceding five specifications. This is true for the IV and naïve OLS results presented throughout this paper, even when the coefficient of income, presented in column (6), is statistically significant. This would suggest that even though the fixed effects absorb certain variation in the data, the model is still able identify variation in income and EITC payments.

Table 3 – Naïve OLS Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.161***	0.102***	0.105***	0.0460***	0.0282*	0.0253	0.0239
	(0.011)	(0.011)	(0.012)	(0.012)	(0.013)	(0.014)	(0.022)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3,349	3,349	3,122	3,031	2,992	2,980	1,377
Adjusted R^2	0.066	0.129	0.132	0.223	0.246	0.256	0.253

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The state fixed effects estimate an average effect for each state over all years, while the year fixed effects estimate an average effect for each year across all states. In an attempt to interact state with year, this study introduces the seventh group of controls, which is a set of economic indicators and policy variables, which vary over time. These include state minimum wage, state per capita GDP, and the state-wise average unemployment rate.

5.1 Estimating the short-run effects of income

5.1.1 Reading Test Scores

First, this study presents the naïve OLS estimates of the income effect from equation (1), presented in Table 3. Columns (1)-(7) show the size of the short-run income effect on reading comprehension scores, estimated using the 7 sets of control variables previously described. Column (1) shows the direct correlation between the estimated post-tax family income and reading comprehension score. Consistent with previous research, there is a large and significant association of 16.1 percent of a standard deviation. Column (2)

Table 4 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.282***	0.205***	0.202***	0.105*	0.0640	0.0355	0.121
	(0.035)	(0.041)	(0.041)	(0.042)	(0.045)	(0.047)	(0.091)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3,349	3,349	3,122	3,031	2,992	2,980	1,377
Adjusted R^2	0.028	0.106	0.111	0.216	0.244	0.256	0.242

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

introduces controls for time-invariant exogenous child characteristics. Their inclusion lowers the estimated income association to 10.2 percent of a standard deviation. Column (3) adds further child characteristics, which in fact increases the size of the income-test score association. However, after controlling for mother's time-invariant characteristics in column (4), the association is more than halved. The association is once again more than halved in column (5), in which the model controls for additional household characteristics. After controlling for state and time fixed effects in column (6), the income effect estimated by the naïve OLS model is no longer significant. This is also seen in column (7), in which the model controls for time varying, state-level economic indicators and policy variables.

These results are the naïve OLS estimates, but the pattern observed across columns (1)-(7) is also seen for the IV estimates listed in Table 4. For all first-stage regressions, EITC benefits are significant at the 0.01 significance level. Similar to the OLS estimates, a simple analysis using only family income yields a large, positive, and significant income effect that is in fact larger than the corresponding OLS estimate. However, the

Table 5 – Naïve OLS Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.188***	0.131***	0.132***	0.0585***	0.0441**	0.0376*	0.0608*
	(0.013)	(0.014)	(0.014)	(0.014)	(0.016)	(0.017)	(0.027)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3,374	3,374	3,145	3,053	3,014	3,001	1,383
Adjusted R^2	0.063	0.107	0.110	0.186	0.209	0.217	0.222

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

size of the effect nearly halves after mother-specific controls are introduced. Once general household characteristics are controlled for, the income effect is no longer a significant predictor of reading test scores.

The method used to produce the results in Table 4 gives similar results when applied to younger age groups. The results from this set of analyses are given in Appendix A. For children aged 11 or 12, the estimated short-run income effect becomes insignificant after household characteristics are controlled for in column (5). For age 9 or 10, the effect becomes insignificant at column (4), whereas at age 7 or 8, the effect only becomes insignificant at column (5). The weakest relationship is seen for children aged 5 or 6, for whom the income effect becomes zero after controlling for time-varying child characteristics in column (3). The size of the estimates, before becoming insignificant, is fairly large and consistent, ranging between 10 percent and 14 percent of a standard deviation, with the exception of children aged 8 or 9, for whom the estimate is 7 percent of a standard deviation. These results are consistent with the estimates obtained using 2-year lagged family income and EITC payments (Appendix B). The income effect

Table 6 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.275***	0.196***	0.181***	0.0865	0.0400	0.0172	0.0826
	(0.043)	(0.051)	(0.052)	(0.054)	(0.059)	(0.062)	(0.128)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3,374	3,374	3,145	3,053	3,014	3,001	1,383
Adjusted R^2	0.050	0.100	0.106	0.184	0.209	0.217	0.222

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

estimated by these models fall to zero after introducing controls for either time-invariant mother's characteristics or household characteristics i.e., in columns (4) or (5) respectively. The estimated effect size before turning insignificant is in the range of 9 percent and 14 percent of a standard deviation for all ages, which is also comparable to the estimates that use current income. The income effect estimates from using a sample of children with married parents are presented in Appendix C and they also show a similar result.

Table 5 shows that the association between family income and reading recognition scores is significant and positive at 6 percent of a standard deviation, even after controlling for state-time variation. However, the IV estimates in Table 6 show that the income effects on reading recognition scores drop to zero after controlling for mother-specific characteristics in column (4). Estimating these income effects for younger age groups gives comparable results (Appendix A). The estimates for family income effects become insignificant either after adding controls for maternal characteristics or after adding controls for household characteristics. The estimated effect at age 13 or 14 is

Table 7 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores across All Ages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.231***	0.172***	0.166***	0.0938***	0.0531*	0.0198	-0.0107
	(0.017)	(0.021)	(0.021)	(0.020)	(0.022)	(0.022)	(0.032)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	16,813	16,813	15,590	15,119	14,911	14,839	8,781
Adjusted R^2	0.145	0.187	0.190	0.259	0.284	0.296	0.303

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

initially significant at 18.1 percent of a standard deviation, but after controlling for mother's characteristics, the effect is found to be insignificant. Similarly for younger ages, the effect ranges between 10 percent and 12 percent of a standard deviation, but none of the coefficients are significant by the stage when household characteristics are controlled for. The results from lagged income and EITC payments (Appendix B) are similar in that for most ages, maternal and household characteristics explain most the variation in reading comprehension scores. For children with married mothers (Appendix C), there is a significant income effect even after controlling for household characteristics. However, the addition of state and year fixed effects in column (6) renders the estimates insignificant.

Although the age-wise income effects appear to be insignificant, it is necessary to consider whether the same is observed for the average effect across all ages. This approach exploits the variation in child and household data across all age groups and may therefore provide more robust results. Table 7 shows the average income effects on reading comprehension scores. The estimates are obtained using equation (1), but unlike

Table 8 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores across All Ages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.235***	0.178***	0.169***	0.105***	0.0597*	0.0320	-0.00139
	(0.019)	(0.023)	(0.023)	(0.022)	(0.024)	(0.024)	(0.035)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	20,013	20,013	18,527	17,963	17,715	17,633	10,713
Adjusted R^2	0.063	0.100	0.102	0.176	0.202	0.216	0.214

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

the estimates in Tables 4-7, this model samples children of all ages and includes a child age dummy variable as a control. The estimated income effect size is significant at 5.3 percent after controlling for child, maternal, and household factors. However, the estimate becomes insignificant after introducing state and year controls. Estimates using lagged income and EITC payments give comparable results (Appendix F). The same pattern holds true for estimates from households with married mothers where the effect size is 5.3 percent before controlling state and time variation (Appendix C). This is also observed for 2-year lagged income estimates for married-parent households (Appendix G).

Estimates of the average income effect across all ages are presented in Table 8, and similar to Table 7, the income effects are significant, but only until state and year fixed effects are controlled for. Lagged income and EITC benefits give a similar result (Appendix F). However, it is interesting to find a slightly different outcome when the sample is restricted to households with married mothers. The average effect across all ages for this sample is significant even in the full specification. The results are presented

Table 9 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores across All Ages for Children of Married Mothers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.237***	0.198***	0.192***	0.132***	0.0967***	0.0799***	0.0791**
	(0.017)	(0.016)	(0.014)	(0.015)	(0.019)	(0.018)	(0.030)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	15797	15797	14624	14139	13925	13848	8252
Adjusted R^2	0.026	0.063	0.066	0.144	0.179	0.197	0.197

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children of mothers who were unmarried when the child was aged 13 or 14, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

in Table 9 and they show that an additional $1,000 in income leads to a modest increase in reading recognition test scores of 7.9 percent of a standard deviation. Similarly, an effect size of 10.4 percent of a standard deviation observed using 2-year lagged income (Appendix G). As discussed in section 3, the married-parent households are likely to have a less dramatic labor supply response to the EITC, which is why this study examines this subsample. However, since there is a net negative change in work hours among married couples, it is reasonable to expect these estimates to be biased. So although a 7.9 percent income effect for these households is reassuring, it must be noted that this might not be a wholly reliable estimate of the true effect.

Overall, the results suggest that there is little to no causal relationship between family income and reading test scores in the short-run at any given age. Instead, most of the variation in reading test scores is explained largely by the mother's AFQT score and family size. For all ages, higher AFQT scores have a significant a positive association with reading test scores, even after controlling for state-time variation. Mothers having

Table 10 – Naïve OLS Estimates of the Short-run Effect of Family Income on Math Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.165***	0.103***	0.103***	0.0252	0.0173	0.0103	0.0424
	(0.012)	(0.012)	(0.013)	(0.013)	(0.015)	(0.015)	(0.024)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3,371	3,371	3,141	3,049	3,009	2,996	1,382
Adjusted R^2	0.061	0.130	0.130	0.228	0.236	0.251	0.217

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

children at an older age also has a positive, albeit small coefficient. Being female has a modest positive association with reading scores. However, black children are found to have lower reading test scores, particularly at older ages. A larger family size also has a moderate negative association with test scores.

5.1.2 Math Test Scores

The short-run income effects for math scores are similar show patterns that are similar to reading recognition and comprehension scores. After controlling for child-specific characteristics at age 13 or 14, both the naïve OLS estimates (Table 10) and the IV estimates (Table 11) are significant and have a similar size of 10 percent to 14 percent of a standard deviation. However, after introducing controls for mother's characteristics, the coefficient estimates for both models are statistically insignificant. The same results can be seen for younger ages (Appendix A). For children aged 11 or 12, the income effect disappears after controlling for time-varying factors. For 9- or 10-year olds, the effect becomes insignificant even after controlling for child demographics (in column (2)). For even younger children, maternal characteristics account for the majority of the variation

Table 11 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.244***	0.147***	0.145***	0.0845	0.0620	0.0308	0.143
	(0.037)	(0.043)	(0.043)	(0.045)	(0.050)	(0.051)	(0.099)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3,371	3,371	3,141	3,049	3,009	2,996	1,382
Adjusted R^2	0.047	0.127	0.126	0.222	0.233	0.251	0.206

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

in math scores that was initially explained by family income. Lagged income estimates (Appendix B) and married-mother estimates (Appendix C) are comparable to the age-wise IV estimates, in that they mostly fall to zero after accounting for maternal or household characteristics.

The average short-run income effect for all ages is also insignificant (Table 12). Household characteristics appear to account for most of the variation in math scores. Before controlling for these variables, the family income estimate is 6.7 percent. The same pattern is observed for children of married parents where the effect size falls from 7.5 percent to zero after accounting for household characteristics (Appendix C). The estimate using 2-year lagged income is in fact significant at 3.2 percent of a standard deviation, even after accounting for state and year fixed effects. However, the measures of state-time policies and economic indicators appear to account for the majority of the variation in math scores, bringing the effect size down to zero (Appendix B).

Based on Tables 11-13 and results presented in the appendices, there appears to be no causal effect of family income on mathematical ability. Rather, several demographic and

Table 12 – IV Estimates of the Short-run Effect of Family Income on Math Scores across All Ages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.194***	0.0956***	0.106***	0.0665**	0.0316	0.00753	-0.00929
	(0.018)	(0.021)	(0.021)	(0.020)	(0.023)	(0.023)	(0.033)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	20,105	20,105	18,618	18,043	17,794	17,711	10,805
Adjusted R^2	0.072	0.124	0.128	0.205	0.218	0.230	0.207

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

household characteristics have a more significant relationship with math test scores. Higher AFQT scores in mothers and older mothers have a significant, positive association with math scores. A larger family size tends to have a negative association across all age groups. Girls have lower math scores, particularly at older ages. It is interesting to note that the opposite is observed for reading test scores. Black and Hispanic children have lower test scores than white children across all age groups.

5.2 Estimating the long-run effects of income received over a lifetime

Although family income has little to no significant short-run effect on cognitive ability, it may impact long-run outcomes differently. For example, it may take several years for the benefits of family income to become apparent. This section models the long-run income effects on child outcomes. The long-run outcome in this model is the cognitive test score in the NLSY-C exit year i.e., the year when the child is aged 13 or 14.

Table 13 – IV Estimates of the Long-run Effect of Family Income on Reading Comprehension Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.0676 (0.097)	-0.0461 (0.097)	-0.0370 (0.104)	-0.0583 (0.101)	-0.0943 (0.101)	-0.0863 (0.102)	-0.00859 (0.191)
Average Family Income for Ages 6-10	0.247 (0.170)	0.235 (0.167)	0.192 (0.179)	0.159 (0.146)	0.179 (0.146)	0.0905 (0.132)	0.199 (0.269)
Average Family Income for Ages 11-14	0.00584 (0.124)	0.00144 (0.122)	0.0408 (0.126)	-0.00741 (0.108)	-0.0409 (0.113)	-0.00393 (0.110)	-0.208 (0.217)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2,604	2,604	2,394	2,324	2,294	2,285	611
Adjusted R^2	0.066	0.125	0.135	0.225	0.233	0.254	0.253

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

5.2.1 Reading Test Scores

The naïve OLS estimates are presented in Appendix D. Before introducing controls for mother and household characteristics, family income shows a significant and positive association with reading scores, suggesting that income received in early childhood may be most effective for improving comprehension ability. However, after adding the aforementioned control variables, the income-test score relationship is no longer significant. The IV estimates in Table 13 also show that the effect of EITC-induced changes in income is an insignificant predictor of test scores across all specifications of equation (9). This result is consistent for children of married mothers as well (Appendix E). This means that the average family income in early childhood, elementary school, and early adolescence have no long-term effect on reading comprehension test scores at age 13 or 14.

Table 14 – IV Estimates of the Long-run Effect of Family Income on Reading Recognition Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	-0.0688 (0.121)	-0.182 (0.122)	-0.0719 (0.123)	-0.113 (0.123)	-0.146 (0.125)	-0.116 (0.127)	-0.0257 (0.233)
Average Family Income for Ages 6-10	0.350 (0.214)	0.337 (0.212)	0.157 (0.217)	0.217 (0.189)	0.261 (0.185)	0.119 (0.167)	0.0109 (0.341)
Average Family Income for Ages 11-14	0.000527 (0.156)	-0.00751 (0.155)	0.0641 (0.157)	-0.0479 (0.144)	-0.104 (0.148)	-0.0385 (0.142)	0.0115 (0.268)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2,626	2,626	2,414	2,343	2,313	2,303	614
Adjusted R^2	0.043	0.072	0.113	0.159	0.159	0.196	0.202

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

For reading recognition scores, the naïve OLS estimates are significant for all three phases, but only when controlling for child-related factors. This is consistent with the corresponding reading comprehension estimates. In the full specification (in column (7)), the coefficient of family income received in early adolescence is significant and equal to 10.1 percent of a standard deviation. The IV estimates (Table 14), however, are insignificant for all specifications of equation (9). While the short-run income effect on recognition scores for children of married mothers was found to be significant in the previous section, the corresponding long-run effects are insignificant. Overall, it may be concluded that family income, as estimated by this model, received at any point in a child's life will not improve reading ability measured in the future.

While there is no measurable long-run income effect on reading ability, other characteristics such as child's sex, birth weight, and family size are better able to account for variation in reading scores (Appendix H). This model, which controls for income

received at all previous stages in a child's lifetime, shows that the most significant predictors of reading ability are nearly the same as those discussed in section 5.1. Mother's AFQT score once again has a significant and positive association with reading scores. For some specifications, being female and having a higher birth weight also are associated with higher reading scores, while being born to a younger mother is associated with lower scores. For reading comprehension ability specifically, black children and children in larger families have lower test scores. It is noteworthy that the majority of these characteristics are determined before the child is even born and only a few factors, such as birth weight and family size can be acted upon.

5.2.2 Math Scores

For math scores, the naïve OLS estimates (Appendix D) follow a similar pattern to the corresponding reading score estimates. The long-run income estimate is initially significant, but after controlling for mother's AFQT score and the age at which she gave birth, income cannot explain for variation in reading scores. The association, when significant, is found to be the highest at elementary school age, which is consistent with the reading comprehension findings, but not the recognition results. Consistent with the estimates for reading scores, the IV estimates for income effects (Table 15) are mostly insignificant for various specifications of the model for long-run effects. However, there is one significant estimate, which is the income effect after controlling for child, mother, and household characteristics. The effect size is large and negative (-23.6 percent of a standard deviation). After controlling for state and time variation, the estimate is once again insignificant. It is conceivable that this result is an anomalous estimate as the corresponding IV estimate for children of married mothers (Appendix E) is insignificant.

Table 15 – IV Estimates of the Long-run Effect of Family Income on Math Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	-0.00282 (0.105)	-0.159 (0.105)	-0.139 (0.111)	-0.189 (0.110)	-0.236* (0.110)	-0.208 (0.112)	-0.133 (0.183)
Average Family Income for Ages 6-10	0.253 (0.197)	0.250 (0.197)	0.167 (0.208)	0.225 (0.179)	0.244 (0.174)	0.113 (0.159)	-0.0728 (0.262)
Average Family Income for Ages 11-14	0.0374 (0.141)	0.0368 (0.139)	0.0943 (0.145)	0.0108 (0.131)	0.00579 (0.131)	0.0415 (0.124)	0.165 (0.227)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2,623	2,623	2,410	2,340	2,310	2,300	614
Adjusted R^2	0.064	0.108	0.117	0.174	0.172	0.220	0.168

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Given that the analysis drawing exclusively from married parents households is expected to give results that are possibly less biased, it can be concluded that the large negative effect observed in Table 15 is an abnormal result.

Most of the variation in math scores is explained by child and mother's characteristics, instead of post-tax family income (Appendix H). Consistent with the effects seen in section 5.1, higher AFQT scores in mothers are associated with higher performance. Higher birth weight and the age at which a mother gives birth also have a modest positive relationship with math scores. Black and Hispanic children did not perform as well as their white counterparts, while children in larger families also had slightly lower scores. One interesting departure from the findings in 5.1 is that when controlling for current or 2-year lagged income, being female is associated with lower math scores at older ages. However, the association between mathematical ability and sex becomes insignificant after controlling for income received over a lifetime.

In the results for math test scores as well as two types of reading scores, many coefficients of income, particularly those related to the 0-5 year age group, were insignificant, but also negative (Tables 14, 15, and 16). Since the coefficients are insignificantly different from zero, it is possible that the results are negative due to random chance. However, since the negative sign is observed consistently for all three tests in the youngest age group, it is possible that the coefficients are affected to some degree by attrition bias or omitted variable bias. Potential sources of omitted variable bias include information about the child's biological father and/or the mother's co-parent, and development inputs received in early childhood.

6. Discussion

This study sets out to estimate the short-run and long-run effects of family income on child cognitive outcomes. The naïve OLS results for short-run income effects when estimated by age are insignificant. However, the naïve estimates for short-run effects when averaged across all ages, indicate a small, but significant association between income and cognitive ability test scores that ranges between 2 percent and 5 percent. On the other hand, the long-run income association, after introducing a full set of controls, is insignificant for all specifications. The short-run associations estimated by the OLS models are mostly consistent with previous literature (Blau 1999), though the long-run estimates are smaller. Although the short-run association is similar to previous findings, the coefficients are still only "modest" in size, as described by Duncan et al. (1997) in a review of literature about the topic.

Even recent research, which estimates the causal relationship between income and child development finds small effects ranging between 5 percent and 8 percent of a test

score standard deviation (Dahl and Lochner 2012; Chetty et al. 2011; Milligan and Stabile 2011; Duncan et al. 2011). Initial IV results from this study using smaller sets of control variables also find a small, but significant average short-run income effect of 5 percent to 6 percent of a standard deviation on reading scores. However, there appears to be no significant income effect after controlling for additional variation across households, states and time. There is also no strong evidence for any significant long-run effects of income. Children of married couples are the only group for whom additional income might improve reading recognition in the short-run. However, the average effect size of an additional $1,000 is small at 7.9 percent of a standard deviation.

Although the existing literature suggests that there is cause to expect a significant positive effect of income on child cognitive achievement, the results described in the previous section do not support this. One possible explanation for this might be that previous studies identified variation in government benefits (e.g. EITC, Child Tax Credit, or Canadian child benefits) at the state or province level in addition to the federal level. State-level benefits provide an additional degree of variation, which means that these studies can identify differences in EITC or other benefit receipts by state of residence, in addition to family size, income level, and tax filing status.

Another possible explanation for the differences in findings might be that the characteristics, which previous studies controlled for differ from those, which this study controls for. Chetty et al. (2011) draw from detailed tax data, including income tax returns, third-party reports on wages, and reports on college attendance. As a result of this, the set of independent variables used to estimate the effect of benefits on test performance is much broader than the set of controls used in this study. These additional

variables include information about family savings, home ownership, special education status, etc. The controls used by Miligan and Stabile (2011), based on a sample of Canadian children, are more similar to those in this study; however, they contain information about the father's education attainment and age, which is not included in this study. The control variables used by Dahl and Lochner (2012) most closely resemble the controls used in this paper as both sets are drawn from the NLSY. However, the authors account for information related to maternal grandparents, and do not include variables related to child health and mother's work hours. In addition, the authors only assess children sampled between 1993 and 1997. The differences in control variables and the children sampled, in addition to the exclusion of state-level variation in EITC might, in part, explain why the findings of this study are inconsistent with those previous studies.

It is also important to note that the nature of the data raise several concerns for interpreting the results. First, the models in this analysis fail to account for multiple paternal and co-parental characteristics. These measures may be especially important given that mother-related variables were significant predictors of test scores. Second, this analysis cannot control for child behaviors that may influence cognitive ability such as exercise, nutrition, or substance abuse, and instead uses weight interacted with sex as a weak proxy for these measures. Third, the data might contain measurement errors as income is self-reported. As a consequence, the estimated post-tax income and EITC payments may also be incorrectly recorded.

Nonetheless, this study finds that overall, family income does not lead to significant improvements in reading or mathematical ability, in both the short-run and the long-run. This result has implications for policy design and child development programs as it

suggests that income-assistance alone might not strengthen cognitive ability in children. Rather than family income, maternal and household characteristics are the most significant predictors of test scores. Among these, the mother's AFQT score coefficients are positive and consistent in size at every stage of analysis. This suggests the presence of a strong genetic or home environment effect on cognitive development. A smaller family size is also associated with improved reading and mathematical ability.

Although the analysis presented in this paper does not find a significant income effect on child cognitive test scores, it should be noted that the average annual EITC benefit for eligible families ranges only between $1,500 and $2,400 for different age groups. If the effect of income on cognitive ability is non-linear, then it is possible that the change in family income induced by the EITC is too small to result in any meaningful improvement in test scores. In addition, the estimated income effects are only applicable to the working poor. It is still unknown whether an income transfer would benefit low-income families who are not eligible for the EITC. Therefore, future research on the subject of child development inputs could shed light on how income transfers of varying sizes and offered with different levels of eligibility conditions might affect cognitive development. It is also important that future research consider how income affects child cognitive ability when a transfer is accompanied by programs aimed at improving the mother's ability or developmental inputs.

References

About EITC. (n.d.). Retrieved November 14, 2016, from <https://www.eitc.irs.gov/EITC-Central/abouteitc>.

Aughinbaugh, A. (2004). The impact of attrition on the children of the NLSY79. *Journal of Human Resources,* Vol. 39, No. 2, 536 - 563.

Averett, S. and Wang, Y. (2015). The effects of the earned income tax credit on children's health, quality of home environment, and non-cognitive skills. IZA Discussion Paper No. 9173.

Bastian, J. and Michelmore, K. (2016). The Intergenerational Impacts of the Earned Income Tax Credit on Education and Employment Outcomes. Working Paper, University of Michigan.

Blau, D. (1999). The Effect of Income on Child Development. *The Review of Economics and Statistics*, 81(2): 261-276.

Brooks-Gunn, J., Duncan, G. J., (1997). The effects of poverty on children. *Future Child*. Summer-Fall; 7(2): 55-71.

Chetty, R., Friedman, J. N., and Rockoff, J. E. (2011). New Evidence on the Long-Term Impacts of Tax Credits. IRS Statistics of Income White Paper.

Conger, R., Conger, K., Elder, G., Jr., Lorenz, F., Simons, R., & Whitbeck, L. (1992). A family process model of economic hardship and adjustment of early adolescent boys. *Child Development*, 63: 526–541.

Conger, R., Conger, K., & Elder, G. (1997). Family economic hardship and adolescent adjustment: Mediating and moderating processes. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 288–310). New York: Russell Sage Foundation.

Dahl, G. B. and Lochner, L. (2012). The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit. *American Economic Review,* 102(5): 1927-56.

Dickert, S., Houser, S., and Scholz, J. K. (1995). The Earned Income Tax Credit and Transfer Programs: A Study of Labor Market and Program Participation. In James M. Poterba, ed. *Tax Policy and the Economy,* 9:1-50.

Duncan, G., Morris, P., and Rodrigues, C. (2011). "Does Money Really Matter? Estimating Impacts of Family Income on Young Children's Achievement with Data from Random-Assignment Experiments." *Developmental Psychology* 47 (5): 1263–79.

Duncan, G.J., Yeung, W., Brooks-Gunn, J., and Smith, J. R. (1998) How Much Does Childhood Poverty Affect the Life Chances of Children? *American Sociological Review*. 63: 406–23.

Earned Income Tax Credit for 2012; Do I Qualify? (n.d.) Retrieved March 27, 2017, from <https://www.irs.gov/uac/newsroom/earned-income-tax-credit-for-2012-do-i-qualify>

Eissa, N. and Hoynes, H. (1998). The Earned Income Tax Credit and Labor Supply: Married Couples. NBER Working Paper No. 6856, December 1998.

Eissa, N., and Hoynes, H. (2004). Taxes and the Labor Market Participation of Married Couples: The Earned Income Tax Credit, *Journal of Public Economics*, 88(9- 10):1931-1958.

Eissa, N., and Hoynes, H. (2006). Behavioral Responses to Taxes: Lessons from the EITC and Labor Supply. *Tax Policy and the Economy*, Vol. 20, ed. James M. Poterba, 74–110. Cambridge, MA: MIT Press

Evans, W. N. and Garthwaite, C. L. (2014). Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health. *American Economic Journal: Economic Policy*, 6(2): 258-90.

Falk, G. and Crandall-Hollick, M. L. (2016). The Earned Income Tax Credit (EITC): An Overview. Congressional Research Service Report.

Grace, S. L., Evindar, A., and Stewart, D. E. (2003). The effect of postpartum depression on child cognitive development and behavior: a review and critical analysis of the literature. *Archives of Women's Mental Health,* 6:263–74.

Guo, G. (1998). The Timing of the Influences of Cumulative Poverty on Children's Cognitive Ability and Achievement. *Journal of Social Forces*, Vol. 77, Issue 1, 257-288.

Guo, G., Harris, K.M. (2000). The mechanisms mediating the effects of poverty on children's intellectual development. *Demography* 37:431–47

Hamad, R. and Rehkopf, D. H. (2016). Poverty and Child Development: A Longitudinal Study of the Impact of the Earned Income Tax Credit. *American Journal of Epidemiology*, 1839:775–784.

Heckman, J.J., Stixrud, J. and Urzua, S. (2006) The Effects of Cognitive and Noncognitive Ability on Labor Market Outcomes and Social Behavior, *Journal of Labor Economic*s, volume 24: 411-482

Hotz, V. J., Mullin C. H., and Scholz, J. K. (2003). Trends in EITC Take-Up and Receipt for California's Welfare Population, 1992-1999, Working Paper (Institute for Research on Poverty, University of Wisconsin, Madison).

Hotz, V. J., and Scholz, J. K. (2003). The Earned Income Tax Credit. Means-Tested Transfer Programs in the United States, ed. Robert A. Moffitt, 141–97. Chicago: University of Chicago Press.

Jiang, Y., Granja, M.R., and Koball, H. (2017). Basic Facts about Low-Income Children: Children under 18 Years, 2015. National Center for Children in Poverty, Columbia University Mailman School of Public Health.

Korenman, S., Miller J.E., and Sjaastad, J. E. (1995). Long-term Poverty and Child Development in the United States: Results from the NLSY. *Children and Youth Services Review*, 17.12,127-55.

Leventhal, T. and Brooks-Gunn, J. (2003). Children and Youth in Neighborhood Contexts. *Current Directions in Psychological Science*, 12 (1): 27–31.

Marr, C., Huang, C., Sherman, A., and Debot, B. (2014). EITC and Child Tax Credit Promote Work, Reduce Poverty, and Support Children's Development, Research Finds. Washington, DC: Center on Budget and Policy Priorities.

Meyer, B. D. (2002). Labor Supply at the Extensive and Intensive Margins: The EITC, Welfare, and Hours Worked. *American Economic Review*, 92(2): 373–79.

Meyer, B. and Rosenbaum, D.T. (2001). Welfare, the earned income tax credit, and the labor supply of single mothers. *The Quarterly Journal of Economics*, 116 (3):1063–1114.

Milligan, K. and Stabile, M. (2011). Do Child Tax Benefits Affect the Well-Being of Children? Evidence from Canadian Child Benefit Expansions. *American Economic Journal: Economic Policy*, 3(3): 175-205.

Murnane, R. J., J. B. Willett, and F. Levy. (1995). The Growing Importance of Cognitive Skills in Wage Determination. Review of Economics and Statistics, 77 (2): 251– 66.

National Institute of Child Health and Human Development Early Child Care Research Network. (2005) A duration and developmental timing of poverty and children's cognitive and social development from birth through third grade. *Child Development*, 76(4): 785-810.

Neumark, D., and Wascher, W. (2001). Using the EITC to help poor families: New evidence and a comparison with the minimum wage. *National Tax Journal*, 54 (2): 281–317.

Paxson, C and Schady, N. (2007). Cognitive development among young children in Ecuador: the roles of wealth, health, and parenting. *Journal Human Resources*, 42: 49–84

Pega, F. (2016). Invited commentary: using financial credits as instrumental variables for estimating the causal relationship between income and health. *American Journal Epidemiology*. 1839: 785 – 789.

Rosenbaum J, DeLuca S. 2008. What kinds of neighborhoods change lives? The Chicago Gautreaux housing program and recent mobility programs. *Indiana Law Review*. 41:653–61.

Steinberg, L. (2005). Cognitive and affective development in adolescence**.** *Trends in Cognitive Sciences*, 9(2): 69–74.

Yoshikawa, H., Aber, J. L., & Beardslee, W. R. (2012). The effects of poverty on the mental, emotional, and behavioral health of children and youth: Implications for prevention. *American Psychologist*, 67: 272–284.

Appendix A: IV estimates of age-specific short-run income effects with additional coefficients presented

Reading Comprehension Scores

Table 1 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.282***	0.205***	0.202***	0.105*	0.0640	0.0355	0.121
	(0.035)	(0.041)	(0.041)	(0.042)	(0.045)	(0.047)	(0.091)
Hispanic		-4.133***	-3.972***	-0.471	-0.239	0.467	0.682
		(0.682)	(0.713)	(0.635)	(0.636)	(0.745)	(1.146)
Black		-6.451***	-5.947***	-2.967***	-3.216***	-2.896***	-2.310*
		(0.863)	(0.851)	(0.671)	(0.668)	(0.701)	(1.048)
Female		0.337	2.358	1.975	1.273	0.956	3.112
		(0.442)	(1.758)	(1.668)	(1.639)	(1.622)	(2.410)
Mother's AFQT score				0.00017***	0.00015***	0.00015***	0.00014***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.854***	-0.774***	-0.904***
					(0.158)	(0.158)	(0.222)
Controls							
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3349	3349	3122	3031	2992	2980	1377
Adjusted R^2	0.028	0.106	0.111	0.216	0.244	0.256	0.242

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 11 or 12

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.265***	0.192***	0.194***	0.111**	0.0754	0.0183	-0.0119
	(0.035)	(0.042)	(0.042)	(0.041)	(0.046)	(0.048)	(0.078)
Hispanic		-4.357***	-4.167***	-0.727	-0.152	0.211	0.0864
		(0.647)	(0.672)	(0.619)	(0.622)	(0.717)	(1.002)
Black		-5.811***	-5.374***	-2.381***	-2.605***	-2.261**	-1.800
		(0.889)	(0.881)	(0.686)	(0.679)	(0.706)	(1.045)
Female		1.368**	5.659***	5.141***	4.675**	4.164**	4.623*
		(0.419)	(1.623)	(1.538)	(1.522)	(1.532)	(2.248)
Mother's AFQT score				0.00016***	0.00014***	0.00014***	0.00016***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.047***	-0.917***	-0.885***
					(0.165)	(0.165)	(0.233)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3810	3810	3534	3430	3391	3378	1806
Adjusted R^2	0.054	0.112	0.114	0.200	0.224	0.234	0.222

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 11 or 12 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 3 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 9 or 10

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.216***	0.146**	0.145**	0.0710	0.00871	-0.0380	-0.0765
	(0.037)	(0.045)	(0.046)	(0.041)	(0.043)	(0.043)	(0.066)
Hispanic		-4.197***	-4.357***	-0.955	-0.281	0.223	0.493
		(0.660)	(0.687)	(0.619)	(0.621)	(0.713)	(0.944)
Black		-5.396***	-4.903***	-1.539*	-1.597*	-1.302	-1.769
		(0.932)	(0.946)	(0.669)	(0.665)	(0.699)	(0.939)
Female		1.532***	3.336*	3.327*	2.838	2.009	2.549
		(0.406)	(1.590)	(1.544)	(1.533)	(1.534)	(2.113)
Mother's AFQT score				0.00017***	0.00013***	0.00014***	0.00016***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.393***	-1.225***	-1.336***
					(0.169)	(0.171)	(0.224)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4279	4279	3946	3821	3766	3743	2208
Adjusted R^2	0.046	0.091	0.093	0.172	0.205	0.217	0.216

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 9 or 10 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 4 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 7 or 8

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.207***	0.160***	0.148***	0.0731*	0.0424	0.00516	-0.0146
	(0.033)	(0.038)	(0.039)	(0.037)	(0.041)	(0.041)	(0.055)
Hispanic		-3.912***	-4.275***	-1.475**	-0.915	-0.473	-0.588
		(0.561)	(0.585)	(0.567)	(0.578)	(0.660)	(0.843)
Black		-3.405***	-3.451***	-0.958	-0.894	-0.798	-0.885
		(0.781)	(0.794)	(0.587)	(0.606)	(0.630)	(0.785)
Female		2.190***	5.411***	5.330***	5.304***	5.224***	4.870*
		(0.368)	(1.563)	(1.552)	(1.541)	(1.532)	(1.944)
Mother's AFQT score				0.00013***	0.00011***	0.00012***	0.00013***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.061***	-0.989***	-0.996***
					(0.156)	(0.153)	(0.206)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4322	4322	3993	3869	3817	3798	2374
Adjusted R^2	0.025	0.069	0.076	0.143	0.161	0.171	0.177

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 7 or 8 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 5 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 5 or 6

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.136*	0.134*	0.138	0.0995	0.0713	0.0457	-0.0885
	(0.055)	(0.068)	(0.075)	(0.065)	(0.071)	(0.079)	(0.077)
Hispanic		-1.334	-0.914	0.672	1.044	0.601	0.0973
		(0.850)	(0.916)	(0.741)	(0.766)	(0.806)	(0.945)
Black		0.488	0.904	2.372**	2.208**	1.808*	1.660
		(1.251)	(1.329)	(0.790)	(0.813)	(0.836)	(0.956)
Female		0.988	-2.250	-1.400	-1.601	-1.382	-0.330
		(0.520)	(2.531)	(2.506)	(2.480)	(2.418)	(2.949)
Mother's AFQT score				0.00008***	0.00008***	0.00009***	0.00011***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.822**	-0.727**	-0.573*
					(0.259)	(0.262)	(0.265)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	1861	1861	1716	1667	1641	1632	1044
Adjusted R^2	.	.	.	0.035	0.072	0.116	0.151

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 5 or 6 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Reading Recognition Scores

Table 6 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.275***	0.196***	0.181***	0.0865	0.0400	0.0172	0.0826
	(0.043)	(0.051)	(0.052)	(0.054)	(0.059)	(0.062)	(0.128)
Hispanic		-3.442***	-3.341***	0.826	1.632*	1.041	1.326
		(0.818)	(0.852)	(0.778)	(0.793)	(0.914)	(1.365)
Black		-6.742***	-6.417***	-2.702**	-2.488**	-2.694**	-2.146
		(1.070)	(1.064)	(0.838)	(0.819)	(0.858)	(1.247)
Female		2.251***	3.785	2.825	1.903	1.859	3.274
		(0.529)	(2.170)	(2.115)	(2.109)	(2.105)	(3.097)
Mother's AFQT score				0.00019***	0.00016***	0.00016***	0.00017***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.308***	-1.193***	-1.331***
					(0.194)	(0.192)	(0.268)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3374	3374	3145	3053	3014	3001	1383
Adjusted R^2	0.050	0.100	0.106	0.184	0.209	0.217	0.222

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).

Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 11 or 12

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.246***	0.165***	0.169***	0.107*	0.0679	0.0326	-0.0222
	(0.041)	(0.049)	(0.050)	(0.050)	(0.056)	(0.058)	(0.095)
Hispanic		-4.216***	-3.956***	0.212	0.854	0.895	0.444
		(0.741)	(0.767)	(0.698)	(0.711)	(0.807)	(1.084)
Black		-6.327***	-6.022***	-1.972*	-2.113**	-2.220**	-2.678*
		(1.033)	(1.026)	(0.779)	(0.764)	(0.799)	(1.149)
Female		2.746***	4.013*	3.520*	3.014	2.551	1.960
		(0.469)	(1.832)	(1.792)	(1.787)	(1.790)	(2.484)
Mother's AFQT score				0.00017***	0.00016***	0.00017***	0.00019***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.063***	-0.868***	-0.719**
					(0.187)	(0.187)	(0.252)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3855	3855	3575	3473	3433	3419	1829
Adjusted R^2	0.063	0.109	0.108	0.181	0.199	0.210	0.219

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 11 or 12 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 8 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 9 or 10

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.215***	0.139**	0.120*	0.0658	-0.00260	-0.0476	-0.0398
	(0.041)	(0.049)	(0.050)	(0.044)	(0.047)	(0.048)	(0.074)
Hispanic		-4.712***	-5.014***	-0.871	-0.240	-0.627	-1.059
		(0.699)	(0.724)	(0.649)	(0.663)	(0.779)	(1.002)
Black		-5.720***	-5.523***	-1.179	-1.450*	-1.898*	-1.975
		(0.992)	(1.001)	(0.704)	(0.715)	(0.758)	(1.030)
Female		2.773***	3.394*	2.967	2.733	2.133	1.877
		(0.436)	(1.709)	(1.675)	(1.679)	(1.683)	(2.249)
Mother's AFQT score				0.00018***	0.00015***	0.00016***	0.00017***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.157***	-0.943***	-1.022***
					(0.185)	(0.186)	(0.247)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4353	4353	4015	3889	3834	3810	2241
Adjusted R^2	0.059	0.100	0.101	0.179	0.199	0.204	0.210

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 9 or 10 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 9 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 7 or 8

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.223***	0.181***	0.172***	0.100*	0.0637	0.0349	0.0171
	(0.037)	(0.044)	(0.043)	(0.040)	(0.043)	(0.043)	(0.060)
Hispanic		-3.842***	-4.082***	-0.855	-0.225	-0.258	-0.494
		(0.591)	(0.600)	(0.552)	(0.558)	(0.648)	(0.818)
Black		-2.925***	-2.692**	0.253	-0.105	-0.307	-0.214
		(0.867)	(0.857)	(0.605)	(0.608)	(0.624)	(0.785)
Female		2.671***	4.439**	4.442**	4.469**	4.279**	4.080*
		(0.373)	(1.564)	(1.554)	(1.545)	(1.544)	(1.974)
Mother's AFQT score				0.00014***	0.00013***	0.00013***	0.00014***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.989***	-0.888***	-0.887***
					(0.153)	(0.150)	(0.198)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4667	4667	4312	4179	4122	4102	2575
Adjusted R^2	0.042	0.080	0.085	0.158	0.183	0.197	0.193

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 7 or 8 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 5 or 6

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.175***	0.143**	0.167***	0.110*	0.0374	-0.0108	-0.0753
	(0.041)	(0.050)	(0.050)	(0.043)	(0.049)	(0.049)	(0.061)
Hispanic		-4.519***	-4.419***	-1.156*	-0.785	-1.331*	-1.218
		(0.622)	(0.631)	(0.566)	(0.575)	(0.648)	(0.771)
Black		-0.470	0.449	3.675***	3.321***	2.422***	2.576***
		(0.934)	(0.900)	(0.600)	(0.622)	(0.621)	(0.756)
Female		2.155***	0.208	0.596	0.695	0.732	2.453
		(0.384)	(1.994)	(1.977)	(1.952)	(1.919)	(2.388)
Mother's AFQT score				0.00013***	0.00011***	0.00012***	0.00014***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.123***	-1.012***	-0.952***
					(0.149)	(0.147)	(0.194)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4455	4455	4098	3970	3911	3896	2583
Adjusted R^2	0.036	0.065	0.063	0.136	0.168	0.196	0.178

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 5 or 6 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Math Scores

Table 11 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.244***	0.147***	0.145***	0.0845	0.0620	0.0308	0.143
	(0.037)	(0.043)	(0.043)	(0.045)	(0.050)	(0.051)	(0.099)
Hispanic		-6.343***	-6.204***	-2.112**	-1.668*	-1.586*	-1.162
		(0.690)	(0.719)	(0.668)	(0.678)	(0.785)	(1.105)
Black		-7.925***	-7.315***	-3.226***	-2.995***	-2.979***	-2.224*
		(0.934)	(0.926)	(0.727)	(0.704)	(0.743)	(1.027)
Female		-1.341**	-2.344	-3.844*	-4.365*	-4.243*	-1.830
		(0.463)	(1.938)	(1.881)	(1.870)	(1.846)	(2.449)
Mother's AFQT score				0.00017***	0.00016***	0.00017***	0.00015***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.707***	-0.616***	-0.627**
					(0.174)	(0.174)	(0.234)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3371	3371	3141	3049	3009	2996	1382
Adjusted R^2	0.047	0.127	0.126	0.222	0.233	0.251	0.206

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 11 or 12

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.203***	0.1000*	0.140**	0.103*	0.0845	0.0753	0.00556
	(0.040)	(0.048)	(0.049)	(0.049)	(0.056)	(0.058)	(0.090)
Hispanic		-6.974***	-6.566***	-2.516***	-1.952**	-1.525*	-1.780
		(0.682)	(0.713)	(0.638)	(0.650)	(0.748)	(0.996)
Black		-8.198***	-7.216***	-2.921***	-3.112***	-2.928***	-2.605*
		(0.986)	(0.977)	(0.721)	(0.702)	(0.744)	(1.036)
Female		-0.865*	-1.637	-2.898	-3.021	-3.490*	-2.321
		(0.430)	(1.678)	(1.622)	(1.618)	(1.623)	(2.247)
Mother's AFQT score				0.00016***	0.00014***	0.00015***	0.00017***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.591***	-0.495**	-0.295
					(0.167)	(0.167)	(0.210)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3867	3867	3588	3481	3441	3427	1837
Adjusted R^2	0.079	0.135	0.134	0.215	0.225	0.237	0.206

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 11 or 12 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 13 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 9 or 10

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.120**	-0.00315	0.0232	0.00619	-0.0406	-0.0559	-0.0893
	(0.041)	(0.049)	(0.049)	(0.044)	(0.048)	(0.049)	(0.073)
Hispanic		-7.193***	-7.123***	-2.548***	-2.291***	-2.732***	-2.570**
		(0.688)	(0.700)	(0.605)	(0.631)	(0.730)	(0.917)
Black		-9.738***	-8.846***	-3.363***	-3.630***	-3.902***	-4.265***
		(0.990)	(0.978)	(0.666)	(0.680)	(0.720)	(0.969)
Female		-1.133**	-2.585	-3.296*	-3.604*	-4.382**	-3.900
		(0.430)	(1.630)	(1.568)	(1.582)	(1.586)	(2.020)
Mother's AFQT score				0.00018***	0.00016***	0.00016***	0.00017***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.745***	-0.620***	-0.328
					(0.175)	(0.177)	(0.214)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4347	4347	4009	3883	3828	3803	2243
Adjusted R^2	0.066	0.089	0.109	0.218	0.218	0.226	0.187

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 9 or 10 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 14 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 7 or 8

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.188***	0.109**	0.0977*	0.0442	0.0118	-0.00978	-0.0201
	(0.035)	(0.042)	(0.042)	(0.040)	(0.044)	(0.043)	(0.059)
Hispanic		-5.762***	-5.956***	-2.586***	-2.180***	-2.901***	-2.649***
		(0.553)	(0.561)	(0.517)	(0.532)	(0.611)	(0.750)
Black		-6.033***	-6.094***	-2.753***	-3.294***	-3.344***	-3.197***
		(0.841)	(0.844)	(0.597)	(0.595)	(0.611)	(0.731)
Female		-0.108	0.583	0.224	0.144	-0.226	-2.618
		(0.356)	(1.564)	(1.560)	(1.558)	(1.558)	(1.932)
Mother's AFQT score				0.00014***	0.00011***	0.00012***	0.00013***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.595***	-0.604***	-0.476*
					(0.150)	(0.148)	(0.191)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4669	4669	4317	4184	4127	4107	2587
Adjusted R^2	0.057	0.111	0.117	0.185	0.201	0.212	0.200

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 7 or 8 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 15 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 5 or 6

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.198***	0.101*	0.139**	0.0848	0.0145	-0.0119	0.00745
	(0.042)	(0.051)	(0.052)	(0.046)	(0.052)	(0.052)	(0.068)
Hispanic		-6.270***	-5.968***	-2.767***	-2.465***	-2.283***	-2.680***
		(0.630)	(0.635)	(0.553)	(0.566)	(0.664)	(0.805)
Black		-6.192***	-5.482***	-2.505***	-2.756***	-2.575***	-2.283**
		(0.957)	(0.943)	(0.613)	(0.628)	(0.643)	(0.787)
Female		1.291***	-3.507	-3.578	-3.391	-3.519	-3.322
		(0.383)	(1.955)	(1.916)	(1.904)	(1.923)	(2.396)
Mother's AFQT score				0.00013***	0.00010***	0.00010***	0.00011***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.752***	-0.701***	-0.491*
					(0.152)	(0.154)	(0.197)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4536	4536	4176	4042	3983	3968	2647
Adjusted R^2	0.060	0.107	0.112	0.169	0.189	0.196	0.191

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 5 or 6 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP.
Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Appendix B: IV estimates of age-specific short-run income effects using lagged family income

Reading Comprehension Scores

Table 1 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 13 or 14 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.264***	0.188***	0.193***	0.104*	0.0717	0.0346	0.00824
Age 13 or 14	(0.034)	(0.041)	(0.043)	(0.043)	(0.049)	(0.051)	(0.087)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3424	3424	3201	3111	3062	3048	1404
Adjusted R^2	0.044	0.119	0.118	0.215	0.241	0.255	0.255

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 2 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 11 or 12 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.217***	0.143***	0.131**	0.0594	0.0223	-0.0214	-0.0343
Age 11 or 12	(0.035)	(0.043)	(0.044)	(0.039)	(0.042)	(0.045)	(0.074)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3899	3899	3622	3512	3464	3451	1948
Adjusted R^2	0.048	0.107	0.109	0.195	0.217	0.224	0.202

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 11 or 12 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 3 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 9 or 10 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.207***	0.135**	0.139**	0.0775	0.0436	0.0135	-0.0283
Age 9 or 10	(0.037)	(0.046)	(0.048)	(0.042)	(0.046)	(0.046)	(0.061)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4237	4237	3912	3801	3746	3725	2429
Adjusted R^2	0.040	0.095	0.099	0.180	0.206	0.219	0.226

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 9 or 10 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 4 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores at Age 7 or 8 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.148***	0.0961*	0.0894*	0.0529	0.0123	-0.0167	-0.0127
Age 7 or 8	(0.033)	(0.041)	(0.044)	(0.038)	(0.044)	(0.045)	(0.052)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3863	3863	3530	3421	3369	3355	2320
Adjusted R^2	0.024	0.064	0.067	0.132	0.148	0.171	0.155

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 7 or 8 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Reading Comprehension Scores

Table 5 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 13 or 14 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.236***	0.148**	0.138**	0.0610	0.0165	0.00439	0.00190
Age 13 or 14	(0.040)	(0.050)	(0.052)	(0.053)	(0.061)	(0.063)	(0.111)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3443	3443	3218	3128	3079	3065	1408
Adjusted R^2	0.064	0.112	0.115	0.181	0.199	0.208	0.210

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 6 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 11 or 12 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at Age 11 or 12	0.220***	0.146**	0.113*	0.0602	0.0124	-0.0239	-0.0722
	(0.039)	(0.048)	(0.050)	(0.044)	(0.047)	(0.049)	(0.080)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3945	3945	3665	3556	3507	3494	1972
Adjusted R^2	0.067	0.111	0.110	0.193	0.208	0.213	0.200

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 11 or 12 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 9 or 10 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at Age 9 or 10	0.229***	0.166***	0.146**	0.0951*	0.0539	0.0169	-0.0457
	(0.040)	(0.049)	(0.051)	(0.044)	(0.048)	(0.048)	(0.068)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3945	3945	3665	3556	3507	3494	1972
Adjusted R^2	0.067	0.111	0.110	0.193	0.208	0.213	0.200

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 9 or 10 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 8 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores at Age 7 or 8 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at Age 7 or 8	0.119**	0.0495	0.0566	0.0226	-0.0353	-0.0660	-0.0538
	(0.038)	(0.048)	(0.049)	(0.041)	(0.048)	(0.047)	(0.055)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4437	4437	4069	3939	3877	3861	2690
Adjusted R^2	0.056	0.072	0.077	0.155	0.164	0.183	0.178

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 7 or 8 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Math Scores

Table 9 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 13 or 14 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.229***	0.131**	0.150**	0.109*	0.0962	0.0675	-0.0204
Age 13 or 14	(0.036)	(0.045)	(0.046)	(0.047)	(0.054)	(0.056)	(0.092)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3440	3440	3214	3124	3074	3060	1405
Adjusted R^2	0.074	0.145	0.143	0.221	0.231	0.251	0.208

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 10 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 11 or 12 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.138***	0.0219	0.0365	0.0158	-0.0134	-0.0180	-0.0886
Age 11 or 12	(0.038)	(0.047)	(0.047)	(0.042)	(0.046)	(0.047)	(0.075)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	3958	3958	3678	3567	3518	3505	1986
Adjusted R^2	0.083	0.120	0.126	0.228	0.232	0.245	0.188

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 11 or 12 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 11 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 9 or 10 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.141***	0.0258	0.0403	0.0255	0.000188	-0.00810	-0.0859
Age 9 or 10	(0.040)	(0.050)	(0.052)	(0.045)	(0.049)	(0.049)	(0.066)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4309	4309	3978	3866	3810	3789	2477
Adjusted R^2	0.070	0.105	0.118	0.217	0.226	0.238	0.196

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 9 or 10 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 12 – IV Estimates of the Short-run Effect of Family Income on Math Scores at Age 7 or 8 using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Family Income at	0.196***	0.0997*	0.0767	0.0357	-0.0172	-0.0400	-0.0251
Age 7 or 8	(0.039)	(0.048)	(0.048)	(0.041)	(0.046)	(0.045)	(0.053)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	4451	4451	4084	3953	3891	3875	2705
Adjusted R^2	0.044	0.117	0.121	0.196	0.211	0.222	0.219

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 7 or 8 years. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Appendix C: IV and Naïve OLS estimates of age-specific short-run income effects for children living with married mothers

Reading Comprehension Scores

Table 1 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores for Children of Married Mothers aged 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.235***	0.184***	0.178***	0.102**	0.0647	0.0386	0.0604
	(0.033)	(0.034)	(0.034)	(0.033)	(0.036)	(0.037)	(0.061)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2643	2643	2466	2384	2351	2340	1024
Adjusted R^2	.	0.058	0.064	0.171	0.202	0.214	0.202

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 2 – Naïve OLS Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores for Children of Married Mothers aged 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.106***	0.0805***	0.0876***	0.0363**	0.0291*	0.0240	0.0244
	(0.014)	(0.013)	(0.014)	(0.014)	(0.014)	(0.015)	(0.024)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2643	2643	2466	2384	2351	2340	1024
Adjusted R^2	0.024	0.081	0.081	0.180	0.204	0.214	0.203

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 3 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores for All Children (aged 5 to 14) of Married Mothers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.200***	0.160***	0.148***	0.0889***	0.0566*	0.0364	0.0158
	(0.016)	(0.016)	(0.017)	(0.021)	(0.026)	(0.023)	(0.044)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	13303	13303	12338	11932	11754	11685	6743
Adjusted R^2	0.100	0.140	0.144	0.217	0.247	0.262	0.274

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Reading Recognition Scores

Table 4 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores for Children of Married Mothers aged 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.273***	0.228***	0.221***	0.147***	0.108*	0.0836	0.136
	(0.040)	(0.041)	(0.042)	(0.041)	(0.046)	(0.046)	(0.088)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2664	2664	2485	2402	2368	2356	1029
Adjusted R^2	0.001	0.046	0.052	0.133	0.166	0.179	0.174

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5 – Naïve OLS Estimates of the Short-run Effect of Family Income on Reading Recognition Scores for Children of Married Mothers aged 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.139***	0.116***	0.122***	0.0589***	0.0552**	0.0461*	0.0787**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.018)	(0.030)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2664	2664	2485	2402	2368	2356	1029
Adjusted R^2	0.029	0.065	0.067	0.144	0.170	0.180	0.177

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 6 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores for All Children (aged 5 to 14) of Married Mothers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.237***	0.198***	0.192***	0.132***	0.0967***	0.0799***	0.0791**
	(0.017)	(0.016)	(0.014)	(0.015)	(0.019)	(0.018)	(0.030)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	15797	15797	14624	14139	13925	13848	8252
Adjusted R^2	0.026	0.063	0.066	0.144	0.179	0.197	0.197

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Math Scores

Table 7 – IV Estimates of the Short-run Effect of Family Income on Math Scores for Children of Married Mothers aged 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.198***	0.132***	0.139***	0.0794*	0.0618	0.0359	0.114
	(0.035)	(0.035)	(0.035)	(0.035)	(0.038)	(0.038)	(0.067)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2663	2663	2483	2400	2366	2354	1029
Adjusted R^2	0.016	0.098	0.095	0.205	0.218	0.239	0.206

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 8 – Naïve OLS Estimates of the Short-run Effect of Family Income on Math Scores for Children of Married Mothers aged 13 or 14

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.121***	0.0899***	0.0937***	0.0194	0.0216	0.0152	0.0654*
	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)	(0.017)	(0.026)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2663	2663	2483	2400	2366	2354	1029
Adjusted R^2	0.027	0.102	0.099	0.211	0.221	0.239	0.209

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged either 13 or 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 9 – IV Estimates of the Short-run Effect of Family Income on Math Scores for All Children (aged 5 to 14) of Married Mothers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family Income	0.180***	0.118***	0.124***	0.0747**	0.0444	0.0335	0.0421
	(0.016)	(0.023)	(0.020)	(0.024)	(0.027)	(0.023)	(0.041)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	15864	15864	14689	14196	13982	13905	8318
Adjusted R^2	0.037	0.098	0.101	0.186	0.202	0.219	0.198

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Appendix D: Naïve OLS estimates of the Long-run Effects of Family Income

Reading Recognition Scores

Table 1 – Naïve OLS Estimates of the Long-run Effect of Family Income on Reading Recognition Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.119***	0.0605*	0.0681*	0.0517*	0.0384	0.0258	0.00851
	(0.026)	(0.026)	(0.027)	(0.026)	(0.026)	(0.028)	(0.060)
Average Family Income for Ages 6-10	0.0884***	0.0757**	0.0735**	0.0399	0.0395	0.0398	0.0525
	(0.025)	(0.024)	(0.025)	(0.024)	(0.025)	(0.026)	(0.068)
Average Family Income for Ages 11-14	0.0676**	0.0472*	0.0434*	0.0174	0.00898	0.00694	0.101*
	(0.021)	(0.021)	(0.021)	(0.020)	(0.021)	(0.022)	(0.047)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2626	2626	2414	2343	2313	2303	614
Adjusted R^2	0.090	0.124	0.125	0.183	0.196	0.208	0.219

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Reading Comprehension Scores

Table 2 – Naïve OLS Estimates of the Long-run Effect of Family Income on Reading Comprehension Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.126***	0.0606**	0.0664**	0.0473*	0.0323	0.0265	0.0155
	(0.021)	(0.021)	(0.022)	(0.021)	(0.021)	(0.022)	(0.043)
Average Family Income for Ages 6-10	0.0648**	0.0520*	0.0519*	0.0286	0.0214	0.0239	0.0881
	(0.021)	(0.020)	(0.021)	(0.019)	(0.019)	(0.019)	(0.054)
Average Family Income for Ages 11-14	0.0613***	0.0380*	0.0369*	0.00966	-0.00269	-0.00319	-0.0291
	(0.018)	(0.018)	(0.018)	(0.016)	(0.017)	(0.018)	(0.040)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2604	2604	2394	2324	2294	2285	611
Adjusted R^2	0.104	0.160	0.161	0.242	0.257	0.263	0.285

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Math Scores

Table 3 – Naïve OLS Estimates of the Long-run Effect of Family Income on Math Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.129***	0.0595*	0.0565*	0.0387	0.0219	0.0105	0.0762
	(0.025)	(0.025)	(0.026)	(0.025)	(0.025)	(0.026)	(0.046)
Average Family Income for Ages 6-10	0.0867***	0.0753**	0.0711**	0.0202	0.0174	0.0132	-0.0431
	(0.026)	(0.025)	(0.027)	(0.025)	(0.025)	(0.027)	(0.055)
Average Family Income for Ages 11-14	0.0423*	0.0200	0.0246	-0.00192	-0.00551	-0.00637	0.0294
	(0.021)	(0.020)	(0.021)	(0.020)	(0.020)	(0.021)	(0.045)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2623	2623	2410	2340	2310	2300	614
Adjusted R^2	0.093	0.148	0.147	0.222	0.229	0.249	0.208

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Appendix E: IV estimates of the long-run effects of family income for children of married mothers

Table 1 – IV Estimates of the Long-run Effect of Family Income on Reading Comprehension Scores for Children of Married Mothers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.133 (0.084)	0.0190 (0.087)	0.0318 (0.092)	0.00782 (0.090)	-0.0348 (0.091)	-0.0181 (0.092)	0.0551 (0.146)
Average Family Income for Ages 6-10	0.114 (0.104)	0.126 (0.102)	0.0995 (0.107)	0.0628 (0.098)	0.0569 (0.099)	-0.00437 (0.096)	0.0870 (0.167)
Average Family Income for Ages 11-14	0.0670 (0.072)	0.0609 (0.071)	0.0835 (0.073)	0.0490 (0.067)	0.0410 (0.071)	0.0435 (0.072)	-0.0860 (0.114)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	1970	1970	1810	1748	1729	1721	428
Adjusted R^2	0.026	0.084	0.083	0.183	0.203	0.213	0.235

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 2 – IV Estimates of the Long-run Effect of Family Income on Reading Recognition Scores for Children of Married Mothers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.0967 (0.103)	-0.00382 (0.108)	0.128 (0.106)	0.0940 (0.104)	0.0309 (0.103)	0.0766 (0.107)	0.0769 (0.195)
Average Family Income for Ages 6-10	0.157 (0.125)	0.169 (0.125)	0.0397 (0.124)	0.0611 (0.119)	0.0735 (0.115)	-0.0146 (0.114)	0.0708 (0.230)
Average Family Income for Ages 11-14	0.0802 (0.089)	0.0749 (0.088)	0.106 (0.090)	0.0365 (0.086)	0.0180 (0.090)	0.0268 (0.090)	0.0570 (0.163)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	1987	1987	1825	1762	1743	1734	431
Adjusted R^2	0.037	0.066	0.074	0.142	0.163	0.178	0.157

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 3 – IV Estimates of the Long-run Effect of Family Income on Math Scores for Children of Married Mothers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.0911	-0.0701	-0.0292	-0.0653	-0.107	-0.0851	-0.155
	(0.096)	(0.098)	(0.102)	(0.102)	(0.103)	(0.104)	(0.156)
Average Family Income for Ages 6-10	0.159	0.176	0.118	0.107	0.0969	0.0263	-0.0383
	(0.127)	(0.124)	(0.127)	(0.122)	(0.118)	(0.116)	(0.173)
Average Family Income for Ages 11-14	0.0334	0.0276	0.0623	0.0208	0.0382	0.0292	0.185
	(0.086)	(0.083)	(0.085)	(0.082)	(0.084)	(0.080)	(0.127)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	1986	1986	1823	1761	1742	1733	431
Adjusted R^2	0.040	0.101	0.104	0.183	0.190	0.223	0.144

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Appendix F: IV estimates of the short-run average income effect across all ages using lagged family income

Table 1 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores across All Ages using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Income	0.266***	0.204***	0.171***	0.110***	0.0813***	0.0204	0.0225
	(0.019)	(0.024)	(0.024)	(0.022)	(0.024)	(0.024)	(0.034)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	14507	14507	13420	13024	12829	12770	7605
Adjusted R^2	.	0.058	0.109	0.189	0.218	0.250	0.246

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 2 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores across All Ages using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Income	0.234***	0.165***	0.133***	0.0811**	0.0430	0.0136	0.0192
	(0.022)	(0.027)	(0.028)	(0.025)	(0.028)	(0.028)	(0.039)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	14928	14928	13807	13403	13200	13140	7872
Adjusted R^2	0.047	0.095	0.103	0.176	0.198	0.213	0.212

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 3 – IV Estimates of the Short-run Effect of Family Income on Math Scores across All Ages using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Income	0.198***	0.0925***	0.0922***	0.0646**	0.0444	0.0241	-0.0173
	(0.020)	(0.025)	(0.026)	(0.023)	(0.026)	(0.026)	(0.035)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	14953	14953	13833	13425	13221	13161	7901
Adjusted R^2	0.072	0.134	0.137	0.219	0.230	0.241	0.214

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Appendix G: IV estimates of short-run the average income effect for children of married mothers across all ages using lagged family income

Table 1 – IV Estimates of the Short-run Effect of Family Income on Reading Comprehension Scores for Children of Married Mothers across All Ages using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Income	0.230***	0.183***	0.157***	0.104***	0.0680***	0.0281	0.0711
	(0.018)	(0.019)	(0.020)	(0.019)	(0.020)	(0.019)	(0.027)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	10600	10600	9801	9491	9361	9307	5295
Adjusted R^2	.	0.026	0.073	0.157	0.193	0.226	0.223

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 2 – IV Estimates of the Short-run Effect of Family Income on Reading Recognition Scores for Children of Married Mothers across All Ages using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Income	0.227***	0.181***	0.167***	0.117***	0.0778***	0.0602**	0.104**
	(0.020)	(0.021)	(0.022)	(0.021)	(0.022)	(0.022)	(0.032)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	10875	10875	10056	9741	9604	9549	5465
Adjusted R^2	0.011	0.057	0.064	0.141	0.174	0.196	0.189

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 3 – IV Estimates of the Short-run Effect of Family Income on Math Scores for Children of Married Mothers across All Ages using Lagged Family Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged Income	0.174***	0.104***	0.107***	0.0637**	0.0362	0.0302	0.0366
	(0.020)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)	(0.029)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	10885	10885	10067	9748	9611	9556	5477
Adjusted R^2	0.042	0.108	0.110	0.202	0.216	0.233	0.209

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: All sampled children are aged between 5 and 14 years. All models include dummy variables for child age between ages 5 to 14. Sample excludes children of unmarried mothers, children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as 2-year lagged estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Appendix H: IV estimates of the long-run income effect with additional coefficients presented

Table 1 – IV Estimates of the Long-run Effect of Family Income on Reading Comprehension Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	0.0676	-0.0461	-0.0370	-0.0583	-0.0943	-0.0863	-0.00859
	(0.097)	(0.097)	(0.104)	(0.101)	(0.101)	(0.102)	(0.191)
Average Family Income for Ages 6-10	0.247	0.235	0.192	0.159	0.179	0.0905	0.199
	(0.170)	(0.167)	(0.179)	(0.146)	(0.146)	(0.132)	(0.269)
Average Family Income for Ages 11-14	0.00584	0.00144	0.0408	-0.00741	-0.0409	-0.00393	-0.208
	(0.124)	(0.122)	(0.126)	(0.108)	(0.113)	(0.110)	(0.217)
Hispanic		-4.571***	-4.527***	-1.130	-0.893	-0.809	-2.020
		(0.834)	(0.865)	(0.779)	(0.799)	(0.926)	(1.878)
Black		-7.343***	-6.740***	-3.910***	-3.882***	-3.879***	-3.953*
		(1.041)	(1.085)	(0.907)	(0.939)	(0.952)	(1.901)
Female		0.227	-1.011	-1.654	-2.197	-2.216	-1.961
		(0.521)	(1.924)	(1.834)	(1.836)	(1.809)	(3.379)
Birthweight			0.0190	0.0155	0.0146	0.0144	0.0000329
			(0.013)	(0.012)	(0.012)	(0.012)	(0.026)
Mother's AFQT score				0.0002***	0.0001***	0.0001***	0.0002***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.757***	-0.632***	-0.854*
					(0.192)	(0.188)	(0.347)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2,604	2,604	2,394	2,324	2,294	2,285	611
Adjusted R^2	0.066	0.125	0.135	0.225	0.233	0.254	0.253

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 2 – IV Estimates of the Long-run Effect of Family Income on Reading Recognition Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family Income for Ages 0-5	-0.0688	-0.182	-0.0719	-0.113	-0.146	-0.116	-0.0257
	(0.121)	(0.122)	(0.123)	(0.123)	(0.125)	(0.127)	(0.233)
Average Family Income for Ages 6-10	0.350	0.337	0.157	0.217	0.261	0.119	0.0109
	(0.214)	(0.212)	(0.217)	(0.189)	(0.185)	(0.167)	(0.341)
Average Family Income for Ages 11-14	0.000527	-0.00751	0.0641	-0.0479	-0.104	-0.0385	0.0115
	(0.156)	(0.155)	(0.157)	(0.144)	(0.148)	(0.142)	(0.268)
Hispanic		-4.033***	-4.089***	-0.304	0.451	-0.938	-2.377
		(1.030)	(1.037)	(0.967)	(1.012)	(1.137)	(2.214)
Black		-7.830***	-7.485***	-4.266***	-3.972***	-4.669***	-3.138
		(1.282)	(1.316)	(1.127)	(1.174)	(1.190)	(2.223)
Female		1.472*	-1.605	-0.473	-0.705	-1.051	-0.628
		(0.640)	(2.391)	(2.363)	(2.381)	(2.326)	(4.453)
Birthweight			0.0312	0.0288	0.0252	0.0249	0.0236
			(0.016)	(0.016)	(0.015)	(0.015)	(0.032)
Mother's AFQT score				0.0002***	0.0001***	0.0001***	0.0001***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-1.172***	-0.975***	-0.848
					(0.243)	(0.237)	(0.440)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2,626	2,626	2,414	2,343	2,313	2,303	614
Adjusted R^2	0.043	0.072	0.113	0.159	0.159	0.196	0.202

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 3 – IV Estimates of the Long-run Effect of Family Income on Math Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average Family	-0.00282	-0.159	-0.139	-0.189	-0.236*	-0.208	-0.133
Income for Ages 0-5	(0.105)	(0.105)	(0.111)	(0.110)	(0.110)	(0.112)	(0.183)
Average Family	0.253	0.250	0.167	0.225	0.244	0.113	-0.0728
Income for Ages 6-10	(0.197)	(0.197)	(0.208)	(0.179)	(0.174)	(0.159)	(0.262)
Average Family	0.0374	0.0368	0.0943	0.0108	0.00579	0.0415	0.165
Income for Ages 11-14	(0.141)	(0.139)	(0.145)	(0.131)	(0.131)	(0.124)	(0.227)
Hispanic		-.6.797***	-6.914***	-3.041***	-2.636**	-3.031**	-4.159*
		(0.897)	(0.928)	(0.869)	(0.888)	(1.017)	(1.960)
Black		-8.416***	-8.018***	-4.524***	-4.388***	-4.902***	-6.059**
		(1.184)	(1.222)	(1.015)	(1.102)	(1.053)	(1.863)
Female		1.738**	-4.491*	-6.080**	-6.678**	-6.591**	-7.640*
		(0.575)	(2.176)	(2.118)	(2.125)	(2.065)	(3.492)
Birthweight			0.0304*	0.0270*	0.0277*	0.0321*	0.0444
			(0.014)	(0.014)	(0.014)	(0.013)	(0.028)
Mother's AFQT score				0.0002***	0.0002***	0.0002***	0.0001***
				(0.000)	(0.000)	(0.000)	(0.000)
Family size					-0.692**	-0.466*	-0.132
					(0.226)	(0.216)	(0.377)
Controls							
Post-tax income	X	X	X	X	X	X	X
Demographic controls		X	X	X	X	X	X
Child characteristics			X	X	X	X	X
Mother characteristics				X	X	X	X
Household characteristics					X	X	X
State and year FE						X	X
State-time policy controls							X
Observations	2,623	2,623	2,410	2,340	2,310	2,300	614
Adjusted R^2	0.064	0.108	0.117	0.174	0.172	0.220	0.168

Source: National Longitudinal Survey of Youth (1985 – 2012) and Children of the NLSY (1986 – 2012).
Notes: Sample excludes children born to mothers younger than 15 years, children who live alone, and children in households with family income greater than $80,000 in 2015 US dollars. Family income is measured as estimated post-tax income reported in $1,000 adjusted for inflation to year 2015. State-time policy controls include minimum wage, average unemployment rate, and state per capita GDP. Heteroskedasticity-robust standard errors are in parentheses.
$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$