Correction and Addendum to "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit"

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In "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit" (*American Economic Review*, 2012, 102:5), we provide some of the first causal evidence of the effects of family income on child math and reading achievement using data from the Children of the National Longitudinal Survey of Youth (CNLSY). Our empirical strategy exploits variation in the Earned Income Tax Credit (EITC) over time as an exogenous source of income variation that differs across families. Unfortunately, a coding error in our creation of total family income has been documented by Lundstrom (2015). While this coding error affects our first-stage estimates and, therefore, the scaling of our instrumental variables (IV) estimates, it does not impact the reduced form estimates or the statistical significance of our estimates. As such, the coding error does not change our core findings or the main message of the paper.

This note first provides a new set of tables that correct for this mistake.[1] Second, we briefly explore the robustness of our estimates to different subsamples of available years. These results clearly demonstrate that our estimated effects of income are identified from changes in the EITC, especially the major change between 1993 and 1995, as emphasized in the paper. Third, given the well-documented maternal labor supply responses to expansions in the EITC, we provide a new set of estimates that also instrument for maternal employment when estimating the effect of family income on child achievement. These results yield very similar estimated effects of family income on achievement suggesting that our main estimates are not confounded by maternal labor supply responses.

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[1] Corrected code is also available at our websites along with the underlying data.

1 A Coding Error for Total Family Income

In order to calculate taxes, EITC amounts, and total after-tax family income, we used the TAXSIM simulator. Unfortunately, the variable for federal income tax changed from version 8 to 9 of TAXSIM, but the change had not been documented and went unrecognized by us when we undertook a major revision of our paper in 2010.[2] As a result, our measure of total family income in the published paper excludes EITC income.

The practical consequences of this are that the first stage coefficient in the baseline *AER* specification is almost 40% larger when using the corrected income variable, but the reduced form estimate is unaffected since it does not use the incorrectly coded variable. The baseline IV estimate is about 30% smaller due to the larger first stage, but it remains statistically significant, in part because the correctly coded variable increases the first stage precision.

Given these differences, we have re-estimated everything in the published version of our paper using the correct coding and report the results in Tables 1-7 of this document.[3] All of these results are consistent with smaller (compared to the published paper) but still statistically and economically significant effects of family income on child achievement.

2 Robustness of our Estimates

In this section, we explore whether the results are robust to different time period subsamples and whether identification is indeed being driven by changes in the EITC schedule, as claimed in our *AER* paper. As discussed in Dahl and Lochner (2012), our IV estimator with a flexible time-invariant control function will break down if the EITC schedule does not change across adjacent years in at least two different ways over the sample period. One of the adjacent year differences can capture no change, but there must also be an adjacent year difference for which there is a non-zero

[2]More specifically, variable v28 created by TAXSIM version 8 was "Federal Income Tax After Credits." In version 9, variable v28 was changed to "Federal Income Tax Before Credits." Unfortunately, the early documentation for TAXSIM version 9 continued to label the variable as "Federal Income Tax After Credits." Later versions of the documentation corrected this error in labeling. We have verified this issue with Dan Feenberg, who developed and actively maintains TAXSIM as a public good for the research community. Although he does not have detailed notes going back to 2010, he was able to confirm that a change happened sometime in the spring of 2010.

[3]Lundstrom (2015) raises two other minor issues related to our construction of the family income variable. The first concerns the incorporation of state tax credits. Some of the state variables/descriptions clearly changed between TAXSIM versions 8 and 9 (e.g. the label for v39 changed from "State General Credit" to "State EITC"); however, we are less sure about others and the timing of when various changes took place. Empirically, very few states had changes to their state EITC's during this period, so this issue has almost no effect on the estimates. The second minor issue relates to holding the EITC schedule fixed (for one versus two+ kids families) over time. We regret that the results reported in the published version of the paper did not hold the schedule fixed over the relevant two-year time periods as was stated. Since this affects less than 3% of the estimation sample, the implications for our estimates are negligible. In our full set of revised tables, we have also addressed these concerns and have ensured that our results are correct using the most recent version of TAXSIM and the updated documentation.

change. There is some unique variation in the EITC schedule in all differenced years except between 1997 and 1999, so in theory, one can use any combination of differenced years (where differences span 2 years given the NLSY data). But it helps a lot in practice to use the variation from 1993 to 1995, since that is when the largest EITC expansion occurs. It is important to note that including differenced years with no (or small) EITC changes can still be useful, since these observations help to estimate the time invariant control function for how lagged earnings are correlated with changes in child outcomes.

Over our sample period, there are a total of 6 "first" differences one could incorporate: 1989-1987, 1991-1989, 1993-1991, 1995-1993, 1997-1995, and 1999-1997.[4] The changes before 1993 or after 1995 are relatively minor. As discussed in our published paper, the major EITC expansion between 1993 and 1995 was especially large. In what follows, we demonstrate that our estimates are primarily identified from the large EITC expansion between 1993 and 1995 and that they are not very sensitive to which other time periods one chooses to use in estimation.[5]

Figures 1-4 all have a similar structure and report estimates from different subsamples of differenced years. Panel A plots the reduced form estimate (of test score changes on our instrument) versus the standard error from the first stage (of changes in total family income on our instrument), while panel B plots the IV estimate (of test score changes on changes in total family income) versus the first stage precision as measured by its standard error. In all graphs, red triangles represent estimates from subsamples that include the large 1995-1993 EITC expansion, while blue circles represent estimates from subsamples that do not include this difference. The markers are filled in if the reduced form estimator (panel A) or IV estimator (panel B) is statistically significant at the 5% level.

We begin by studying all 5 subsamples that drop one of the 6 "first" differences, i.e. quintiplets of differences. Four of these subsamples include the large 1995-1993 change in the EITC (red triangles), while one does not (blue circle). Panel A of Figure 1 shows that all 5 reduced form estimates are positive, with the 4 estimates using the 1995-1993 change being statistically significant at the 5% level. Turning to the IV estimates in Panel B, we find estimates of the effect of family income on child achievement which range from 0.28 to 0.55 with those using the 1995-1993 change statistically significant at the 5% level. Standard errors for the first stage estimates are larger than those for our baseline estimate in Table 3, reflecting the smaller sample sizes; yet, the differences are fairly

[4] Because the CNLSY only surveyed children every other year, we must examine two-year differences. However, for expositional purposes, we refer to them as first differences in this document.

[5] For this analysis, we focus attention on estimates for combined math and reading scores using our baseline specifications from Table 3.

modest. First stage estimates that take advantage of the major EITC change in 1995-1993 are all more precise than the one that does not, but there is enough variation in all other years of our sample such that even when we drop the 1995-1993 change, the reduced form and IV estimates are significant at the 10% level.

Figure 2 graphs analogous results for all 15 possible quadruplets of differenced years. Ten of these include 1995-1993, while 5 do not. As in Figure 1, all of the reduced form and IV estimates based on subsamples that include the major EITC expansion are positive and statistically significant at the 5% level. When excluding 1995-1993, 3 out of 5 quadruplet subsample reduced form estimates are significant and none of the IV estimates are significant. One of the subsamples that excludes 1995-1993 produces negative (and insignificant) reduced form and IV estimates. As with our subsamples of quintuplets, the estimates are not very sensitive to which differenced pairs of years one leaves out of the sample as long as 1995-1993 is included.

There are 20 possible triplets of differenced years one could choose from. As Figure 3 shows, half of these possible triplets do not include the large EITC change of 1995-1993. All 10 of the reduced form and IV estimates from triplet subsamples that include the large change are positive with 9 reduced form and 8 IV estimates significant. All have first stage estimates with standard errors less than 0.6. By contrast, among triplet subsamples without the major EITC change, half of the first stage standard errors are greater than 0.6, 3 reduced form and IV estimates are negative, and only 4 reduced form and 0 IV estimates are statistically significant. Altogether, Figure 3 clearly demonstrates the value of including the major 1995-1993 EITC change in terms of improving precision for the first stage, reduced form, and IV estimates.

Finally, consider using pairs of differenced years. This is the bare minimum required to identify the model, since we estimate a flexible time-invariant control function (of lagged pre-tax family income, which is used to construct the instrument). Figure 4 shows the 15 possible pairs of differenced years one could choose from. Panel A shows that if one includes the large EITC change, 3 out of 5 reduced form estimates are statistically significant, and all are positive. In contrast, if 1995-1993 is excluded, only 3 out of 10 reduced form estimates are significant, and several are negative. First stage standard errors are especially large for many of the subsamples that do not include the large EITC expansion. With just a pair of differenced years, the IV estimates are quite noisy, and only 1 is statistically significant. Still, the general message that the major EITC expansion helps with identification is clear from the more precise and robust set of estimates it produces (notice how the triangles are much more clustered than the circles).

Together, these figures highlight the importance of using the major EITC expansion to help identify the effects of income, especially when several differenced years of data are excluded from the analysis. Our results are remarkably robust when 1995-1993 is used, regardless of which smaller EITC changes are also used in estimation. However, subsamples that exclude the major EITC expansion have noticeably less precise first stages, and noisier reduced form and IV estimates as well. This is exactly what one would expect if identification is mostly coming from the large EITC change and only to a lesser extent from the more modest EITC changes in other years.

To be clear, the results in our published paper (and Tables 1-7 of this document) are based on a sextuplet of differenced years. There is only one sextuplet, and it uses all possible differences in our data to construct the estimate. Because it uses the most data, it has smaller first stage and reduced form standard errors, yielding more precise IV estimates of the effects of income on achievement.

3 Accounting for Endogenous Changes in Mother's Labor Supply

A large share of the change in income exploited by our instrument is due to EITC-induced changes in maternal labor supply.[6] Indeed, with the incorrectly coded variable we had for family income (in our *AER* paper), our first stage was primarily driven by the increased earnings of mothers from EITC expansions. Using the correctly coded income variable makes the first stage larger and more precise, since it also includes the increase in EITC payments.

In Dahl and Lochner (2012), we recognized that maternal labor supply could matter, and we were clear that other sources of income might respond besides direct EITC payments. This is why we used total income and not EITC income as our main regressor and variable of interest. The fact that mother's labor supply might have an effect on children is precisely why we attempted to control for it in a robustness check (see Table 7). Unless one thinks maternal labor supply has positive direct effects on children (contrary to what the literature concludes), we have a lower bound estimate for the effect of income on child achievement.[7]

While we controlled for maternal labor supply as an additional regressor in Dahl and Lochner (2012), we were unable to find a good instrument to account for its potential endogeneity. For

[6] See Hoynes and Patel (2015), which finds sizable labor supply responses by mothers and that ignoring the extra induced earnings vastly understates the poverty-reducing effects of the EITC.

[7] U.S. based studies typically estimate zero or negative effects of maternal labor supply on child development (Baker and Milligan, 2010; Baum, 2003; Bernal, 2008; Blau and Grossberg, 1992; Herbst, 2014; James-Burdumy, 2005; Ruhm, 2004, 2008); however, most studies focus on mothers' work behavior when children are in the first few years of life. It seems likely that direct effects of maternal labor supply are weaker for our sample of 5-14 year-olds, since most of the children have already entered school.

example, we initially explored using changes in measures of marginal tax rates, the EITC phase-in and phase-out rates, and the max credit implied by the EITC as instruments in addition to our predicted change in the EITC amount, but these were so highly correlated with our predicted EITC change instrument that they were relatively 'weak' instruments. More recently, we noticed that changes in the EITC had fairly different effects on mother's labor force participation depending on lagged employment status. Based on this insight, we have interacted our main predicted EITC change instrument with lagged maternal employment, including this as a second instrument. In doing so, we must also interact lagged maternal employment with our control function (a polynomial in lagged pre-tax family income that also includes a dummy for positive pre-tax family income) to account for the fact that lagged employment may be correlated with changes in family income and maternal employment and, therefore, changes in shocks to child achievement.

Specifically, we now explicitly include maternal employment E_{ia} for child i at age a (in addition to other time-invariant x_i and time-varying w_{ia} characteristics) into the contemporaneous effects model of Dahl and Lochner (2012), so child achievement is given by:

$$y_{ia} = x_i'\alpha_a + w_{ia}'\beta + E_{ia}\gamma + I_{ia}\delta_0 + \mu_i + \varepsilon_{ia},$$

where total net family income for child i at age a is given by

$$I_{ia} = P_{ia} + \chi_a^{s_{ia}}(P_{ia}) - \tau_a^{s_{ia}}(P_{ia}),$$

P_{ia} reflects family pre-tax income, $\chi_a^{s_{ia}}(P_{ia})$ reflects EITC income, and $\tau_a^{s_{ia}}(P_{ia})$ reflects other taxes. Notice that both EITC income and taxes depend on both pre-tax income P_{ia} and the appropriate EITC/tax schedule for the family, denoted by the superscript s_{ia}.[8] Most importantly, the EITC (and tax) functions change over time as reflected in the a subscripts. This is the exogenous source of income changes we exploit in our estimation strategy.

Letting Δ reflect the first-difference operator, our estimating equation is given by:

$$\Delta y_{ia} = x_i'\alpha + \Delta w_{ia}'\beta + \Delta E_{ia}\gamma + \Delta I_{ia}\delta_0 + \Phi(P_{i,a-1}, E_{i,a-1}) + \eta_{ia}, \tag{1}$$

where we use

$$\Delta\chi_a^{IV}(P_{i,a-1}) \equiv \chi_a^{s_{i,a-1}}(\hat{E}[P_{i,a}|P_{i,a-1}]) - \chi_{a-1}^{s_{i,a-1}}(P_{i,a-1}) \qquad \text{and} \qquad \Delta\chi_a^{IV}(P_{i,a-1})E_{i,a-1}$$

[8] Most notably, the EITC schedules differ based the number of children in the household, while the more general tax function depends on a broader set of family characteristics. Our empirical analysis takes many additional income and tax distinctions into account, which we abstract from here for expositional purposes. See Dahl and Lochner (2012), especially Appendix A, for further details.

to instrument for changes in total net family income and changes in maternal employment.[9] Crucially, estimating equation (1) includes a flexible function of lagged pre-tax income and lagged maternal employment, $\Phi(P_{i,a-1}, E_{i,a-1})$, as a 'control function' to account for the fact that changes in child achievement shocks, $\Delta\varepsilon_{i,a}$, may be correlated with both variables. Empirically, we use a high-order polynomial in lagged pre-tax income and an indicator for positive lagged pre-tax income to estimate $\hat{E}[P_{i,a}|P_{i,a-1}]$ in creating our instrument. We use the same order polynomial and indicator for positive lagged pre-tax income in creating our control function. Letting $D_{i,a-1} \equiv 1(P_{i,a-1} > 0)$ be an indicator for positive lagged pre-tax family income and assuming a polynomial of order J, the control function is given by:

$$\Phi(P_{i,a-1}, E_{i,a-1}) = \phi_{0D} D_{i,a-1} + \sum_{j=0}^{J} \phi_{0j} P_{i,a-1}^{j} + E_{i,a-1} \left[\phi_{1D} D_{i,a-1} + \sum_{j=0}^{J} \phi_{1j} P_{i,a-1}^{j} \right].$$

Extending our instrument set and control function in this way implicitly assumes that expected changes in achievement shocks conditional on lagged pre-tax income and maternal employment are stable over time.[10]

We report these new estimates in Table 8, along with our revised baseline estimate that does not control for maternal labor supply (reported in column (i)). Columns (ii) and (iii) directly control for changes in maternal employment and instrument for changes in both income and maternal employment as described above. In column (ii), we use a fifth order polynomial in lagged pre-tax family income in creating our instrument and control function, while in column (iii) we use a fourth order polynomial (to improve precision). As one can see from the first-stage estimates for the new IV specifications, the effects of predicted changes in EITC income (from period t-1 to t) are quite similar for families regardless of whether mothers worked in period t-1; however, the increase in predicted EITC generates more positive increases in employment for mothers who were initially not working in period t-1. A \$1,000 increase in predicted EITC payments increases the probability a previously non-working mother will work during the next period by 14 percentage points. In contrast, this labor supply effect is small for mothers who were already working. When instrumenting for both current family income and mother's employment, we estimate that the effect of an additional \$1,000 in family income on child achievement is 0.039 (column (ii)) or 0.038 (column (iii)) standard deviations. These estimates are very similar to our revised baseline estimate

[9] As in Dahl and Lochner (2012), our baseline covariates include gender, race/ethnicity, age, and number of siblings.

[10] More formally, our control function is assumed to satisfy $E[\Delta\varepsilon_{ia}|P_{i,a-1}, E_{i,a-1}, x_i, \Delta w_{ia}] = \Phi(P_{i,a-1}, E_{i,a-1})$; however,we obtain nearly identical results if we generalize the control function by interacting $\Phi(P_{i,a-1}, E_{i,a-1})$ with all regressors, x_i and Δw_{ia}. In this case, the estimated effect of family income is 0.037 (0.022), significant at the 10% level, corresponding to the fifth-order polynomial specification in column (ii) of Table 8.

of 0.041 (column (i)), which does not account for mother's labor supply. Not surprisingly, our new estimates in columns (ii) and (iii) are less precise than our baseline estimate; however, they are still statistically significant at the 10% and 5% levels, respectively.

Unfortunately, we are unable to obtain precise estimates of the impacts of maternal employment on child outcomes using this approach. Regardless of our lack of precision for the coefficient on maternal employment, the estimated effects of income are purged of any potential endogeneity concerns that may arise due to impacts of the EITC expansions on maternal employment. In the end, our findings are quite robust. We obtain very similar estimated effects of family income whether we ignore maternal labor supply, include maternal labor supply without instrumenting for it (see specification G of Table 7), or directly control for maternal labor supply and instrument for it.

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Table 1: Family Income, EITC Eligibility, and EITC Payments over Time (in Year 2000 $)

Year (i)	Number of Children (ii)	Median Lagged Family Income (iii)	Fraction of Children in EITC Eligible Families (iv)	Median EITC Payment (if Eligible) (v)	EITC Payment as a Fraction of Family Income (if Eligible): 1 Child Families (vi)	EITC Payment as a Fraction of Family Income (if Eligible): 2+ Child Families (vii)
1988	1,187	24,824	0.31	547	0.05	0.05
1990	1,187	26,397	0.35	718	0.05	0.05
1992	1,648	28,464	0.31	833	0.06	0.06
1994	1,655	29,242	0.35	1,124	0.08	0.07
1996	1,682	33,588	0.34	1,917	0.09	0.11
1998	1,349	36,684	0.34	2,035	0.10	0.12
2000	1,088	38,399	0.34	2,226	0.10	0.13
All	9,796	31,043	0.34	1,129	0.07	0.08

Notes: Data are from the Children of the NLSY linked to their mothers in the main NLSY79. The unit of observation is a child. The sample is restricted to those used in our baseline IV analysis in Table 3. Children must have valid math and reading PIAT scores, child control measures in panel A of Table A1, and family income measures for the reported year. Children must also have at least two years of valid observations to be included. Year in column (i) refers to the NLSY survey year; income and EITC payment variables refer to the previous year's income. Family income includes tax payments and tax credits (including the EITC); the sources for family income include earned income, unearned income, and non-taxable income.

Table 2: OLS Estimates of the Effect of Family Income on Math-Reading Achievement

	(i)	(ii)	(iii)	(iv)
A. Estimated in Levels				
Current Income	0.0048**	0.0031**	0.0021	0.0023
	(0.0011)	(0.0014)	(0.0016)	(0.0015)
Lagged Income (a-1)		0.0024	0.0024	
		(0.0016)	(0.0024)	
Lagged Income (a-2)			0.0013	
			(0.0019)	
Sum of (a-1) and (a-2) Lagged Income				0.0018**
				(0.0009)
Medium-Term Effect of Increasing Income by $1,000/Year for 3 Years	0.0048**	0.0055**	0.0058**	0.0058**
	(0.0011)	(0.0013)	(0.0015)	(0.0015)
B. Estimated in Differences				
Current Income	0.0012*	0.0016*	0.0010	0.0016*
	(0.0007)	(0.0008)	(0.0010)	(0.0009)
Lagged Income (a-1)		0.0006	0.0014	
		(0.0009)	(0.0011)	
Lagged Income (a-2)			-0.0008	
			(0.0009)	
Sum of (a-1) and (a-2) Lagged Income				0.0002
				(0.0005)
Medium-Term Effect of Increasing Income by $1,000/Year for 3 Years	0.0012*	0.0022**	0.0016	0.0019
	(0.0007)	(0.0010)	(0.0013)	(0.0013)
Sample Size (for both panels)	8,609	6,543	5,019	5,019

Notes: Child achievement is a normalized average of math and reading scores. Income is measured in $1,000 of year 2000 dollars. Panel A 'levels' regressions (equation 1 in the paper) control for all variables listed in Appendix Table A1. Panel B 'difference' regressions (equation 2 in the paper) use two-period differences and control for baseline variables in Panel A of Table A1. Samples include children taking a math or reading PIAT test in the 1988 survey year or later. 'Medium-Term Effect' is given by the sum of current and all estimated lagged income coefficients in columns (i)-(iii) and the sum of the coefficient on current income plus twice the coefficient on the sum of lagged income measures in column (iv). Standard errors are reported in parentheses and are clustered at the family level. ** Significant at the 5% level, * significant at the 10% level.

Table 3: Baseline IV Estimates of 'Contemporaneous Effects' Model

	Combined Math and Reading (i)	Reading Recognition (ii)	Reading Comprehension (iii)	Math (iv)
Current Income	0.0411**	0.0296**	0.0391**	0.0362**
	(0.0131)	(0.0128)	(0.0163)	(0.0158)
1^{st} Stage Coefficient on Instrument	1.758**	1.758**	1.758**	1.758**
	(0.361)	(0.361)	(0.361)	(0.361)

Notes: Income is measured in $1,000 of year 2000 dollars. All specifications control for 'baseline variables' listed in Appendix Table A1, an indicator for positive lagged pre-tax income, and a fifth order polynomial in lagged pre-tax income. All models are estimated in two-year differences to account for unobserved child fixed effects. See the Online Appendix for all other first- and second-stage coefficient estimates. Sample size is 8,609 for all the columns. Standard errors are reported in parentheses and are clustered at the family level. ** Significant at the 5% level, * significant at the 10% level.

Table 4: IV Estimates of 'Contemporaneous Effects' Model Accounting for Time Trends and Time-Varying State Policies (Math-Reading Achievement)

	Effect of Current Income	1^{st} Stage Coefficient on Instrument
A. Year Dummies	0.0446**	1.167**
	(0.0200)	(0.361)
B. Linear Time Trend	0.0623**	1.188**
	(0.0222)	(0.345)
C. Linear Time Trend Interacted with Control Function	0.0597**	1.567**
	(0.0240)	(0.509)
D. State School Accountability Policies Interacted with Control Function	0.0358**	1.801**
	(0.0129)	(0.387)
E. State Welfare Policies Interacted with Control Function	0.0448**	1.854**
	(0.0149)	(0.428)
F. Time Trend, Accountability and Welfare Policies Interacted with Control Function	0.0479**	1.629**
	(0.0221)	(0.540)

Notes: Child achievement is a normalized average of math and reading scores. Income is measured in $1,000 of year 2000 dollars. All specifications control for 'baseline variables' listed in Appendix Table A1. All specifications are estimated in two-year differences to account for unobserved child fixed effects. Sample size is 8,609 for all specifications. Standard errors are reported in parentheses and are clustered at the family level. ** Significant at the 5% level, * significant at the 10% level.

Table 5: IV Estimates of Achievement Models with Lasting Income Effects

	(i)	(ii)	(iii)
Current Income	0.0351*	0.0539	0.0429**
	(0.0203)	(0.0455)	(0.0172)
Lagged Income (a-1)	0.0129	0.0031	
	(0.0361)	(0.0488)	
Lagged Income (a-2)		0.0217	
		(0.0344)	
Sum of (a-1) and (a-2) Lagged Income			0.0159
			(0.0180)
Medium-Term Effect of Increasing Income by $1,000/Year for 3 Years	0.0479*	0.0786	0.0746*
	(0.0249)	(0.0526)	(0.0440)
F-statistics from 1st Stage	11.02, 5.42	5.76, 2.74, 3.94	8.40, 2.85
Sample Size	6,543	5,019	5,019

Notes: Child achievement is a normalized average of math and reading scores. Income is measured in $1,000 of year 2000 dollars. All specifications control for 'baseline variables' listed in Appendix Table A1, an indicator for positive lagged pre-tax income, and a fifth order polynomial in lagged pre-tax income. All models are estimated in two-year differences to account for unobserved child fixed effects. 'Medium-Term Effect' is given by the sum of current and all estimated lagged income coefficients in columns (i) and (ii) and the sum of the coefficient on current income plus twice the coefficient on the sum of lagged income measures in column (iii). F-statistics are for tests that all instruments equal zero in first-stage equations. See the Online Appendix for all other first- and second-stage coefficient estimates. Standard errors are reported in parentheses and are clustered at the family level. ** Significant at the 5% level, * significant at the 10% level.

Table 6: IV Estimates of 'Contemporaneous Effects' Model for Various Subgroups

	Mother's Education	Race	Mother's Marital Status	Mother's AFQT	Child's Age	Child's Gender
	High School or Less	Black or Hispanic	Not Married	Low AFQT	Age < 12	Male
Effect of Current Income	0.0360**	0.0523**	0.0494**	0.0428**	0.0481**	0.0518**
	(0.0122)	(0.0157)	(0.0208)	(0.0162)	(0.0200)	(0.0195)
1^{st} Stage Coefficient on Instrument	1.930**	1.851**	1.340**	1.669**	1.704**	1.721**
	(0.382)	(0.413)	(0.381)	(0.409)	(0.460)	(0.457)
'Percent in EITC Range'	56.4	62.8	90.1	64.9	46.4	49.6
Sample Size	6,253	4,602	2,977	4,311	4,654	4,261
	Some College or More	White (not Hisp.)	Married	High AFQT	Age ≥ 12	Female
Effect of Current Income	0.4240	0.0090	0.0279	0.0366	0.0349**	0.0291*
	(2.0237)	(0.0210)	(0.0172)	(0.0254)	(0.0158)	(0.0157)
1^{st} Stage Coefficient on Instrument	0.218	1.594**	2.352**	1.726**	1.808**	1.797**
	(1.048)	(0.755)	(0.849)	(0.777)	(0.432)	(0.453)
'Percent in EITC Range'	30.8	34.1	27.9	33.3	53.0	49.3
Sample Size	2,356	4,007	5,632	4,040	3,955	4,348

Notes: Income is measured in $1,000 of year 2000 dollars. All specifications control for 'baseline variables' listed in Appendix Table A1 and are estimated in two-year differences to account for unobserved child fixed effects. 'Percent in EITC Range' is calculated as the fraction with lagged pre-tax income less than or equal to $30,000. Standard errors are reported in parentheses and are clustered at the family level. ** Significant at the 5% level, * significant at the 10% level.

Table 7: Robustness of IV Estimates for 'Contemporaneous Effects' Model

	Effect on Child Achievement	1^{st} Stage Coefficient on Instrument
A. Additional Control Variables		
Effect of Current Income	0.0484**	1.405**
	(0.0181)	(0.376)
B. No Control Variables (Except Control Function, i.e., Polynomial in Lagged Earnings)		
Effect of Current Income	0.0443**	1.811**
	(0.0130)	(0.362)
C. Interact Control Function with Baseline Regressors		
Effect of Current Income	0.0410**	1.785**
	(0.0128)	(0.367)
D. Include State Dummies with Baseline Regressors		
Effect of Current Income	0.0426**	1.679**
	(0.0140)	(0.369)
E. Use NLSY-supplied Weights		
Effect of Current Income	0.0354**	1.642**
	(0.0158)	(0.443)
F. Log Family Income Measure		
Effect of Log Current Income	0.6993**	0.103**
	(0.2573)	(0.029)
G. Controls for Mother's Labor Market Participation and Work Hours		
Effect of Current Income	0.0526**	1.337**
	(0.0191)	(0.349)
Effect of Mother's Participation	-0.0137	
	(0.0349)	
Effect of Mother's Work Hours (in 100's)	-0.0169**	
	(0.0061)	

Notes: Specifications identical to those for 'Combined Math and Reading' in Table 3 with the noted exceptions. Specification A controls for all variables in Appendix Table A1 and state school accountability and welfare policies (in addition to the control function in lagged pre-tax income). Specification B controls only for the control function. Specification C interacts the control function with all baseline regressors. Specification D includes state indicators along with all baseline regressors. Specification E uses the NLSY-supplied weights for mothers (includes baseline controls and control function). Specification F uses log family income rather than income measured in levels (includes baseline controls and control function). Specification G controls for mother's labor market participation and hours worked in addition to baseline regressors and control function. Sample sizes are 8,609 for Specifications A–F and 8,239 for Specification G. Standard errors are reported in parentheses and are clustered at the family level. ** Significant at the 5% level, * significant at the 10% level.

Table 8: Effects of Family Income and Maternal Employment on Combined Math and Reading Achievement

		Instrument and Control Function Polynomial:	
	Baseline	Fifth Order	Fourth Order
	(i)	(ii)	(iii)
A. IV Estimates			
Current income	0.041**	0.039*	0.038**
	(0.013)	(0.024)	(0.016)
Working mother		0.060	0.177
		(0.546)	(0.454)
B. First Stage Estimates			
First stage for current family income:			
Predicted ΔEITC	1.758**		
	(0.361)		
Predicted ΔEITC × mother not working last period		1.957**	2.010**
		(0.624)	(0.608)
Predicted ΔEITC × mother working last period		1.693**	1.811**
		(0.430)	(0.412)
SW multivariate F-test		6.20	12.65
[p-value]		[0.013]	[0.000]
First stage for working mother:			
Predicted ΔEITC × mother not working last period		0.143**	0.142**
		(0.040)	(0.040)
Predicted ΔEITC × mother working last period		0.034**	0.017
		(0.016)	(0.015)
SW multivariate F-test		5.40	9.22
[p-value]		[0.020]	[0.002]

Notes: Income is measured in $1,000 of year 2000 dollars. Column (i) controls for 'baseline variables' listed in Appendix Table A1 of Dahl and Lochner (2012), an indicator for positive lagged pre-tax income, and a fifth order polynomial in lagged pre-tax income. Column (ii) additionally controls for an indicator for lagged maternal labor force participation and interactions between the lagged pre-tax income variables with lagged maternal labor force participation. Column (iii) is similar to column (ii), but reduces the polynomial used to construct the instrument and the control function to a fourth order polynomial in lagged pre-tax income. All models are estimated in two-year differences to account for unobserved child fixed effects. Sample size is 8,609 for all columns. Standard errors are reported in parentheses and clustered at the family level. SW multivariate F-test is the Sanderson and Windmeijer (2013) multivariate F-test for weak instruments, which is a refinement of the Angrist Pischke multivariate F-test. ** Significant at the 5% level, * significant at the 10% level.

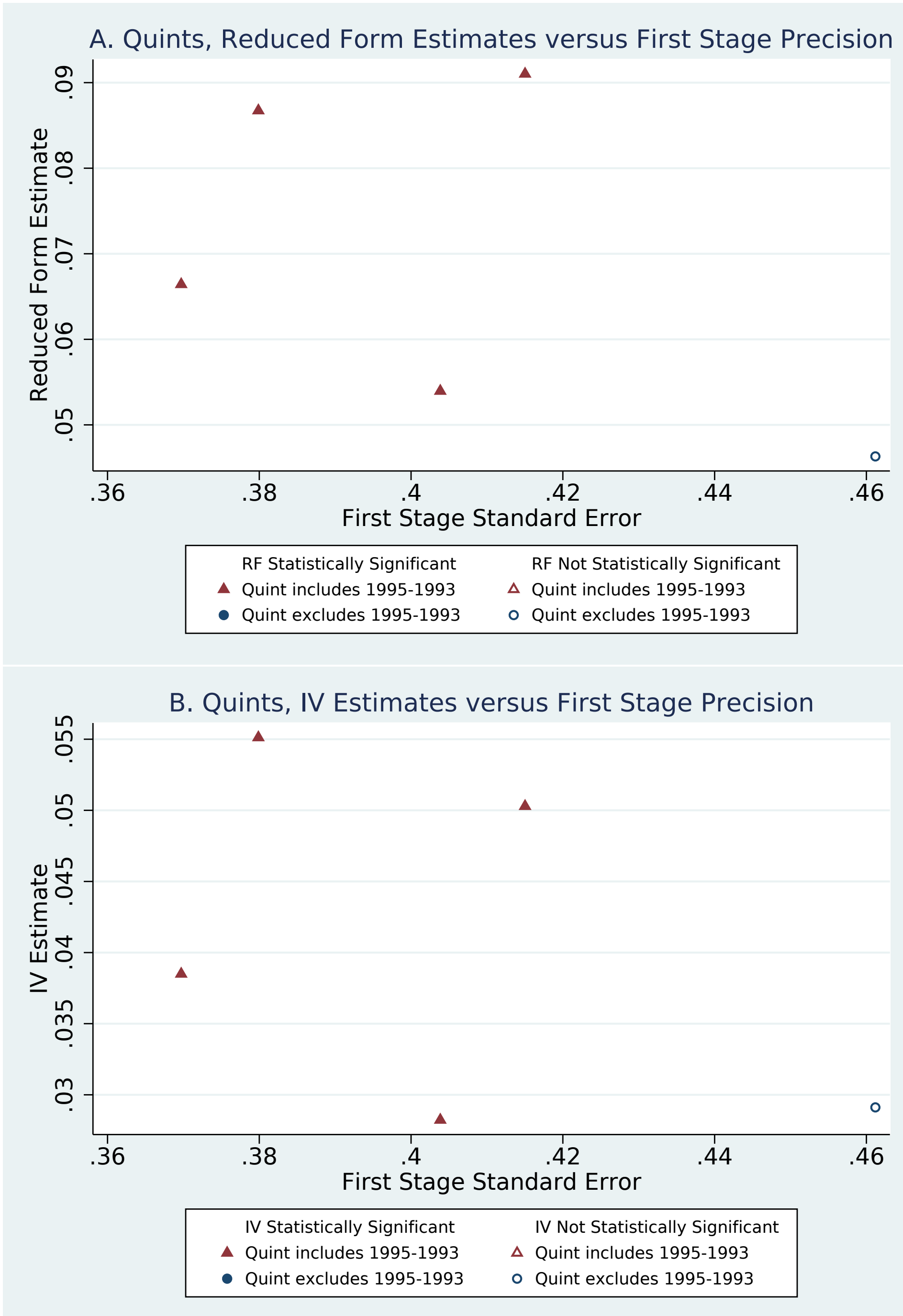

Figure 1: Subsample Estimates for Quintuplets of First-Differenced Years.

Notes: Each marker denotes estimates from a different subsample of quintuplets of first-differenced years. For example, 1989-1987, 1993-1991, 1995-1993, 1997-1995 and 1999-1997 is one possible quint. There are 5 possible quints; 4 of these quints include the big EITC change of 1995-1993 (triangles) while 1 does not (circles). Markers are filled in if the reduced form estimate / IV estimate is statistically significant at the 5% level.

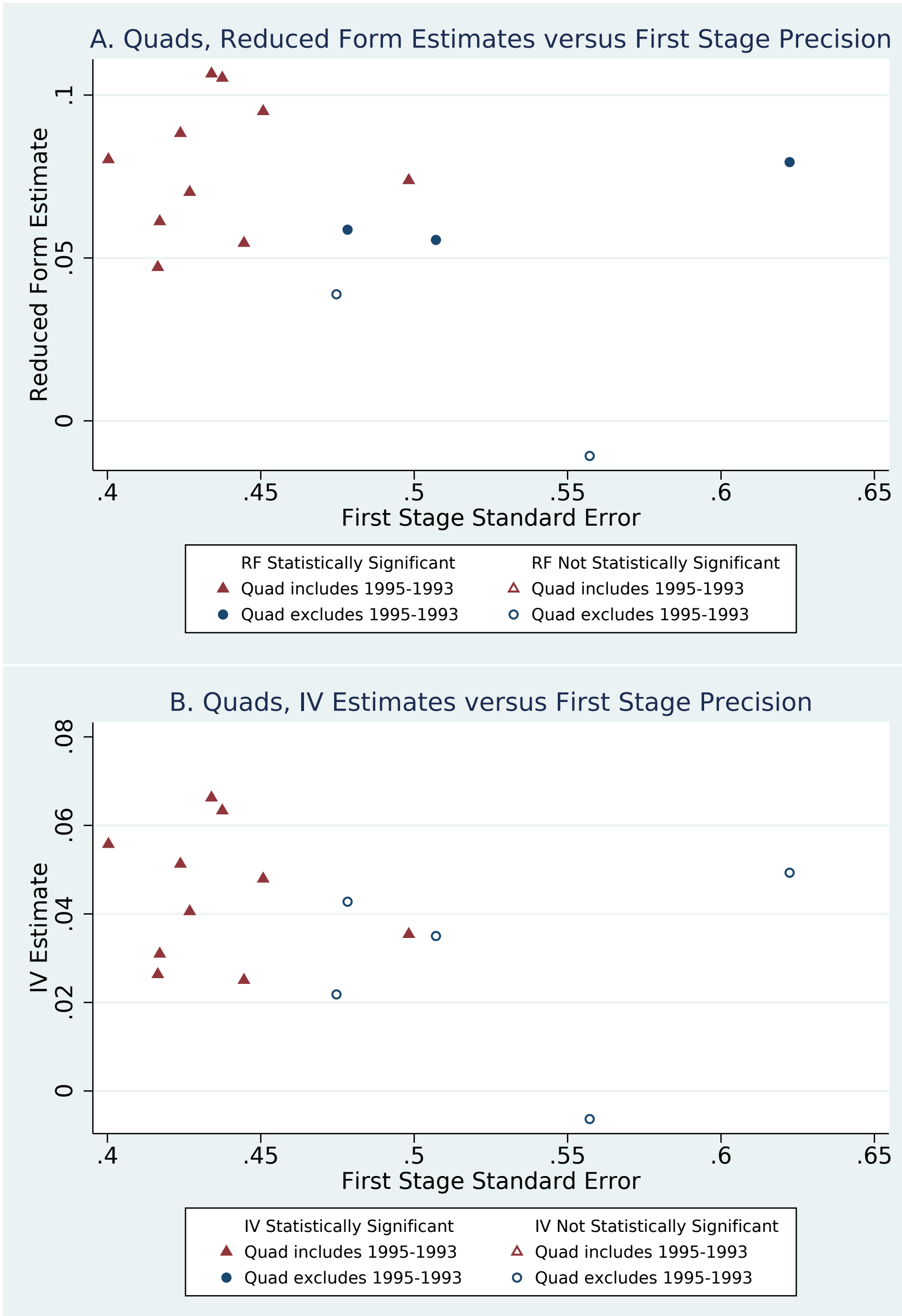

Figure 2: Subsample Estimates of Quadruplets of First-Differenced Years.

Notes: Each marker denotes estimates from a different subsample of quadruplets of first-differenced years. For example, 1989-1987, 1995-1993, 1997-1995 and 1999-1997 is one possible quad. There are 15 possible quads; 10 of these quads include the big EITC change of 1995-1993 (triangles) while 5 do not (circles). Markers are filled in if the reduced form estimate / IV estimate is statistically significant at the 5% level.

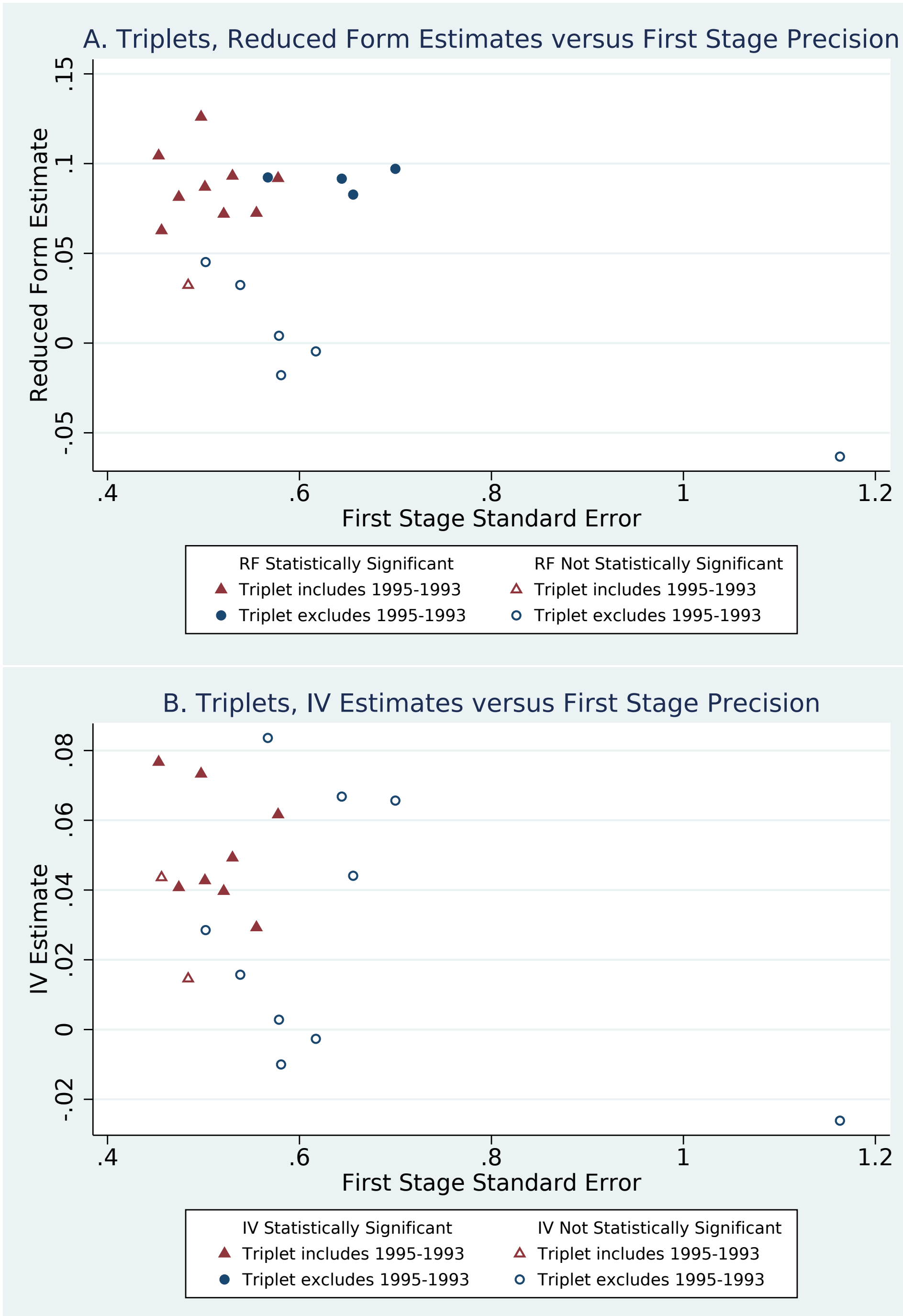

Figure 3: Subsample Estimates of Triplets of First-Differenced Years.

Notes: Each marker denotes estimates from a different subsample of triplets of first-differenced years. For example, 1989-1987, 1995-1993 and 1997-1995 is one possible triplet. There are 20 possible triplets; 10 of these triplets include the big EITC change of 1995-1993 (triangles) while 10 do not (circles). Markers are filled in if the reduced form estimate / IV estimate is statistically significant at the 5% level.

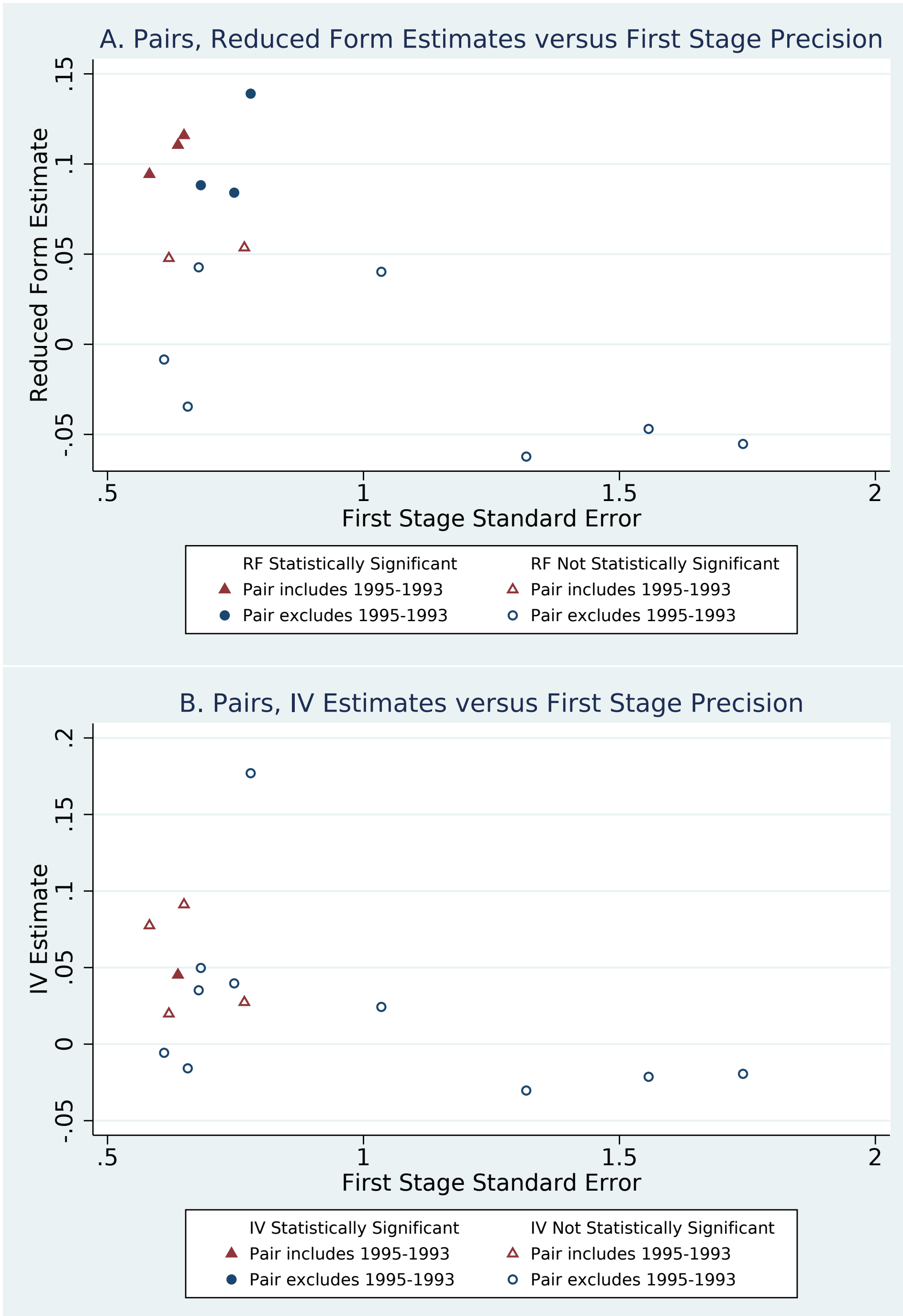

Figure 4: Subsample Estimates of Pairs of First-Differenced Years.

Notes: Each marker denotes estimates from a different subsample of pairs of first-differenced years. For example, 1989-1987 and 1995-1993 is one possible pair. There are 15 possible pairs; 5 of these pairs include the big EITC change of 1995-1993 (triangles) while 10 do not (circles). Markers are filled in if the reduced form estimate / IV estimate is statistically significant at the 5% level.