Parental Involvement and the Intergenerational Transmission of Educational Attainment

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Abstract:

Several authors have speculated that better-educated parents' higher levels of parental involvement may influence the intergenerational transmission of education; however, this hypothesis has yet to be formally tested. We begin to fill this gap in the literature by estimating augmented intergenerational mobility models that include measures of parental involvement using rich data from the Child and Young Adult Supplement to the National Longitudinal Survey (NLSY79). In a sample of 3,208 children linked to 2,031 mothers, we find that much of the correlation between mothers' and children's education is driven by college-educated mothers reading to their children. Looking across household types, this relationship is stronger for children of married parents and teenage parents, respectively.

Keywords: Economic Mobility, Intergenerational Transmission of Education, Educational Attainment, Parental Involvement

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1. Introduction

Educational attainment is an important predictor of social and economic upward mobility (e.g., Card 1999; Checchi 2006; Ellwood & Kane 2000; Lochner 2011). Accordingly, a large literature is devoted to identifying its determinants (e.g., Haveman & Wolfe 1995), with several studies focused on family socioeconomic characteristics including parents' schooling and permanent income (Blau 1995; Chetty et al. 2014; Ladd 2012). The resulting evidence highlights the persistence of education and income across generations and how parent-child transmission maintains or even increases socioeconomic inequality (Autor 2014); a subset of the mobility literature focuses exclusively on the intergenerational education coefficient (IEC). This coefficient simply represents the bivariate regression of the adult child's educational attainment on parents' educational attainment (Black, Devereux, & Salvanes 2005; Hertz et al. 2007).[1]

However, the underlying sources of this persistence are poorly understood. Several scholars have speculated that parental involvement and related investments in children's human capital made at home, outside the traditional school day, and by better-educated parents may help explain the intergenerational transmission of educational attainment (e.g., Checchi 2006; Entwisle, Alexander, & Olson 2001; Guryan, Hurst, & Kearney 2008; Ramey & Ramey 2010). Indeed, there are well-documented socioeconomic differences in parental involvement, which might contribute to inequities in educational attainment and achievement (e.g., Dooley & Stewart 2007; Ermisch 2008; Gershenson 2013; Kalil, Ryan, & Corey 2012; Todd & Wolpin 2007). The current study tests this hypothesis by testing whether the intergenerational persistence of

[1] The literature on intergenerational education mobility also includes estimates of parent-child education correlations as well as closely-related parent-child regressions (e.g. Checchi et al. 2013; Ermisch & Pronzato 2011) and instrumental variables approaches (e.g. Oreopoulos et al. 2006).

educational attainment is stronger among mothers who were more involved—as measured by the frequency with which mothers read to their children—than among their less involved counterparts.

Specifically, we estimate parent-child models of educational attainment and test the importance of maternal reading frequency as a mediator of the IEC. We use data from the 1979 National Longitudinal Survey of Youth (NLSY79) that links mothers to their adult offspring and contains rich demographic, labor market, child development, and parental involvement information.

The main results suggest that a specific form of parental involvement—reading to children—explains a significant portion of educational persistence across generations. This mediating role of maternal reading in explaining educational attainment and the parent-child IEC is robust to controlling for a rich set of observable parental and family characteristics, unlikely to be entirely spurious, and consistent with intergenerational education mobility models that predict positive returns to parental investments in children's human capital of the sort described in section 2.

2. Econometric Model

Several studies find a positive association between out-of-school inputs, such as parental involvement, and academic achievement (e.g., Avvisati, Besbas, & Guyon 2010; Covay & Carbonaro 2010; Kim 2006; Phillips 2011; Spera 2005). Meanwhile, numerous scholars have developed and tested the hypothesis that socioeconomic status, inclusive of educational attainment, is passed on to children (e.g., Becker and Tomes 1979, 1986; Blau 1999; Bloome & Western 2011; Chetty et al. 2014; Guldi, Page, & Stevens 2007; Solon 1999). The current study

extends empirical models of socio-economic mobility to include the frequency with which mothers read to their child (Phillips 2011), a key indicator of parental involvement. By controlling for this out-of-school input, we further our understanding of the mechanisms through which educational attainment is transmitted across generations.

We adapt an empirical model of educational attainment (e.g., Ermish & Pronzato 2011) that assumes a linear relationship between parent-child educational attainment (*S*, measured in years of schooling) across generations. The subscripting reflects children as the unit of analysis with siblings nested in households. Specifically, for each adult child *i* of mother *j*, we estimate the following model of educational attainment with controls for a standard set of household socioeconomic and demographic characteristics (**x**):

$$(1) \qquad S_{ij} = \alpha + \boldsymbol{\lambda}\mathbf{p}_{ij} + \rho S_j + \boldsymbol{\delta}\mathbf{p}_{ij} \times S_j + \boldsymbol{\beta}\mathbf{x}_{ij} + v_{ij.}$$

In equation (1), ρ is a descriptive parameter representing the intergenerational education coefficient, which captures the persistence of educational attainment between parents and their adult children. The idiosyncratic error term v_{ij} is likely correlated with S_j, and many elements of the child's educational capacity are unobservable, such as innate ability, social networks, neighborhood quality, and so on.

Generally, (1) is similar to conventional specifications considered in previous work on the determinants of educational attainment and socioeconomic mobility (e.g., Björklund & Jäntti 2009; Blanden et al. 2005; Duncan et al. 2010; Duncan & Brooks-Gunn 2000; Ellwood & Kane 2000; Ermisch & Pronzato 2011; Hertz et al. 2007; Hardy 2014; Johnson & Schoeni 2011; Machin 2009; Pronzato 2010). The primary contribution of the current study is the inclusion of parental involvement (**p**) both additively and multiplicatively, formalizing the insights of Blau (1999) and Guryan et al. (2008), among others.

Equation (1) is estimated by OLS, where mothers' Armed Forces Qualification Test (AFQT) scores proxy for unobserved maternal ability and **x** includes a set of children's birth-cohort fixed effects.[2] The elements of **p** and **x** are described in section 3. Standard errors are clustered at the mother level to make statistical inference robust to arbitrary heteroskedasticity and within-family correlations in siblings' composite error terms created by unobserved family effects.

Several generalizations of the baseline estimating equation (1) are considered as well, both to verify the robustness of the results and to investigate potential heterogeneities in the intergenerational transmission of education. First, we replace mothers' years of schooling (S_j) with a set of categorical dummies for mothers' highest degree obtained and similarly replace children's years of schooling (S_{ij}) with a set of highest degree obtained dummies and estimate the resulting four specifications as linear probability models (LPM), where the outcome is 4-year college degree (or more).[3] This allows for nonlinearities in the intergenerational transmission of education, perhaps driven by "sheepskin effects" associated with the diplomas and degrees associated with 12 and 16 years of schooling, respectively (Hungerford & Solon 1987).

Second, we generalize the main estimating equation of (1) to accommodate potential differences by household income, household structure, and teenage motherhood in the roles that

[2] The 2006 revision of mothers' AFQT scores that adjusted for the age at which the test was taken are used. See the discussion in Altonji, Bharadwaj, and Lange (2012) or the definitions in http://www.nlsinfo.org/nlsy79/docs/79html/79text/achtests.htm. Using AFQT scores as a proxy may be sufficient to eliminate the correlation between mothers' unobserved ability and years of schooling, household income, and parental involvement, though it does not necessarily eliminate the presence of an unobserved family effect. AFQT likely captures a range of environmental, developmental, and hereditary inputs, but there is not a consensus on whether AFQT tests achievement, ability, some combination of the two, or something altogether different (Neal & Johnson, 1996; Rodgers & Spriggs, 1996; Darity & Mason, 1998; Heckman, 1998).

[3] Linear probability models (LPMs) are preferred to nonlinear (e.g., logit) models because they facilitate straightforward interpretation of the models' interaction effects (Ai & Norton, 2003).

parental involvement play in the intergenerational transmission of education. Such non-separabilities may exist for a number of reasons. First, higher income households have a greater ability to both pay for post-secondary schooling and provide physical resources such as books, tutoring services, and high-quality out-of-school inputs (e.g., Checchi 2006). Second, single mothers may be limited in their ability to interact with children by rigid or non-traditional work schedules (e.g., Bianchi 2000; Bianchi & Robinson 1997). Finally, both single mothers and teenage mothers are historically among the groups most likely to be poor and thus a focus of economic mobility efforts (Brooks-Gunn & Duncan 1997).

3. Data

The 1979 National Longitudinal Survey of Youth (NLSY79) is administered by the U.S. Bureau of Labor Statistics and tracks the socioeconomic and labor-market outcomes of a sample of young adults in the United States aged 14 to 22 in 1979. Beginning in 1986 the NLSY79 Child and Young Adult Supplement (CYA) provides detailed information on the children of the original NLSY79 female respondents, including measures of home environment, parental involvement in children's home and school lives, and children's participation in summer activities. The CYA has followed the offspring of the original NLSY79 female respondents to adulthood and recorded their educational attainment. Importantly for the current study, this enables the comparison of mothers' educational attainment to that of their children (BLS 2011).

After matching children in the CYA to their mothers in the NLSY79 we restrict the sample to offspring who were 25 or older in 2010, as this is an age at which a majority of the CYA sample is likely to have completed formal schooling and an age used in previous studies of educational mobility (e.g., Hout & Janus 2011). However, the qualitative results of the current

study are robust to alternative age cutoffs, notably 27 or older in 2010, to allow for the completion of graduate school (Hout & Janus 2011). While we do not observe fathers' educational attainment, Behrman and Rosenzweig (2002) and Heckman and Hotz (1986) suggest that mother's education is a stronger predictor of offspring's educational attainment and parents' education levels are positively correlated due to positive-assortative mating (e.g., Lam 1988).

All summary statistics and regressions reported in the main text are estimated using NLSY sampling weights that adjust for unequal probabilities of sample selection, as the NLSY and CYA oversample low-income and minority households. However, as suggested by Solon et al. (2013), we report un-weighted regression estimates of the baseline model in appendix table A.1 as part of a sensitivity analysis. We find, as have others using NLSY data, that weighted and un-weighted estimates are qualitatively similar (e.g., Arcidiacono, Bayer, & Hizmo 2010).

Table 1 summarizes the main analytic sample. Educational attainment is observed for 4,002 child-mother pairs. After restricting the sample to children for whom the full set of controls and parental involvement data are available the estimation sample contains 3,208 children of 2,031 mothers.[4] The distribution of mothers' education is similar to that of children's, though it is worth noting that both post-secondary educational attainment *and* the frequency of high school dropouts increased across generations. This is consistent with the basic finding of increased inequality in educational attainment during the years surveyed by the NLSY79 and CYA (Hout & Janus 2011).

[4] Appendix table A.2 shows how the main analytic sample was formed via listwise deletion. An earlier draft of this paper conditioned on "region of birth," which was coded as the child's earliest reported region of residence before age 6. This information is frequently missing, however, and results in a loss of more than 1,000 observations (N = 2,130 children). Appendix table A.3 shows that the main results are robust to controlling for region of birth.

The average household income experienced by children in the sample between birth and age 18 was about $5,000 in 2008 dollars.[5] We average household income through age 18 in an effort to account for the household's permanent income throughout childhood (Rothstein & Wozny 2013) and the influence of binding budget and credit constraints on the decision to enroll in postsecondary education. Similarly, mothers' marital status is collapsed into a child-specific binary indicator equal to one if the mother was continuously married from the child's birth through age 18; this is true for about 38% of child respondents. The results are robust to instead averaging household income and marital status through age 14.

About half of the sample's child respondents are male, one tenth are Hispanic, and one quarter are black. The average child respondent is one of three siblings, though siblings who were not yet 25 in 2010 are excluded from the sample. The average birth-order position of children in the sample is 1.6, which is also influenced by the exclusion of relatively young siblings from the sample. The children in the analytic sample were born between 1976 and 1985 and more recent birth cohorts are over represented in the analytic sample because the mid-1980s were the original NLSY female respondents' prime childbearing years. The 1985 birth cohort turned 25 in 2010 and thus contains the youngest children eligible to be included in the analytic sample.

Finally, the NLSY contains rich measures of the quality of the child's home environment, which it collapses into an aggregate index. The measure includes activities that occur inside and outside of the home such as grocery store visits, playing with child-appropriate toys, as well as factors such as the child's autonomy in choosing meals and home responsibilities, the home's

[5] Nominal household incomes reported in the NLSY79 are adjusted for inflation using the personal consumption expenditure deflator and 2008 as the base year (Council of Economic Advisors, 2012, table B-7).

physical condition and cleanliness, and social constructs such as discipline, the child's relationship to her father, and the frequency of displays of affection and affirmation. See Bradley et al. (1988, 2000) for a full description of this variable. We control for each household's percentile in the distribution of aggregate "home environment" index (HOME) scores. The average household in the analytic sample was at about the 72nd percentile of the home environment distribution.

Table 2 summarizes the key independent variable of interest: the frequency with which mothers read to children, which is a type of parental involvement that is generally thought to positively influence educational achievement (e.g., Phillips 2011). Beginning in 1986, the CYA asked how frequently mothers read to children ages 0-2, 3-5, and 6-9 in even years. Thus whether the mother read to children aged 0-2 is only observed for the 1984 and 1985 birth cohorts, and so on. As a result, the preferred baseline specification includes a measure of how frequently mothers read to children aged 6-9, as these data are available for the largest subsample of children.[6] The CYA data on how often mothers read to/with children in a particular year is reported as an ordinal categorical variable that takes 6 values: never, several times per year, several times per month, once a week, three times per week, and everyday. For simplicity, this variable is operationalized in the econometric model as a binary indicator of "mother frequently

[6] Although our main specifications do not focus on early reading (0-2, 3-5), which is equally if not more important for child development, parental involvement during these earlier periods strongly predicts parental involvement between the ages of 6-9. Specifically, bivariate regressions indicate that mothers who frequently read to their children between ages 0-2 are about 24 percentage points more likely to frequently read with their children between ages 6-9, and mothers who frequently read to their children between the ages of 3 and 5 are about 17 percentage points more likely to frequently read with their children between ages 6-9. These significant correlations suggest that our preferred measure of parental involvement (between ages 6-9) is a proxy for parental involvement at earlier ages. Moreover, a sensitivity analysis is conducted in table 6 that distinguishes between mothers' reading to/with children during all three age ranges using data on the 1984 and 1985 birth cohorts only.

reads to child between ages 6-9" that equals one if the mother reported reading to the child more than once per week (i.e, three times per week or everyday), and zero otherwise. The average is used when two years of data are observed.[7] Column 1 of table 2 shows that 35% of child respondents were frequently read to by their mother between ages 6 and 9. In a sensitivity analysis we also adopt a more nuanced measure of reading frequency that splits the non-frequent readers into "rare" (i.e., never or several times per year) and "occasional" (i.e., several times per month or once per week) groups. Column 1 of table 2 shows that "occasional" is the most common level of parental involvement.

Columns 2 and 3 of table 2 compare the average levels of parental involvement received by children who failed to complete high school to that received by children who earned a four-year college degree. Columns 4 and 5 provide a similar comparison based on mothers' educational attainment. In each case, better educated children and parents were significantly more likely to experience frequent parental involvement. These descriptive results motivate the subsequent regression analyses that seek to better understand the potential for parental involvement to explain the intergenerational transmission of education.

4. Results

4.1 Main Results

The models estimated in table 3 investigate the relationship between mothers' and children's years of schooling and are the preferred baseline specifications. The simple regression estimated in column 1 shows a strongly significant IEC of 0.35, which is consistent with existing

[7] For example, the mother of a child who was 6 years old in 1986 could report reading to the child once a week (6) in 1986 and everyday (8) in 1988. The average of these scores (7) would translate to a value of one for the "frequently reads to child between ages 6-9" binary indicator.

estimates of this descriptive parameter (e.g., Hertz 2007). The model estimated in column 2 corresponds to equation (2) and extends the simple regression to include a standard set of socio-demographic controls (e.g., Haveman & Wolfe 1995) including mother's age at birth, marital status, and household income; the child's gender, race, ethnicity, birth order, and number of siblings; and a full set of child birth-cohort fixed effects. Adding these covariates to the years-of-schooling regression reduces the estimated coefficient on mother's schooling by about 30% to 0.24, which remains strongly significant. The estimated coefficients on the controls are of the expected sign and consistent with the existing literature (e.g., Black, Devereux, & Salvanes 2005; Cameron & Heckman 1999; Ellwood & Kane 2000).

The models estimated in columns 3 and 4 of table 3 enrich the specification of column 2 by conditioning on parental involvement (the **p** in equation (1)), home environment, and mothers' AFQT scores (a proxy for cognitive ability). These variables enter the model estimated in column 3 linearly. These additional controls further reduce the estimated coefficient on mother's schooling by about 30%. The estimated coefficient on "frequently reads" is indistinguishable from zero, perhaps because it is highly correlated with the other markers of socioeconomic status in the model or because parental involvement is endogenous in the sense that parents respond to difficulties by increasing their involvement.

The estimates reported in column 4 of table 3 correspond to the baseline estimating equation specified in equation (1), which generalizes the specification of column 3 to allow the intergenerational persistence of educational attainment to vary by the level of parental involvement. Interestingly, including this interaction reduces the IEC by almost 50%. The "mother frequently reads" interaction is statistically significant and relatively large in magnitude, however, suggesting that the well-known correlation between mothers' and children's years of

schooling is at least partly driven by the more stimulating home environments provided by better-educated mothers. Specifically, the estimated coefficients in column 4 on the "mother frequently reads" interaction term and the mother's years of schooling variable sum to 0.26, indicating that the intergenerational persistence of education for "frequently involved" mothers is more than twice as large as that for less involved mothers.

4.2 Heterogeneity

As discussed in section 2, there are a number of reasons why the mechanism through which educational attainment is transmitted across generations might vary by household income, child's gender, household structure, and mother's age at birth. Accordingly, we investigate these potential sources of heterogeneity in table 4 by estimating the baseline specification of column 4 of table 3 separately by household income, mother's marital status, and whether the mother was a teenager at the time of birth. Columns 1 and 2 of table 4 estimate the baseline specification for households below and above the median household income, respectively.[8] As in the main results reported in column 4 of table 3, the by-income results in table 4 yield estimated coefficients on mothers' schooling that are noticeably smaller than the schooling-frequently reads interaction terms, as the estimated interaction effects of 0.22 and 0.15 are similar in magnitude to that in column 4 of table 3. However, the schooling-frequently reads interaction term is smaller in column 2, the subsample of households with incomes above the median.[9] This suggests that there

[8] The median weighted household income in the analytic sample is $52,676 in 2008 dollars.
[9] The sample was divided by the weighted household income median. The un-weighted sample size is larger for households below the median income both because low-income individuals were oversampled and birthrates were higher in low-income households during this time period. Estimating the model by household income quartiles yields qualitatively similar results that are imprecisely estimated, perhaps due to some combination of small sample sizes and a lack of variation in mothers' schooling by parental involvement within household income quartiles.

is a slight income gradient in how mother's involvement affects the intergenerational transmission of education. Put differently, the difference in the intergenerational persistence of educational attainment between more and less involved parents is marginally larger in less affluent households than in more affluent households. Columns 3 and 4 of table 4 estimate the baseline specification separately for children whose parents were continuously married through childhood, and children whose parents were not, respectively. The relationship between married mothers' and children's years of schooling operates entirely through the schooling-frequently reads interaction effect. However, the relationship between mother's and children's educational attainment is weaker when the mother was not continuously married during childhood and does not vary by mothers' levels of involvement. This is perhaps the result of married mothers having more non-work time in which to read to children and college-educated mothers providing high-quality reading opportunities. Similarly, the rigid work schedules of single mothers may restrict their ability and time with which to read to children, regardless of education level.

Finally, columns 5 and 6 of table 4 estimate the baseline specification separately for children born to teenage mothers and children born to older mothers. Interestingly, for teenage mothers, the intergenerational transmission of education is almost entirely driven by those who frequently read to their children. For mothers who were at least 20 years old at the time of giving birth, like in the full analytic sample, the "mother frequently reads" interaction is statistically significant and indicates that the intergenerational persistence of education for "frequently involved" mothers is about twice as large as that for less involved mothers.

4.3 Sensitivity Analysis

The main results presented in sections 4.1 and 4.2 provide evidence that the intergenerational persistence of educational attainment is at least partly, and for some demographic groups entirely, driven by the parental involvement of college-educated mothers. In this section we probe the robustness of this general result. Table 5 reports estimates of models that replace mother's years of schooling with binary indicators of "highest degree attained" and replace child's years of schooling (the dependent variable) with a binary indicator equal to one if the child earned a four-year college degree, and zero otherwise. These models are otherwise identical to the preferred specifications reported in table 3. These specifications allow for nonlinearities in the intergenerational transmission of educational attainment created by "sheepskin effects" associated with diplomas and degrees (e.g., Hungerford & Solon 1987). We estimate linear probability models to facilitate the interpretation of interaction effects.

Generally, the estimates reported in table 5 reinforce the findings from the preferred baseline specifications of table 3. Specifically, column 1 of table 5 shows a clear gradient in the probability that children complete a college degree by mother's degree attainment. For example, children of college-educated mothers are 38 percentage points more likely to earn a four-year degree than the children of high-school dropouts. Again, column 2 shows that conditioning on basic controls cuts this effect in half, while column 3 shows that additionally controlling for parental involvement, home environment, and mother's cognitive ability further reduces, but does not eliminate, the significant association between mothers' and children's college attainment. Finally, column 4 shows that the intergenerational transmission of college degrees is entirely driven by college-educated mothers who frequently read to their children. Together, the results reported in table 5 suggest that the main results are robust to the definition and functional form of educational attainment and provide more nuanced evidence that observed relationships

between parental involvement and the intergenerational transmission of education are largely driven by the behavior of college-educated parents.

Finally table 6 conducts a battery of sensitivity analyses that assess the robustness of the main results to the coding of the parental involvement variable. Column 1 reports the baseline estimates from column 4 of table 3 to facilitate comparisons. Columns 2 and 3 of table 6 extend the baseline model to account for potentially confounding omitted variables. Specifically, a critique of the results presented thus far is that they could be driven by other, unobserved dimensions of heterogeneity in the relationship between mothers' and children's education that are correlated with the frequency with which parents read to children. For example, it could be that college-educated parents who read more often to their children also have systematically richer and more stimulating home environments, or that such parents devote more resources to children's experiences during summer vacation. The models estimated in columns 2 and 3 address each of these concerns by augmenting the baseline model to include interactions between mother's schooling and the home environment index and children's summer activities, respectively.[10] The home environment index and summer activity interaction terms are positive, but only the former is statistically significant. However, it is small in magnitude, and the "frequently reads" interaction term remains similar in magnitude and statistically significant. This reinforces the main finding that a significant portion of the intergenerational persistence of

[10] The summer activity questions ask whether children ages 10 to 12 read during summer vacation or participated in organized summer activities in the 1992, 1994, 1996, and 1998 CYA surveys. Children were unlikely to be asked these questions in more than one year, so these variables are collapsed into binary variables that indicate whether the child ever reported participating in either summer activity. There is substantial variation in participation in both summer activities: about 60% of children aged 10-12 reported reading and participating in organized activities during at least one summer vacation. Appendix table A.1 shows a significant drop in sample size, which is due to the summer questions not being asked to the earliest cohorts of children.

educational attainment is due to high levels of parental involvement among better educated mothers. Moreover, it suggests that this result is not driven by unobserved factors related to the home environment or other parenting practices that might be correlated with the frequency with which mothers read to their children.

Column 4 of table 6 estimates a version of the baseline model that incorporates a more nuanced measure of the frequency with which mothers read to children between ages 6 and 9. The "frequent" definition remains the same, but the omitted reference category becomes "rarely reads" and an "occasionally reads" indicator and associated interaction term is added to the model. Doing so does not appreciably change the estimated coefficients on mother's education and the associated "frequently reads" interaction, which are nearly identical to those in column 1.

Finally, column 5 of table 6 augments the baseline model to distinguish between the frequency of mothers' reading to/with children at different developmental stages: 0-2 years, 3-5 years, and 6-9 years. As discussed in section 3, this analysis can only be conducted on the restricted sample of children who were born in 1984 and 1985. In addition to being a substantially smaller sample (N = 1,027), it is also a selected sample in the sense that these children were born to relatively older mothers. Nonetheless, the estimates reported in column 5 display the same qualitative pattern observed in previous analyses: the intergenerational persistence of educational attainment is about twice as strong in households in which the mother frequently read to children. However, this effect primarily loads on parental involvement early in children's lives (0-2 years of age); the interaction terms for involvement at older ages are imprecisely estimated. This is intuitive, as parental involvement and child development at these early stages is particularly important (Duncan et al. 2010; Waldfogel et al. 2015). It also suggests that the main results, which rely on parental involvement between ages 6 and 9, might be driven

by parental involvement that is relatively persistent throughout childhood. Nonetheless, the results presented tables 5 and 6 show that the general finding that the intergenerational transmission of education is influenced by the frequency with which highly-educated mothers read to/with their children is robust to a variety of reasonable model specifications and is unlikely to be driven by unobserved parental behaviors or household characteristics that are correlated with parental involvement.

5. Conclusion and Discussion

Using rich data from the NLSY79, the current study investigates the role that parental involvement plays in the intergenerational transmission of education. Controlling for additively separable terms in parental involvement in a standard intergenerational mobility model does not significantly change the intergenerational education coefficient in a model that conditions on basic demographic and socioeconomic variables. However, strongly significant interaction effects of mothers' schooling with the frequency with which mothers read to/with children suggest that part of the IEC may be influenced by the children of better-educated mothers experiencing richer and more stimulating home environments. This finding is stronger in married households and those with a teenage mother. For married households, this suggests these households have the time and financial resources necessary to provide children with some combination of more and higher-quality experiences outside the traditional school day. For teenage mother households, this is at once encouraging and challenging, given that they may have relatively less time and lower financial resources. On average, teenage mothers are more likely to be unmarried (Horn & Sawhill 2001), have lower income (Fletcher & Wolfe 2008), and

face difficult employment arrangements (Bianchi 2000; Bianchi & Robinson 1997; Johnson et al. 2010).

The NLSY79 data used in the current study are well suited for the analysis, as they contain rich data on mother's involvement. However, these data are not without limitations. Importantly, the CYA data on maternal involvement may be subject to social desirability bias, as some parents may over-report the frequency of socially desirable activities such as reading to children. Retrospective 24-hour time diaries of either children's or parent's time use would likely provide more accurate measures of parental involvement (Juster & Stafford 1991). Additionally, it would be beneficial to perform similar analyses of subsequent generations and cohorts, as the mechanisms through which education is transmitted across generations may change over time. For these reasons, similar analyses of the Panel Study of Income Dynamics' (PSID) Child Development Survey (CDS) may prove fruitful, as the PSID covers more recent cohorts and the CDS module contains time diaries.[11]

While the IEC is a descriptive parameter, a related caveat concerns the likely endogeneity of parental involvement. For example, college-educated mothers who frequently read to their children may be doing other things or may possess other resources that drive the intergenerational transmission of education that are unobserved by the econometrician, such as employing different parenting techniques or living in select neighborhoods. As a result, the model may not fully account for the socioeconomic advantages inherited by some children (Robinson & Harris 2014). Accordingly, our study complements current and future research exploring the underlying causal mechanisms that produce adult socio-economic outcomes (Gayle et al. 2015; Heckman & Mosso 2014). Nonetheless, it seems unlikely that the observed

[11] Unfortunately the CDS does not collect summer time diaries.

differential effects of parental involvement are entirely spurious. Gould & Simhon (2011), for example, provide arguably causal evidence that the relationship between parents' and children's schooling depends on the frequency and duration of parent-child interactions. Thus, while the impact of parental involvement on the intergenerational transmission of education may be overstated in the current analysis, these behaviors likely play important roles in the process.

Our study provides preliminary support for the hypothesis that the intergenerational transmission of educational attainment is at least partially facilitated by differences in the frequency and quality of parental involvement provided by highly-educated parents (e.g., Checchi 2006; Guryan et al. 2008; Ramey & Ramey 2010). Specifically, frequent and ostensibly high-quality reading by such parents seems to drive the persistence of educational attainment and potentially worsens socioeconomic inequality. Ultimately, this study provides an additional link between literatures on parental involvement and economic mobility, and supports hypotheses put forth regarding the role of parental time and involvement in explaining educational and socioeconomic outcomes (Guryan et al. 2008; Kalil et al. 2010; Ramey & Ramey 2010). Moving forward, more research is needed to understand what, if any, additional components of parental involvement beyond frequent reading drive the IEC. The current study also leaves for future work the identification of a causal parameter for reading and other forms of parental involvement within the IEC.

For now, policy makers might consider our findings amid accounts of increasingly demanding work schedules to recommend reforms. First, some states, such as California, have adopted parental leave policies that could promote mobility by providing parents with more time for involvement in their children's lives (Han et al. 2009). Second, early child education interventions might assist parents with child care while providing children with additional

reading and adult interactions that would otherwise not occur. Targeting such policy interventions to socioeconomically-disadvantaged children may increase educational attainment and ultimately play a role in reducing the persistence of low socioeconomic status.

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Table 1: Sample Summary Statistics

Child's years of schooling (as of 2010)	12.9
Standard Deviation (SD)	(2.4)
No H.S. diploma	23.0%
H.S. diploma	30.1%
Some college	28.0%
4-year College degree	19.0%
Mom's years of schooling (as of 2010)	12.7
SD	(2.1)
No H.S. diploma	11.5%
H.S. diploma	50.5%
Some college	27.4%
4-year college degree	10.6%
Mom's age at birth	21.1
SD	(2.9)
Average household income[a]	$49,723
SD	(44,965)
Continuously married[b]	38.3%
Male	51.0%
Hispanic	10.5%
Black	26.4%
Siblings	2.9
SD	(1.3)
Birth Order	1.6
SD	(0.8)
HOME index (percentile)[c]	71.8
SD	(22.1)
Birth Cohort	
1976	3.7%
1977	5.8%
1978	6.2%
1979	8.3%
1980	7.3%
1981	11.9%
1982	13.8%
1983	12.4%
1984	14.6%
1985	15.9%

Notes: N = 3,208 children of 2,031 mothers. Means and SD are weighted to account for unequal probabilities of sample selection. a) Household income is child's average household income from birth to age 18, deflated to 2008 dollars. b) Continuously married is a child-specific binary indicator equal to one if the mother was continuously married from the child's birth through age 18, and zero otherwise. c) HOME index scores the "quality" of household environment along multiple dimensions. Percentile refers to the household's place in the distribution of this index.

Table 2: Mothers' Reading Frequency by Educational Attainment

		Child's Attainment		Mom's Attainment	
	All	No H.S.	College	No H.S.	College
	1	2	3	4	5
Mom rarely read to child (less than once per week)	17.5%	20.0%**	14.8%	28.8%***	9.8%
Mom occasionally read to child (about once per week)	47.4%	48.8%*	42.4%	39.4%	45.9%
Mom frequently read to child (more than once per week)	35.1%	31.2%***	42.8%	31.8%***	44.3%
N (Moms, unweighted)	2,031	643	436	237	218
N (Children, unweighted)	3,208	818	508	436	316

Notes: All means were computed using sampling weights that account for unequal probabilities of sample selection. ***, **, and * indicate statistically significant-mean differences between columns 2 and 3, and between columns 4 and 5, at 0.01, 0.05, and 0.1 confidence levels, respectively.

Table 3: Child's Years of Schooling Regressions (OLS)

	(1)	(2)	(3)	(4)
Mom's years of schooling (S)	0.35	0.24	0.16	0.10
	(0.03)***	(0.03)***	(0.03)***	(0.03)***
Mom frequently read to child			-0.05	-0.18
			(0.10)	(0.11)*
S*Mom freq. read to child				0.16
				(0.05)***
HH income		0.00	0.00	0.00
		(0.00)***	(0.00)***	(0.00)***
Age at birth		0.10	0.09	0.09
		(0.02)***	(0.02)***	(0.02)***
Cont. married		0.87	0.68	0.66
		(0.12)***	(0.12)***	(0.12)***
Male		-0.81	-0.77	-0.77
		(0.09)***	(0.09)***	(0.09)***
Hispanic		-0.20	0.04	0.02
		(0.13)	(0.13)	(0.13)
Black		-0.02	0.36	0.35
		(0.11)	(0.12)***	(0.11)***
Siblings		-0.00	0.01	0.01
		(0.04)	(0.04)	(0.04)
Birth order		-0.39	-0.33	-0.33
		(0.07)***	(0.07)***	(0.07)***
HOME Index (percentile)			0.01	0.01
			(0.00)***	(0.00)***
Control for AFQT score	No	No	Yes	Yes
Birth-cohort fixed effects	No	Yes	Yes	Yes
Adjusted R^2	0.09	0.21	0.23	0.24

Notes: N = 3,208 children of 2,031 mothers. Parentheses contain standard errors clustered at the mother (family) level. "Frequently reads" is a binary indicator equal to one if the mother read to the child 3 or more times per week between ages 6 – 9. All regressions are weighted to account for unequal probabilities of sample selection. ***, **, and * indicate 2-tailed *p*-values below 0.01, 0.05, and 0.1, respectively.

Table 4: Heterogeneous Child's Years of Schooling Regressions (OLS)

	Household Income		Mother's Marital Status		Mother's Age at Birth	
	Below median	Above median	Married	Non-married	Teen (< 20)	Not Teen (≥ 20)
	(1)	(2)	(3)	(4)	(5)	(6)
Mom's schooling (S)	0.08	0.12	0.01	0.16	0.06	0.13
	(0.04)**	(0.05)**	(0.06)	(0.03)***	(0.05)	(0.04)***
Mom freq. read	-0.07	-0.28	-0.32	-0.17	-0.21	-0.18
	(0.13)	(0.17)	(0.20)	(0.12)	(0.17)	(0.14)
S*Mom freq. read	0.22	0.15	0.30	0.05	0.21	0.14
	(0.06)***	(0.07)**	(0.07)***	(0.05)	(0.08)***	(0.05)***
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Birth-cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.131	0.198	0.228	0.173	0.176	0.253
N (Moms, unwtd.)	1,079	999	663	1,396	969	1,542
N (Kids, unwtd.)	1,748	1,460	1,042	2,166	1,166	2,042

Notes: Parentheses contain standard errors clustered at the mother (family) level. "Frequently reads" is a binary indicator equal to one if the mother read to the child 3 or more times per week between ages 6 – 9. All regressions are weighted to account for unequal probabilities of sample selection and condition on the full set of statistical controls. ***, **, and * indicate 2-tailed *p*-values below 0.01, 0.05, and 0.1, respectively. The median weighted household income in the analytic sample is $52,676 in 2008 dollars. Married refers to mothers who were married continuously throughout child's first 18 years.

Table 5: Probability of Child Earning College Degree (LPM)

	(1)	(2)	(3)	(4)
Mother's Highest Degree				
No HS Diploma	Omitted			
HS Diploma	0.08	0.02	-0.02	-0.02
	(0.02)***	(0.02)	(0.02)	(0.02)
Mom reads*HS				0.03
				(0.04)
Some College	0.18	0.10	0.03	0.02
	(0.02)***	(0.02)***	(0.03)	(0.03)
Mom reads*Some college				0.03
				(0.05)
College Degree	0.38	0.23	0.14	0.03
	(0.04)***	(0.04)***	(0.04)***	(0.05)
Mom reads*College				0.29
				(0.07)***
Mom frequently read to child			0.01	-0.04
			(0.02)	(0.03)
HOME Index (percentile)			0.01	0.01
			(0.00)***	(0.00)***
Control for AFQT score	No	No	Yes	Yes
Socio-Demographic Controls	No	Yes	Yes	Yes
Birth-cohort FE	No	Yes	Yes	Yes
Adjusted R^2	0.07	0.15	0.16	0.17

Notes: N = 3,208 children of 2,031 mothers. Parentheses contain standard errors clustered at the mother (family) level. "Frequently reads" is a binary indicator equal to one if the mother read to the child 3 or more times per week between ages 6 – 9. All regressions are weighted to account for unequal probabilities of sample selection. ***, **, and * indicate 2-tailed *p*-values below 0.01, 0.05, and 0.1, respectively.

Table 6: Sensitivity Analyses

	(1)	(2)	(3)	(4)	(5)
Mom's schooling (S)	0.10	-0.05	-0.13	0.10	0.14
	(0.03)***	(0.06)	(0.10)	(0.04)**	(0.05)***
Mom frequently read (6-9)	-0.18	-0.17	-0.27	-0.24	-0.03
	(0.11)*	(0.11)	(0.14)*	(0.14)*	(0.17)
S*Mom frequently read (6-9)	0.16	0.13	0.12	0.17	0.08
	(0.05)***	(0.04)***	(0.06)**	(0.05)***	(0.07)
Mom occasionally read (6-9)				-0.21	
				(0.60)	
S*Mom occasionally read				0.01	
				(0.05)	
Mom frequently read (3-5)					0.18
					(0.21)
S*Mom frequently read (3-5)					-0.10
					(0.08)
Mom frequently read (0-2)					0.01
					(0.17)
S*Mom frequently read (0-2)					0.15
					(0.07)**
HOME Index (percentile)	0.01	-0.01	-0.02	0.01	0.01
	(0.00)***	(0.01)	(0.02)	(0.00)***	(0.00)
S*HOME Index		0.00	0.00		
		(0.00)***	(0.00)**		
Child read in summer			0.20		
			(0.12)		
S* Child read in summer			0.06		
			(0.05)		
Summer organized activity			0.22		
			(0.12)*		
S* Summer organized activity			0.02		
			(0.06)		
N (Moms, unweighted)	2,031	2,031	1,497	2,031	1,027
N (Kids, unweighted)	3,208	3,208	1,967	3,208	1,147
Adjusted R^2	0.24	0.24	0.24	0.24	0.26

Notes: The baseline estimates from column 4 of table 3 are repeated in column 1 to facilitate comparisons. All models control for AFQT scores and full sets of controls and birth cohort fixed effects. Parentheses contain standard errors clustered at the mother (family) level. "Frequently reads" is a binary indicator equal to one if the mother read to the child 3 or more times per week and "occasionally reads" is a binary indicator equal to one if the mother read to the child about once per week. 6-9, 3-5, and 0-2 refer to the child's age during which the mother read to her. All regressions are weighted to account for unequal probabilities of sample selection. ***, **, and * indicate 2-tailed *p*-values below 0.01, 0.05, and 0.1, respectively.

Appendix Table A.1: Unweighted Child's Years of Schooling Regressions (OLS)

	(1)	(2)	(3)	(4)
Mom's years of schooling (S)	0.32	0.22	0.15	0.10
	(0.02)***	(0.02)***	(0.03)***	(0.03)***
Mom frequently read to child			-0.04	-0.14
			(0.09)	(0.09)
S*Mom freq. read to child				0.15
				(0.04)***
HH income		0.00	0.00	0.00
		(0.00)***	(0.00)***	(0.00)***
Age at birth		0.10	0.09	0.09
		(0.02)***	(0.02)***	(0.02)***
Cont. married		0.78	0.61	0.59
		(0.11)***	(0.11)***	(0.10)***
Male		-0.82	-0.81	-0.81
		(0.07)***	(0.07)***	(0.07)***
Hispanic		-0.20	0.05	0.03
		(0.12)*	(0.12)	(0.12)
Black		-0.03	0.34	0.33
		(0.10)	(0.11)***	(0.11)***
Siblings		-0.04	-0.02	-0.03
		(0.04)	(0.04)	(0.04)
Birth order		-0.35	-0.30	-0.30
		(0.06)***	(0.06)***	(0.06)***
HOME Index (percentile)			0.01	0.01
			(0.00)***	(0.00)***
Control for AFQT score	No	No	Yes	Yes
Birth-cohort fixed effects	No	Yes	Yes	Yes
Adjusted R^2	0.09	0.21	0.23	0.23

Notes: N = 3,208 children of 2,031 mothers. Parentheses contain standard errors clustered at the mother (family) level. "Frequently reads" is a binary indicator equal to one if the mother read to the child 3 or more times per week between ages 6 – 9. ***, **, and * indicate 2-tailed *p*-values below 0.01, 0.05, and 0.1, respectively.

Appendix Table A.2: Missing Data Cases

Variables	Children (N)
Starting point: Educational attainment of children born in or before 1985, and of their mothers	4,002
Basic socio-demographic characteristics	3,800
Household income	3,779
Mother's AFQT score	3,779
HOME Index Percentile	3,759
Frequency with which mother read to child, aged 6-9	**3,208***
Child read during summer vacation	1,988
Child participated in organized summer activity	1,967

Notes: * indicates the main analytic sample. The large drop in sample size associated with summer activity data is largely due to children born before 1981 being dropped because the summer questions were not asked to these cohorts.

Appendix Table A.3: Child's Years of Schooling Regressions (OLS)

	(1)	(2)	(3)	(4)
Mom's years of schooling (S)	0.40	0.27	0.19	0.13
	(0.03)***	(0.03)***	(0.03)***	(0.04)***
Mom frequently read to child			-0.14	-0.30
			(0.12)	(0.13)**
S*Mom freq. read to child				0.16
				(0.06)***
HH income		0.00	0.00	0.00
		(0.00)***	(0.00)**	(0.00)**
Age at birth		0.12	0.12	0.12
		(0.03)***	(0.03)***	(0.03)***
Cont. married		0.96	0.78	0.76
		(0.14)***	(0.14)***	(0.14)***
Male		-0.75	-0.71	-0.71
		(0.11)***	(0.11)***	(0.11)***
Hispanic		-0.12	0.16	0.14
		(0.15)	(0.16)	(0.16)
Black		0.08	0.45	0.44
		(0.12)	(0.13)***	(0.13)***
Siblings		0.00	0.02	0.01
		(0.05)	(0.05)	(0.05)
Birth order		-0.39	-0.34	-0.34
		(0.08)***	(0.08)***	(0.08)***
HOME Index (percentile)			0.01	0.01
			(0.00)***	(0.00)***
Control for AFQT score	No	No	Yes	Yes
Birth-cohort fixed effects	No	Yes	Yes	Yes
Region of birth fixed effects	No	Yes	Yes	Yes
Adjusted R^2	0.12	0.24	0.26	0.26

Notes: N = 2,130 children of 1,463 mothers. Parentheses contain standard errors clustered at the mother (family) level. "Frequently reads" is a binary indicator equal to one if the mother read to the child 3 or more times per week between ages 6 – 9. All regressions are weighted to account for unequal probabilities of sample selection. ***, **, and * indicate 2-tailed *p*-values below 0.01, 0.05, and 0.1, respectively.