PUBLISHED IN THE EUROPEAN SOCIOLOGICAL REVIEW DOI: HTTPS://ACADEMIC.OUP.COM/ESR/ADVANCE-ARTICLE-ABSTRACT/DOI/10.1093/ESR/JCAB056/6444190

CULTURAL INPUTS AND ACCUMULATING INEQUALITY IN CHILDREN'S READING: A DYNAMIC APPROACH

Ea Hoppe Blaabæk

Department of Sociology, University of Copenhagen, Øster Farimagsgade 5, Bld. 16 DK-1014 Copenhagen K, Denmark, e-mail: ebl@soc.ku.dk

Abstract

Previous research shows that children from socioeconomically advantaged families read more than children from less advantaged homes. This paper studies how inequality in the amount that children read accumulates across childhood and the extent to which this inequality depends on the cultural inputs parents provide. Additionally the paper studies whether children's or parents' cognitive ability moderate the effect of cultural inputs. Based on a Dynamic Panel Data Model and data from the National Longitudinal Survey of Youth 1979 – Children and Young Adults Supplement, I find that the amount that children read depends on both the cultural inputs they currently receive, but also on those inputs received in previous years (which shaped how much they read in previous years). This cross-time accumulation, coupled with a socioeconomic gradient in the levels of cultural inputs parents provide, leads to growing inequality in children's reading. I do not find that cultural inputs are more effective in encouraging children with higher ability or children of mothers with higher ability to read more.

Declarations of interest None

Keywords Reading, Cultural Inputs, Inequality, Accumulation, Dynamic panel data model

Acknowledgments This paper has been presented at the 2019 RC28 Spring Meeting at the University of Frankfurt and at research seminars at the University of Copenhagen. The research leading to the results presented in this paper has received funding from the VELUX Foundations (Grant No. 00017000). I would particularly like to thank Mads Meier Jæger, Merlin Schaeffer and Richard Breen for comments on previous versions of the paper.

Introduction

The 2019 National Assessment of Educational Progress (NAEP) shows that 34 percent of fourth graders in the U.S. do not read at the basic achievement level and that this number is even higher (47 percent) for children from disadvantaged families (U.S. Department of Education, 2019). Similarly, PISA data provide evidence for stark socioeconomic status (SES) differences in reading achievement across OECD countries (Schleicher 2019). These inequalities are important because research shows that "*skills beget skills*" so that early SES gaps in reading skills will likely lead to increased SES gaps in educational performance and attainment later on (Cunha and Heckman, 2007:35). Thus, there is a clear need for understanding why children from socioeconomically disadvantaged homes struggle in terms of reading skills. Research shows that one factor affecting children's reading skills is the extent to which they read (Sullivan 2001, 2007; DeGraaf, DeGraaf and Kraaykamp, 2000; Jæger and Breen, 2016; Breinholt and Jæger, 2020). Inequality in the extent to which children read is then one potential pathway that shapes inequality in children's reading skills. This paper studies inequality in children's reading and more specific, the role of the culture to which parent's expose children throughout childhood (cultural inputs) in shaping this inequality. In its focus on cultural inputs, this paper takes inspiration from Bourdieu's (1977, 1986) theory of cultural reproduction, which argues that children who come from culturally active families have improved educational outcomes.

This paper adds to existing research by providing a conceptual framework that draws together different strands of empirical research that have previously been discussed separately. This framework enables understanding how differences in the levels of cultural inputs (e.g. taking children to museum, providing books, having a musical instrument in the home) families provide affect inequality in how much children read and how the effect thereof compounds across time. The paper highlights how a within-family process of accumulation exacerbates inequalities created by between-family differences in levels of cultural inputs. Although previous research has shown that children's cultural capital accumulates over time (Jæger and Breen, 2016), this process of accumulation has not been linked explicitly to increasing inequality. Further, this paper adds to research by studying whether the effectiveness of cultural inputs depends on children's and mother's cognitive ability. Although research has long been interested in the relationship between cognitive ability and the use of culture (Berlyne, 1971; Ganzeboom, 1982; Kaufman and Gabler, 2004; Notten et al., 2015; Sullivan, 2007), there is little research on whether children's or mother's cognitive ability moderate the effect of cultural inputs.

The basic inspiration for the conceptual framework is Bourdieu's (1977, 1986) theory of cultural reproduction which argues that parents transfer advantages to their children by providing them with more cultural inputs ("cultural capital" in Bourdieu's terminology). I draw on three strands of sociological literature to compile the framework. First, I use literature on the *intergenerational transmission of cultural consumption* to understand how parents expose children to culture (cultural inputs) and how this affects the amount that children read (van Hek and Kraaykamp, 2015; Kraaykamp, 2003). I use the concept of cultural inputs to capture both when parents actively engage children in cultural activities (e.g., taking them to museums, providing books, engaging them in hobbies) and when they passively expose children to culture in the home (e.g., musical instruments in the home and having a daily newspaper subscription). Second, I use *information processing theory* to argue there might be an SES gradient in how effective cultural inputs are in inducing children to read more. I argue that children with higher cognitive ability respond more to cultural inputs because they understand cultural activities better and derive more enjoyment from them (Berlyne, 1971; Ganzeboom, 1982; Notten et al. 2015). Similarly, children whose parents have higher cognitive ability might also achieve a stronger effect from cultural inputs as high-ability parents understand cultural activities better and are better able to motivate and engage their children in cultural activities. Third, I employ a *life-course perspective* (Potter and Roksa 2013; Georg 2016; Schiefele, Stutz, and Schaffner, 2016; Ho, Wheaton, and Baumann, 2021) and analyze childhood as a dynamic process in which inequality builds as a function of the cultural inputs parents provide throughout childhood.

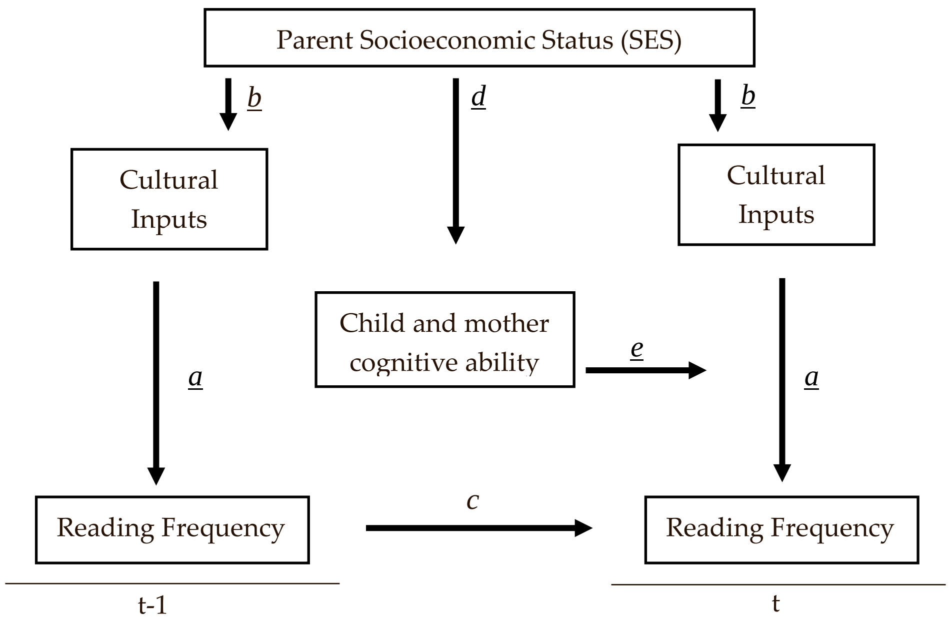
While in this paper I apply the framework to U.S. data, the conceptual framework is intended to be a general framework for understanding the relationships between reading, cultural inputs, and inequality. I therefore draw on empirical research from across national contexts to compile the framework (e.g., the U.S., the U.K., the Netherlands, and Germany). In the empirical application of the framework, I use data from the National Longitudinal Survey of Youth 1979 – Children and Young Adults Supplement (NLSY79-CYA), which includes a nationally representative sample of the U.S. population and panel data on parents' cultural inputs and how often children read. I employ a dynamic panel data (DPD) model, which is able to estimate how children's reading accumulates across childhood while controlling for between-child differences. This allows me to estimate the effect of cultural inputs while controlling for the effect of time-invariant factors (e.g., early rearing environment, socioeconomic position, and genetic predispositions) that might affect both the amount of cultural inputs parents provide and how much children read.

Applying the framework to U.S. data shows, first, that children read more when parents provide more cultural inputs, and that parents with higher income and education provide more cultural inputs. Taken together, these findings suggest that a socioeconomic gradient in cultural inputs leads to inequality in how much children read. Second, I find that how much children read accumulates across childhood: Children's reading at one point in time depends primarily on the cultural inputs provided in this period, but also on those provided in previous periods. Third, I do not find that the effect of cultural inputs depends on the children's or mother's ability. I demonstrate the framework's usefulness to understanding how inequality in children's reading grows across childhood by using linear predictions from the estimated DPD model to illustrate (a) the impact of receiving later rather than early cultural inputs, and (b) the effect of socioeconomic gradients in cultural inputs. These applications show that the dynamic accumulation of reading across childhood means it takes longer for children who start receiving cultural inputs later on to catch up. Further, accumulation across time exacerbates inequalities that socioeconomic differences create in the levels of cultural inputs. The framework and empirical findings add to a growing literature on the importance of childhood investments (and the lack thereof) to shaping inequalities between socioeconomic groups (Cunha and Heckman, 2007).

Conceptual Framework

In this section, I present the conceptual framework that consists of four main elements: (i) cultural inputs affect how much children read, (ii) parents with a high SES provide more cultural inputs, (iii) reading accumulates throughout childhood, and (iv) the heterogeneity in the effect of cultural inputs on children's reading. Fig. 1 illustrates these elements. The figure does not address all possible scenarios, but rather outlines the main effects I address in the conceptual framework.

FIG. 1. ILLUSTRATION OF FRAMEWORK



A Socioeconomic Gradient in Cultural Inputs

First, I argue that parents with a higher SES provide more cultural inputs than parents with a lower SES (*b* arrows in fig. 1). I base this argument on Bourdieu's (1977, 1986) theory of cultural reproduction, which argues that high-SES parents have more cultural resources that they transmit to their children. Consistent with this idea, empirical studies show that parents with more education and higher income provide more cultural inputs to their children, for example, by taking them to museums and the theater, reading to them, buying books for them, and investing in extracurricular activities (Dumais, 2006, 2019; O'Flaherty and Baxter, 2020; Georg, 2004; Gracia, 2015).

Cultural Inputs and Children's Reading

Second, when parents provide more cultural inputs, children read more (*a* arrows in Fig. 1). I base this argument on research on the intergenerational transmission of cultural consumption, which argues that children use more culture (e.g., read more) when parents provide more cultural inputs (van Hek and Kraaykamp, 2015; Jæger and Breen, 2016; Notten et al., 2012). Parents provide cultural inputs in two distinct ways: through cultural guidance and cultural exposure. Cultural guidance refers to parents actively engaging their children in cultural activities. For example, by taking them to museums, or encouraging participation in extracurricular activities (van Hek and Kraaykamp, 2015). Cultural guidance increases children's use of culture because it increases children's knowledge of and interest in activities, and provides them with the skills needed to participate (Banks, 2012; Notten et al., 2012; Silinskas et al., 2012). Cultural exposure refers to parents engaging in culture for their own enjoyment or providing a cultural environment in the home (e.g. books and musical instruments) and through this showing a template for desired cultural values and practices. For example, studies show that parents who read more and who report higher levels of reading enjoyment have children who read more (Klauda, 2009; Pfost, Schiefer, and Artelt, 2016).

In this paper, I study the effect of several types of cultural inputs (described in more detail in the data section below). It seems intuitive to assume that reading-related cultural inputs might have the strongest effect on incentivizing children to read more because they signal to children most directly that parents find reading to be a desired behavior. However, "crossover effects" from other types of cultural inputs are likely because they contribute to broadening children's cultural knowledge, interests, and skills, which in turn might inspire children to read more (and diversify their selection of) books. In line with this idea, Lizardo and Skiles (2015) draw on Bourdieu's theory of taste to argue that when parents expose children to culture, children develop an aesthetic disposition that enables them to appreciate not only the exact forms of culture they have been exposed to, but also a wider cultural repertoire. Empirically, Kraaykamp and Van Eijck (2010) provide evidence in favor of such "crossover effects" as parents' cultural possessions affect children's cultural behavior and vice versa.

Accumulation of Reading

Third, I argue that children's reading develops as a dynamic process in which the amount that children read in the present (i.e., time *t*) depends on how much they read in the past (i.e., time t-1; arrow *c* in fig. 1). For simplicity, Fig. 1 only illustrates two time periods: the present time period (t) and one previous time period (t-1). However, the conceptual framework assumes several consecutive time periods. This part of the framework captures the accumulation of reading across childhood and allows disentangling the extent to which children's reading frequency depends on present cultural inputs or the past accumulative effect hereof. If accumulation is present, this has the important implication that how much children read reflects the effect of both past and present cultural inputs etc.. If socioeconomic gradients in cultural inputs are present, the effects hereof will compound over time leading to increasing inequality between high and low SES children. I base this part of the framework on life-course theory that emphasizes how outcomes at one point in time depend on one's circumstances in the present, but also on the accumulation of one's previous experiences (Potter and Roksa 2013; Georg, 2016; Ho et al., 2021). This idea is also similar to the technology of skill formation proposed by Cunha and Heckman (2007:35), where they argue that "skills beget skills" as the development of new (cognitive and non-cognitive) skills builds on previously acquired skills. In line with this, and in an application similar to this paper, Jæger and Breen (2016) show that children's cultural capital accumulates through childhood. Specifically related to reading, Schiefele et al. (2016) and Stutz et al. (2016) additionally show that children's reading, reading motivation, and reading skills are dynamically related. Based on this we would expect past reading to affect present reading as increased reading in one period (e.g., due to receiving cultural inputs) leads to higher reading skills and motivation, which then dynamically reinforces more reading in the next period.

Heterogeneity in the Effect of Cultural Inputs

Fourth, I argue that cultural inputs are more effective in encouraging children to read when children have higher cognitive ability or their mothers have higher cognitive ability (arrow *e*). Further, I argue that as parents' and children's cognitive ability positively correlates with family SES (arrow *d*), this heterogeneity in cultural inputs' effects adds to inequality in how much children read (Cunha and Heckman, 2007, 2008; Gil-Hernández, 2019).

I motivate this part of the framework by drawing on information processing theory, which argues that individuals with higher ability are better at processing complex information that cultural activities provide and therefor derive more enjoyment from them (Berlyne, 1971; Ganzeboom, 1982; Notten et al., 2015). As an example, enjoying literature requires decoding skills to infer meaning from text, but also analytical and processing skills that enable understanding the work within its social, cultural, and historical context. Following information processing theory, children with higher ability have a better capacity to process cultural information. I argue that because these children are better able to understand and enjoy cultural inputs, they are more likely to respond to them by reading more. Similarly, parents with higher ability are better able to understand and appreciate cultural inputs. I argue that this mechanism increases the effectiveness of parents' inputs through improving the quality of cultural inputs. High-ability parents are better at communicating activities to their children and are better at engaging children in participating. The following case illustrates this point: Two mothers each provide their daughters with five books. The mother who is better able to understand and enjoy the books' context, nuances, and meanings is more likely to engage her daughter in the joys of reading than the mother who also encourages her child to read the books, but is not able to help her fully grasp their content.

Despite previous academic interest in the relationship between the use of cultural activities and individual's cognitive and academic abilities (e.g. Ganzeboom, 1982; Notten et al., 2015; Sullivan, 2007), there is little research on whether children's or mother's cognitive ability moderate the effect of cultural inputs.. However, the claim that the effect of cultural inputs is higher for high-ability children is in line with Covay and Carbonaro's (2010) study, which finds that extracurricular activities have a stronger effect on cognitive and non-cognitive skills for high-SES, compared to low-SES, children.

Hypotheses

Based on the conceptual framework, I present four hypotheses about the relationships between parents' SES, cultural inputs, cognitive ability, and children's reading frequency. Put together, these four elements lead to growing inequality in children's reading across childhood.

H1: High-SES parents provide more cultural inputs than low-SES parents.

H2: Children read more when parents provide more cultural inputs.

H3: How much children read accumulates across childhood.

H4: The effect of parents' cultural inputs is higher when children have higher cognitive ability and for children whose mothers have higher cognitive ability.

Data and Research Design

I use data from the National Longitudinal Survey of Youth 1979 – Children and Young Adults Supplement (NLSY79-CYA). NLSY79 is a nationally representative U.S. survey of young adults aged 14–22 when first surveyed in 1979 who have been followed since. I use information from an add-on survey (the CYA; Children and Young Adults Supplement), which has followed all children born to female participants in the original sample biannually since 1986 (CHRR 2006). This data set is particularly well-suited to test the conceptual framework because it contains panel data on the cultural inputs parents provide throughout childhood, information on how much children read, and on children's and mothers' cognitive ability. The primary analysis employs data from 1986 to 2014 on children aged 10–14 years old. I use this age restriction as the independent variables based on the Home Observation Measurement of the Environment – Short Form (HOME-SF) are only consistent within this age range. However, the analyses additionally use information on children's reading from one prior measurement (ages 8–9) as an instrument for previous reading to avoid excessive data loss (this particular question is the same for children ages 8–9 and 10–14). I do not use information from the later survey rounds as these do not have information on children's reading and math ability. All variables described below are measured once every second year for each child (with the exception of the mother's cognitive ability). Below, I first present the main dependent and independent variables I use in the analyses, then describe the main research design (dynamic panel data model) and finally present descriptive statistics.

Dependent Variable

Children's reading

The main dependent variable is the mother's answer on how often the child reads for enjoyment (1: Never, 2: Several times a year, 3: Several times a month, 4: Several times a week, 5: Daily). The question is asked as part of the HOME-SF. I rescale the variable on how often the child reads to lie in the range 0–1. The index captures a quantitative assessment of how much a child reads for enjoyment.

Explanatory Variables

Parents' cultural inputs

Cultural Guidance: To distinguish different types of cultural inputs, I construct two indicators that capture different types of cultural guidance. These constructs are: highbrow cultural inputs, and extracurricular cultural inputs. I use information from the HOME-SF assessment (the sub-test for cognitive stimulation) for both indicators of cultural guidance. Highbrow cultural inputs consist of two items (Cronbach's α: .66): How often during the last year the child was taken to a museum, and how often during the last year the child was taken to a concert or the theater.[1] I rescale both items to lie in the range 0–1, summarize them into one using PPCA, and then rescale to lie in the range 0–1. I measure extracurricular cultural inputs through two binary

[1] Appendix Table A1 show regressions where I use the theater and museum indicators rather than the highbrow index. Results are similar to the main results.

indicators: whether the child has been encouraged to take on hobbies, and whether the child currently attends any extracurricular lessons or activities.

Cultural Exposure: I measure cultural exposure with three indicators. I measure reading cultural inputs as the number of books the child has (1: None, 2: 1–9, 3: 10–19, 4: 20+; rescaled to lie in the range 0–1). Additionally, I use an indicator of whether the family subscribes to a newspaper, and whether there is a musical instrument in the home.

Children's cognitive ability

I use two different measures to capture children's cognitive ability: the Peabody Individual Achievement Test (PIAT) test score on reading recognition and the PIAT test score on math. The PIAT test is designed to measure achievement related to academic performance. Reading recognition measures skills such as matching letters, naming names, and reading single words aloud (Center for Human Resource Research [CHRR], 2006). The PIAT math score consists of 84 multiple-choice items of increasing difficulty. Children begin with questions on early skills such as recognizing numerals and progress to advanced concepts in geometry and trigonometry. While the PIAT tests more directly tests academically related abilities than broader cognitive abilities, I argue that these test scores are appropriate indicators as studies show that PIAT test scores are positively related to to broader cognitive ability tests (Wilson, and Spangler, 1974). Additionally, previous research use such academic ability tests indicators of cognitive abilities (Cunha and Heckman, 2008; Notten et al., 2015). I use the percentile ranked scores and thus measure a child's position relative to children in the same cohort at a given point in time. I recode this variable to lie in the range 0–1.

Mothers' cognitive ability

I measure mothers' cognitive ability via the mother's results from the Armed Forces Qualifying Test (AFQT). The AFQT was administered to the entire NLSY-1979 sample (age of respondents: 15–22; 94 percent participated) and include questions on arithmetic reasoning, word knowledge, paragraph comprehension, and numerical operations. I use a percentile ranked age-normalized score. I use only information on mother's (and not father's) ability because children were sampled based on their mother's participation in the original NLSY survey and the AFQT was not administered later on to partners of the original NLSY participants. In contrast to children's ability, which I model as developing over time, I treat mother's ability as time invariant because I only have one measurement hereof. I find this reasonable as studies show that cognitive ability only vary very little after young adulthood (Deary et al., 2000; Tucker-Drop, 2009).

SES

I use information on mother's highest years of education and family income (price adjusted to 1992 and then recoded into deciles) to test H1 regarding a socioeconomic gradient in parents' cultural inputs.

Dynamic Panel Data Model

As described in the conceptual framework, I study children's reading as a dynamic process. I use a dynamic panel data (DPD) model to estimate how much children read in the present as a function of parents' current cultural inputs and how much children read in the past (which depends on cultural inputs made in the past). The DPD model is similar to the more well-known, fixed-effect model in that it exploits the data's panel structure to control for the effect of unobserved time-invariant confounding (Anderson and Hsiao, 1982; Bond, 2002; Kiviet, 1995). However, it is superior to fixed-effects models in this context because it enables explicating the observations' temporal order. This allows estimating how children's reading accumulate across childhood and enables estimating the effect of cultural inputs on children's reading while holding all aspects that affected reading in the past stable.

I estimate the following DPD equation, which regresses reading frequency in the present time period (t) on children's reading frequency in the previous time period (t-1) and on parents' cultural inputs in the present time period (t) (and a vector of time-varying control variables; X) (Bond 2002). Equation (1) contains both an individual time-constant and time-varying error term.

$$Read_{i,t} = \beta_1 Read_{i,t-1} + \beta_2 Cult_{i,t1} + \beta_3 X_{i,t} + e_{i,t} + e_i \quad (1)$$

The parameter β_1 in equation 1 captures the accumulative feature of the conceptual framework: To what extent does present reading depend on present cultural inputs or the accumulation of past cultural inputs etc.? This parameter then captures the lingering effect of everything that affected reading in the past. The time-constant error term (e_i) could be removed through fixed effects. However, in this case, that would cause negative bias due to correlation between $Read_{i,\, t-1}$ and the time-varying error term. To avoid this issue, the DPD model (in the difference GMM implementation) uses first differences to remove the time-constant error term (e_i) and instruments the first-differenced lagged dependent variable ($Read_{i,\, t-1}$) with further lags of the same variable (Kiviet, 1995; Roodman, 2009).[2] I treat children's math and reading ability as predetermined (similar to the lagged dependent variable) to allow correlation between children's ability and the time-varying error term due to children's ability potentially being a function of previous reading (Schiefele et al, 2016; Stutz et al, 2016.)[3] I cluster standard errors at the family level to account for siblings nested within families (Roodman, 2009). Similar to fixed-effect models, the DPD model with GMM estimation cannot estimate (consistently) the effects of time-invariant variables because the model is based on within-individual changes through the use of first-differences (Kripfganz and Schwarz, 2015). Put differently, the model controls for, but cannot estimate the effect of, time-invariant individual characteristics such as cohort, sex, race, etc. Further, this means I do not estimate a baseline effect of mother's cognitive ability, but only whether the effect of cultural inputs differs as dependent on mother's cognitive ability (an interaction effect). I control for the following

[2] I use the stata command xtabond2 and the syntax described on page 111 in Roodman (2009) with robust standard errors.

[3] Appendix table A2 and A3 show results from alternative specifications: (a) treating no control variable as predetermined; (b) additionally treating reading inputs as predetermined, i.e., a function of previous reading; (c) using system gmm with exogenous variables as instruments in levels equation; and (d) using system gmm with exogenous variables as instruments in difference equation. Overall results are similar to the main results presented in Table 2 with the exception of some interactions with child cognitive ability being significant in specification (c) – however this implies the assumption that first-differences are not needed to interpret the effect of cultural inputs on reading as causal, which is not reasonable.

variables in the DPD model to ensure that the effect of cultural inputs on children's reading is not confounded by changes in the financial etc. resources: family income (measured in $1,000s and price adjusted to 1992), family size. I additionally control for child age, and survey year dummies to capture general age or year trends.

Descriptive Statistics

Table 1 shows descriptive statistics for (a) the entire sample of children aged 10–14 and (b) the analytical sample with no-missing information on relevant variables and information on at least one preceding time period. The symbol * indicates whether differences in means between samples are statistically significant. Although means are only slightly different, the differences are mostly statistically significant because standard deviations are small and the sample size is large. Sample a consists of 28,615 observations covering 11,477 children. Sample b consists of 4,831 observations covering 4,031 children. The large drop in sample size between sample a and b is mainly due to dropping observations through list-wise deletion, dropping all children that do have at least three observations on reading frequency (needed to instrument the lagged dependent variable) and dropping the first observation on all children (to construct first-differences).

TABLE 1. DESCRIPTIVE STATISTICS – MEAN, STANDARD DEVIATION, N, AND CORRELATIONS.

	Sample (a)			Sample (b)		
	Mean	Std. dev.	N	Mean	Std. dev.	N
Children's reading*	0.69	0.28	18,549	0.67	0.29	4,831
Highbrow cultural inputs	0.28	0.19	18,793	0.27	0.18	4,831
Reading cultural inputs	0.81	0.28	17,043	0.82	0.27	4,831
Hobby*	0.92	0.27	18,830	0.94	0.24	4,831
Extracurricular lessons*	0.63	0.48	18,826	0.66	0.47	4,831
Newspaper subscription	0.44	0.50	18,821	0.44	0.50	4,831
Instrument in the home*	0.53	0.50	18,816	0.57	0.50	4,831
Child reading ability*	0.56	0.30	17,657	0.58	0.29	4,831
Child math abilitya	0.52	0.29	17,654	0.53	0.28	4,831
Mother cognitive Ability (AFQT)*	0.37	0.28	27,199	0.41	0.29	4,831
Yearly family income in $1,000*	63.66	95.06	18,645	74.68	94.13	4,831
Family size*	2.52	1.27	22,273	2.59	1.18	4,831
Child age*	12.02	1.41	28,615	13.20	0.78	4,831
Year*	1998	6.30	28,615	2000	6.31	4,831

Note. – *The difference in means between the full (a) and analytical (b) samples are statistically significantly different at *P*<.05.

Results

In the following section, I apply the conceptual framework presented in the previous sections in an empirical analysis of U.S. data from NLSY79-CYA. First, I use descriptive distributions and linear regressions models of cultural inputs dependent on parents income and education to test H1 (SES gradient in cultural inputs). To account for the survey's sample structure, I use survey weights in these descriptive analyses.[4] Second, I use the DPD model to test H2-H4 and finally, I present results from linear predictions from the DPD model to illustrate implications of the framework on inequality in children's reading.

Heterogeneity in Cultural Inputs

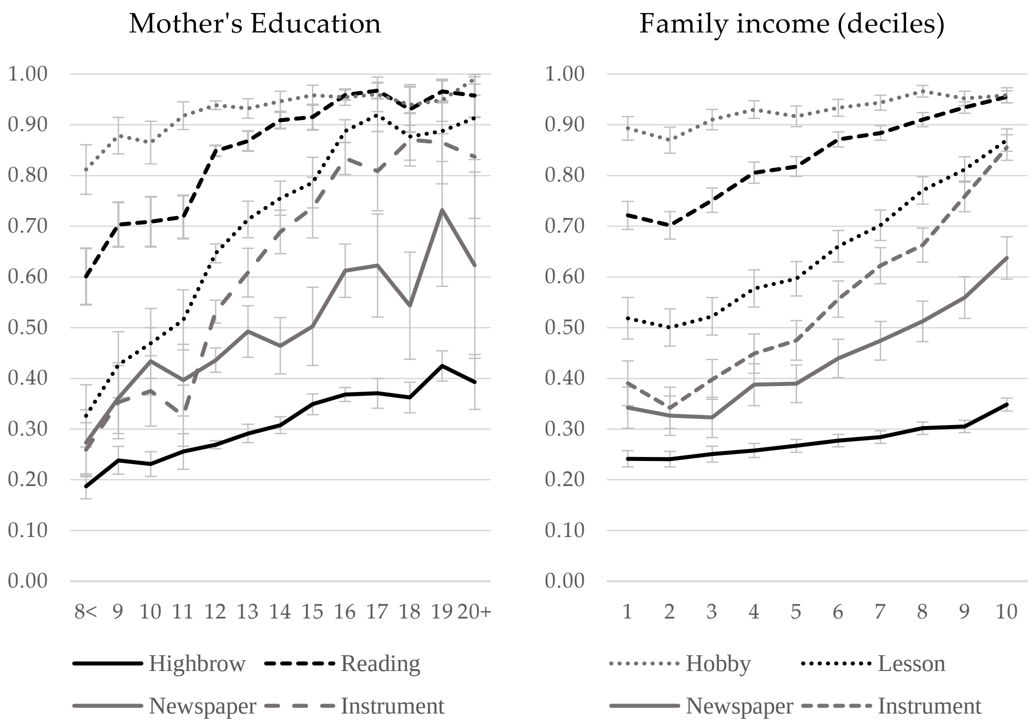
H1 states that high-SES parents provide more cultural inputs than low-SES parents. Fig. 2 shows the descriptive distributions of the average levels of cultural inputs parents provide, given the mother's education and family income (with 95% confidence interval bars). Fig. 2 shows that as parents' income and education increases, so does the amount of cultural inputs they provide. Appendix Table A4 show simple linear regressions of cultural inputs on parents' education and income. All linear trends are statistically significant.[5] Results then support H1 proposing socioeconomic gradients in parents' cultural inputs.

---

[4] The standard NLSY79-CYA survey weights do not allow aggregating information across several survey rounds. Therefore, I use customized survey weights based on child id's from the total sample (sample a in Table 2) calculated via the survey-weights program NLSY provides (https://www.nlsinfo.org/weights/nlscya).

[5] I use OLS to estimate all models – also those with a binary outcome. I choose this approach over using a logistic model to ease interpretability of parameters (Hellevik, 2009; Huang, 2019). Associations are also significant using logit models for the binary outcomes.

FIG. 2. SOCIOECONOMIC GRADIENTS IN CULTURAL INPUTS



Parents' Cultural Inputs

Hypothesis *H2* proposed a positive effect of parents' cultural inputs on children's reading frequency. Table 2 presents the main results from the DPD model estimating results related to hypothesis H2-H4. Results from Model 1 show that, conditional on whatever affected children's reading in the past, parents' cultural inputs (except for hobbies, lessons, and an instrument in the home) have a positive effect on how much children read. Thus, results support *H2:* Children read more when parents provide more cultural inputs. Combined with the previous finding of SES gradients in cultural inputs, this result suggests that heterogeneity in cultural inputs leads to inequality in how much children read. Reading cultural inputs have the strongest effect. When parents increase reading cultural inputs by 1 standard deviation (.280), children's reading frequency increases by .050 (18 percent of a standard deviation change in reading). When parents increase their highbrow and newspaper cultural inputs by 1 standard deviation (.182 and .50, respectively), children's reading increases by .022 and .010. The results then suggest that it is primarily reading-related (books and newspaper) and highbrow (museum and theater) cultural inputs that have a positive effect on how much children read.[6]

[6] With a bonferroni correction (VanderWeele and Mathur, 2019) to account for multiple hypotheses testing based on all six tested cultural inputs (α<.05/6 = α<.008), highbrow and reading cultural inputs remain statistically significant, newspaper subscription does not.

TABLE 2. RESULTS FROM DPD REGRESSIONS ON CHILDREN'S READING.

	Model 1	Model 2	Model 3
Children's reading (t-1)	.093*	.089*	.094*
	(.037)	(.038)	(.037)
Highbrow inputs	.123***	.149	.125**
	(.025)	(.095)	(.041)
Reading inputs	.180***	.161	.196***
	(.021)	(.174)	(.035)
Newspaper subscription	.020*	.014	.036*
	(.010)	(.033)	(.016)
Instrument in the home	.002	.001	.001
	(.009)	(.009)	(.009)
Hobby	.027	.027	.027
	(.016)	(.016)	(.016)
Lessons	.005	.004	.005
	(.008)	(.009)	(.008)
Child PIAT math score	.052	.461	.054
	(.038)	(.289)	(.038)
Child PIAT reading score	.025	−.421	.026
	(.058)	(.404)	(.028)
PIAT reading * Highbrow inputs		.186	
		(.182)	
PIAT reading * Reading inputs		.399	
		(.332)	
PIAT reading * News inputs		.028	
		(.048)	
PIAT math * Highbrow inputs		−.250	
		(.143)	
PIAT math * Reading inputs		−.395	
		(.263)	
PIAT math * News inputs		−.018	
		(.038)	
Mother AFQT * Highbrow inputs			−.008
			(.087)
Mother AFQT * Reading inputs			−.053
			(.087)
Mother AFQT * News inputs			−.044
			(.033)
Hansen (J) test *P* value	.370	.475	.381
N	4,831	4,831	4,831

Note. – Two-tailed tests. *P<.05, **P<.01, ***P<.001. Controls: Family income, family size, child age, and year dummies. Hansen (j) test = exogeneity of the instruments; null hypothesis of exogenous instruments. P-values above .250 suggest valid instruments (Piper, 2015).

Accumulation across Childhood

Hypothesis *H3* proposed that the frequency with which children read in the present period depends on both present inputs and the lingering effects of past inputs (through affecting previous reading). Model 1 in Table 2 shows a statistically significant and positive effect of reading in the previous period on reading in the present period. This suggests that reading does depends on not only the cultural inputs children receive in the present period, but also what shaped reading in the past (among the past cultural inputs). This result supports *H3* and has important implications for how to interpret the short- and long-term effects of parents' cultural inputs on children's reading. The coefficient on past reading provides information on the extent to which the present is shaped by long- or short-term shocks (Piper, 2015). The coefficient from Model 1 (β = .093*) indicates that approximately 91 percent of the variation in how much children read is determined by what has happened since the last measurement 2 years prior (e.g., cultural inputs). Thus, while children's reading does accumulate over time, the substantial part of how much children read depends on what happens in the current period (e.g., current cultural inputs). The coefficient on the lagged dependent variable can also be used to calculate the total of long- and short-term effects. As an example, the total effect of parents' reading cultural inputs is calculated by dividing the estimate from model 1 by 1-the effect of reading^{t-1} [.180/(1-.093)= .198] of which the majority (.180) is the effect of present reading cultural inputs, while about 9 percent (.018) is due to a long-term effect of reading inputs provided in previous years (through the effect these had on reading in previous years). The estimate also suggests that the effect of cultural inputs "depreciate" over time, but continue to affect how much children read for about 4 years (two periods in the data) after they are given.

Heterogeneity in the Effect of Cultural Inputs

Children's Cognitive Ability

Hypothesis *H4* proposed that the effect of cultural inputs is higher when children have higher cognitive ability and when their parents have higher cognitive ability. In Model 2, I add interaction effects between children's cognitive ability (reading and math test scores) and the three types of cultural inputs that in Model 1 had a significant effect on children's reading. [7] Model 2 shows no significant interaction effects between children's ability and parents' cultural inputs. Hence, when children have higher ability, they do not achieve a higher return to any type of cultural input. In the supplementary analysis, I have tested models where I include the interactions, one by one, to increase power, but all interactions remain statistically insignificant (results are available upon request).

[7] I have also tested models that include interactions with all of the cultural input variables, and only one out of eighteen tested interactions was statistically significant. With a bonferroni correction accounting for multiple hypothesis testing (α<.05/18 = α<.003), none of the interactions with the children's ability were statistically significant. (VanderWeele and Mathur, 2019). Results are available upon request.

Mother's Cognitive Ability

In Model 3, I include interactions between parents' cultural inputs and mother's cognitive ability and find no significant interaction effects. Thus, the results do not support the hypothesis that high-ability mothers are more efficient in influencing their children to read more when they provide cultural inputs. As none of the hypothesized interaction effects were significant, results overall show no support for *H4*. Cultural inputs are not more efficient in encouraging children to read more when children have higher ability or have mothers with higher ability.

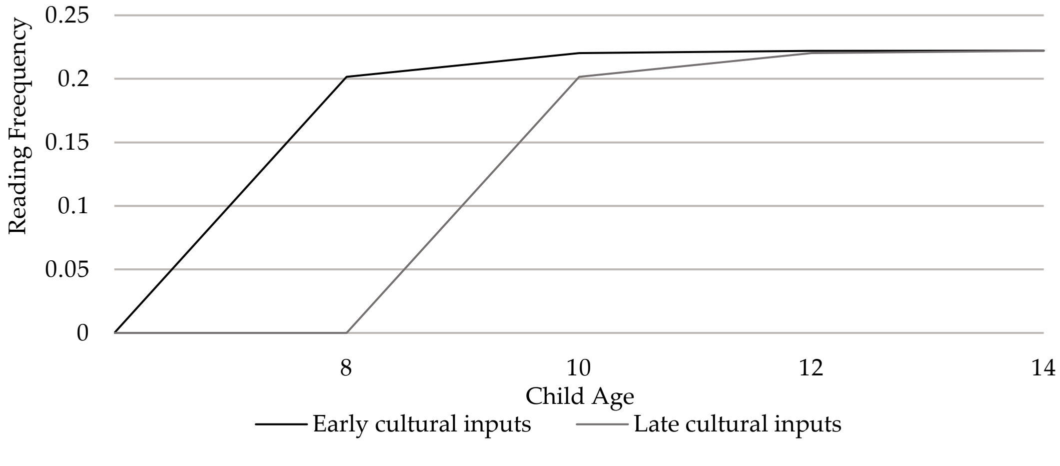
Illustrating Implications of the Conceptual Framework

In this section, I show two ways in which the conceptual framework can be used to understand how parents' cultural inputs affect inequality. First, I show that the timing of parents' cultural inputs matters. Second, I show that the accumulation of the cultural inputs' effect across childhood increases inequality in children's reading. All illustrations below are simple linear predictions based on Model 1 from Table 2.

Timing of Cultural Inputs

This first application illustrates how accumulation of reading impacts the importance of *when* cultural inputs are made. Fig. 3 shows predicted values of reading frequency at the mean levels of reading, highbrow, and newspaper cultural inputs based on Model 1 in Table 2. The only aspect that varies between the two predictions are when cultural inputs start (here ages 8 and 10). Hence, for simplicity, this illustration assumes no change in the amount of cultural inputs parents provide across time (and does not incorporate age effects, average changes in family size, family income, etc.). Thus, Figs. 3 and 4 illustrate the impact of cultural inputs on increasing how much children read, and not the marginal effect at the mean level of income, education, family size, etc. Fig. 3 shows that given a 2-year gap in when parents start providing cultural inputs, the child receiving later inputs does not catch up to the child receiving early inputs until after 4 years. This result is due to the accumulative effect estimated in Model 1. Reading at age 10 in the black line is .019 points higher (7 percent of the standard deviation change in reading) than in the gray line due to a lingering effect of the cultural inputs received at age 8 (which led to higher reading at age 8). The figure also shows that after two time periods (4 years in total), children settle at a new (higher) steady-state level of reading frequency, which allows children receiving later inputs to catch up. This result arises because the inputs provided three or more time periods ago are no longer affecting children's present reading behavior.

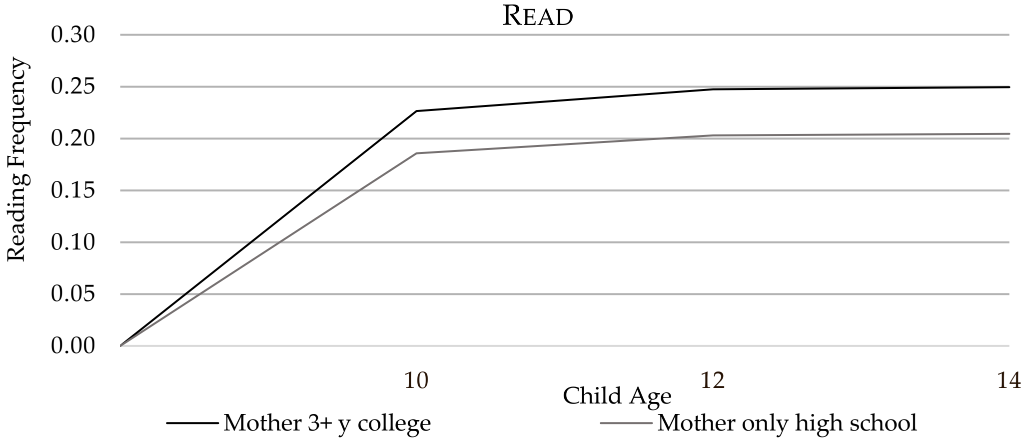
FIG. 3. CHILDREN'S READING FREQUENCY - TIMING OF CULTURAL INPUTS



Growing Inequality due to Differences in Levels of Cultural Inputs

The second application focuses on the impact of heterogeneity in the amount of cultural inputs parents provide. All lines in Fig. 4 are predictions at different levels of cultural inputs based on Model 1 in Table 2. Again, for simplicity, Fig. 4 assumes no change across time in the levels of cultural inputs the two family types provide.

FIG. 4. ACCUMULATING INEQUALITY IN HOW MUCH CHILDREN READ



The gray line represents a child with a mother whose highest education is a high school degree (or less) and who provides a mean level of cultural inputs (for this type of mother). Similarly, the black line represents the child of a mother with at least 3 years of college (who also provides a mean level of cultural inputs [for this type of mother]). First, due to the positive effect of cultural inputs, differences in levels of cultural inputs leads to differences in how much children read. In this application, the difference of .041 at age 10 is equivalent to about 15 percent of one standard deviation change in children’s reading frequency. Although the majority of the difference between the two predictions in Fig. 4 is due to differences in levels of cultural inputs, an important takeaway from this figure is that despite no change in the level of cultural inputs across time, the predicted difference in reading frequency does grow by 10 percent from .041 to .046. Had there been no accumulation across time, this difference would be stable, assuming no change in the amount of inputs parents provide across time.[8]

A limitation of this study and the illustrations above is that it is difficult to interpret the substantive importance of changes in a 0–1 scale on reading frequency. To "anchor" the results, I have estimated the impact that the difference in reading frequency from Fig. 4 might have on a more tangible outcome – in this case children's later educational attainment. I do this by using a sibling fixed-effect model (see Appendix Table A5) to estimate the effect of children's reading frequency at age 14 on their final educational attainment (age 26+). Results from this model suggest that the predicted difference in reading at age 14 from fig. 4 leads to a difference of .033 years of completed schooling[9] (or the equivalent of increasing children's reading ability at age 14 by 15 percent of one standard deviation[10]).

---

[8] Appendix Fig. A1 shows that also taking into account information about varying levels of cultural inputs at different ages leads to additional predicted inequality (growing by 30 percent from .039 at age 10 to .050 at age 14). Average inputs in the sample are generally higher at lower ages and the gap between the groups is higher for older children.
[9] Reading frequency difference (.046) * the effect of reading frequency on educational attainment (.727) = .033
[10] .033 / (Standard deviation reading ability at age 14 [.288] * effect of reading ability on educational attainment [.753]) = .15

Discussion

This paper studies whether parents' cultural inputs, and the effectiveness of these, affects (inequality in) how much children read. I propose a conceptual framework that ties together key empirical findings from previous research to argue that a socioeconomic gradient in the amount of cultural inputs parents provide, and in the effectiveness of these inputs, together lead to growing inequality in how much children read across childhood.

The conceptual framework I propose is intended to be general (pending empirical validation), and in this particular paper, I apply it to U.S. data from the NLSY79-CYA. I present four main findings: First, there is a socioeconomic gradient in the amount of cultural inputs parents provide. Second, cultural inputs have a positive effect on how much children read. Third, accumulation of the effect of cultural inputs' across childhood leads to growing inequality in children's reading. Fourth, and finally, I do not find that the impact of cultural inputs depends on children's or mother's cognitive ability. As the empirical results suggest no support for the information processing theory hypotheses, the results are in line with previous research suggesting a simple additive effect of cultural inputs such as e.g. the dynamic model of cultural reproduction proposed by Jæger and Breen (2016). However, the framework presented in this paper expand upon previous research by explicitly incorporating the unequal distribution of cultural inputs. Combining the results regarding SES gradients in levels of cultural inputs with the results from the DPD model, I show that linear predictions suggest that inequality in how much children read will grow across childhood (by 10 percent in the given illustration) – Even if one assumes a stable difference between children of more and less educated mothers in the levels of cultural inputs. This growth in inequality is due to the effect of cultural inputs accumulating across childhood.

A set of limitations of the empirical application of the conceptual framework relates to the measurement of cognitive abilities. First, the data set only includes information on the cognitive ability of the mother (and not the father). I find this approach reasonable as previous research shows that women are more culturally active than men, and hence more likely to be the ones exposing children to cultural inputs (Christin 2012). Additionally, due to assortative mating and a positive association between parents cognitive ability, the mother's ability indicator will also indirectly capture an association with fathers' ability (Luo, 2017). Further, one explanation for the insignificant interaction between mother's ability and the effect of cultural inputs could be that skills more closely related to the items in questions (e.g. reading skills or knowledge of theater and art) are more important to encouraging children to read more than parents' basic cognitive abilities. I cannot test such a distinction in this application as I do not have information on e.g. reading skills or cultural knowledge of parents. However, if true, this result would be more in line with the interpretation that it is parents cultural capital (and the specific skills and competencies this enable) which matter to the effectiveness of cultural inputs than their basic cognitive abilities (as implied by information processing theory). In contrast, for children the empirical measures are actually closer to such context-specific skills, and still, I do not find that children with higher reading skills are more likely to read more, when parents provide cultural inputs such as access to books and newspapers. An additional limitation is that due to limited information on how parents engage children in cultural activities, a clear-cut empirical distinction between cultural guidance and exposure cultural inputs is not possible. E.g. the indicator on the number of books children have is presented as cultural exposure as it is part of the "passive" cultural environment in the home. However, giving books to children could also be understood as actively engaging children in reading (and hence more of a *guidance* indicator). In any, books in the home and engaging children in reading are probably positively correlated, which means the variable will proxy the effect of both.

A promising avenue for further research is to extend the framework to incorporate a broader set of (cultural) inputs and outcomes. In terms of *inputs*, the present tests and framework focus on transmission within the family, but the framework easily could be extended to incorporate effects of cultural inputs from a wider array of sources, e.g., schools or cultural institutions in the neighborhood. This would allow the framework to look beyond the cultural transmission that occurs within the immediate family to processes that include the neighborhood, school, or social contexts in which the children live. Such an approach would also be interesting in a comparative perspective, where one could speculate that countries with strong (and well-funded) public schooling systems might buffer some of the inequality found in this U.S. context (by providing more cultural inputs within schools). The framework could also be extended to incorporate other theoretical mechanisms through which parents might affect (inequality in) how much children read—for example, whether the particular timing of cultural inputs matters or whether the return to cultural inputs might depend on families' socioeconomic status. Within the age range (10-14) of this study, there does not seem to be evidence of "sensitive periods" in which cultural inputs are particularly important (results are available upon request). By incorporating effects of early (cultural) inputs, the framework could possibly further the understanding of how building the early groundwork for cognitive and non-cognitive skills might impact children's later reading behavior (Cunha and Heckman, 2007, 2008). In terms of SES dependent effects of cultural inputs, one could draw on the cultural mobility thesis by DiMaggio (1982) to propose a higher return to cultural inputs among low SES families. This paper shows how the accumulative effect of cultural inputs on children's reading leads to increasing inequality. In contrast, an extension of the model along the lines of the cultural mobility thesis implies that a higher return to cultural inputs among low SES families could counteract some of the inequality identified in this paper. Exploring such potential heterogeneous treatment effects is an important avenue to further understand the mechanisms that combine to in- or de-crease patterns of inequality in children's reading.

In terms of *outcomes*, the NLSY79-CYA data does not enable testing whether the framework applies equally well to cultural activities beyond reading. Comparing the framework's applicability to other cultural outcomes could improve the understanding of how inequality in children's cultural capital more generally arises. The results from this paper show a certain symmetry between input and outcome (a stronger effect of reading-related cultural inputs on reading frequency). This could potentially indicate that for different cultural outcomes, cultural inputs that are more tightly related to these outcomes might matter more, e.g., musical instruments might be important to musical preferences, and access to hobby and art materials might be more important to visual arts interest. If this is the case, it would indicate that different cultural inputs are needed to increase different components of children's cultural capital. Recent evidence which shows that different components of cultural capital affect children's educational success through different mechanisms, suggests that disaggregating the effect of cultural capital indicators is important to understand which mechanisms lead to culturally active children (Mikus, Tieben and Shober, 2020). I.e., are some cultural inputs effective across the board or do the inputs' effectiveness vary across cultural outcomes? Although such a distinction is theoretically important, children's reading is an important indicator to consider first because research consistently finds that out of different indicators of cultural capital, reading is more strongly related to children's reading skills and educational success (Breinholt and Jæger, 2020; DeGraaf et al., 2000; Mikus et al., 2021; Sikora, Evans, and Kelley, 2019; Sullivan, 2001, 2007).

References

Anderson, T. W. and Hsiao, C. (1982). Formulation and Estimation of Dynamic Models. *Journal of Econometrics* 18(1):47-82.

Banks, P. A. (2012). Cultural Socialization in Black Middle-Class Families. *Cultural Sociology* 6(1):61–73.

Berlyne, D.E. (1972). Aesthetics and psychobiology. New York: McGraw-Hill.

Bond, S. R. (2002). Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice. *Portuguese Economic Journal* 1(2):141–62.

Bourdieu, P. (1977). Cultural Reproduction and Social Reproduction. *Power and*

Ideology in Education, edited by J. Karabel and A. H. Halsey. New York: Oxford University Press : 487-511.

Bourdieu, P. (1986). The Forms of Capital. *Handbook of Theory and Research in the Sociology of Education*, edited by J. G. Richardson. New York: Greenwood: 241–258.

Breinholt, A. and Jæger, M. M. (2020). How does cultural capital affect educational performance: Signals or skills? *The British Journal of Sociology*, *71*(1), 28–46.

Buckingham, J.; Wheldall, K., and Beaman-Wheldall, R. (2013). Why poor children are morelikely to become poor readers: The school years. *Australian Journal of Education 57*(3), 190-213.

Christin, Angèle. (2012). Gender and highbrow cultural particupation in the United States. *Poetics, 40*, 423-443.

CHRR (Center for Human Resource Research). 2006. *NLSY79 Children and Young Adults Data Users Guide*. Columbus, Ohio: Center for Human Resource Researchm Ohio State University.

Covay, E. and Carbonaro, W. (2010). After the Bell Participation in Extracurricular Activities, Classroom Behavior and Academic Achievement. *Sociology of Education* 83(1):20–45.

Cunha, F. and Heckman J. J. (2007). The Technology of Skill Formation. *The American Economic Review* 97(2):31–47.

Cunha, F. and Heckman J. J. (2008). Formulating, Identifying and Estimating the Technology of Cognitive and Noncognitive Skill Formation. *Journal of Human Resources* 43(4):738–82.

Deary, I. J.; Whalley, L. J.; Lemmon, H.; Crawford, J. R.; and Starr, J. M. (2000). The

Stability of Individual Differences in Mental Ability from Childhood to Old Age: Follow-up of the 1932 Scottish Mental Survey. *Intelligence* 28(1):49–55.

DiMaggio, P. (1982). Cultural capital and school success: The impact of status culture participation on the grades of US high school students. *American Sociological Review* 87(2): 189–201.

Dumais, S. A. (2006). Early Childhood Cultural Capital, Parental Habitus, and Teachers' Perceptions. *Poetics* 34(2):83–107.

Dumais, S. A. (2019). The Cultural Practices of First-Generation College Graduates: The Role of Childhood Cultural Exposure. *Poetics* (July):101378.

Ganzeboom, H. B. G. (1982). Explaining Differential Participation in High-Cultural Activities A Confrontation of Information-Processing and Status Seeking Theories. *Theoretical Models and Empirical Analyses*, edited by R. Werner. Utrecht: E.S. Publications: 186–205.

Georg, W. (2004). Cultural Capital and Social Inequality in the Life Course. *European Sociological Review* 20(4):333–44.

Georg, W. (2016). Transmission of Cultural Capital and Status Attainment – an Analysis of Development between 15 and 45 Years of Age. *Longitudinal and Life Course Studies* 7(2):106–23.

deGraaf, N. D.; deGraaf, P. M. and Kraaykamp, G. (2000). Parental Cultural Capital and Educational Attainment in the Netherlands: A Refinement of the Cultural Capital Perspective. *Sociology of Education* 73: 2.

Gil-Hernández, C. J. (2019). Do Well-off Families Compensate for Low Cognitive Ability? Evidence on Social Inequality in Early Schooling from a Twin Study Cognitive Ability and Educational. *Sociology of Education* 1–26.

Gracia, P. (2015). Parent-Child Leisure Activities and Cultural Capital in the United Kingdom: The Gendered Effects of Education and Social Class. *Social Science Research* 52:290–302.

van Hek, M. and Kraaykamp, G. (2015). How Do Parents Affect Cultural Participation of Their Children? Testing Hypotheses on the Importance of Parental Example and Active Parental Guidance. *Poetics* 52:124–38.

Hellevik, O. (2009). Linear versus logistic regression when the dependent variable is a dichotomy. *Quality and Quantity* 43:59-74.

Ho, L.; Wheaton, B. and Baumann, S. (2021). A life course perspective on cultural capital acquisition: How the timing and duration of musical socialization affect the taste for classical music and opera. *Poetics* 84:101498

Huang, F. L. (2019). Alternatives to logistic regression models in experimental studies. *The Journal of Experimental Education*

Jæger, M. M. and Breen, R. (2016). A Dynamic Model of Cultural Reproduction. *American Journal of Sociology* 121(4):1079–1115.

Kaufman, J. and Gabler, J. (2004). Cultural Capital and the Extracurricular Activities of Girls and Boys in the College Attainment Process. *Poetics* 32(2):145–68.

Kiviet, J. F. (1995). On Bias, Inconsistency, and Efficiency of Various Estimators in Dynamic Panel Data Models. *Journal of Econometrics* 68:53–78.

Klauda, S. L. (2009). The Role of Parents in Adolescents' Reading Motivation and Activity. *Educational Psychology Review* 21(4):325–63.

Kraaykamp, G. (2003). Literary Socialization and Reading Preferences. Effects of Parents, the Library, and the School. *Poetics* 31:235–57.

Kraaykamp. G. and Van Eijck. (2010). The Intergenerational Reproduction of

Cultural Capital: A Threefold Perspective. *Social Forces* 89(1):209-232.

Kripfganz, S. and Schwarz, C. (2015). Estimation of Linear Dynamic Panel Data Models with Time-Invariant Regressors. *European Central Bank: Working Paper Series* (1838).

Lizardo, O. and Skiles, S. (2015). Chapter 5. After Omnivorousness. Is Bourdieu still relevant? In *Routledge International Handbook of the Sociology of Art and Culture* (ed. L. Hanquinet and M. Savage). Routledge: London and New York.

Luo, S. (2017). Assortative mating and couple similarity: Patterns, mechanisms, and consequences. *Social and Personality Psychology Compass* 11.

Mikus, K.; Tieben, N., and Schober, P. (2020). Children's conversion of cultural capital into educational success: the symbolic and skill-generating functions of cultural capital. *British Journal of Sociology* 41(2):197-217.

Notten, N.; Kraaykamp, G. and Konig, R. P. (2012). Family Media Matters: Unraveling the Intergenerational Transmission of Reading and Television Tastes. *Sociological Perspectives* 55(4):683–706.

Notten, N.; Lancee, B.; van de Werfhorst, H. and Ganzeboom, H. B. G. (2015). Educational Stratification in Cultural Participation: Cognitive Competence or Status Motivation?. *Journal of Cultural Economics* 39:177–203.

O'Flaherty, M. and Baxter, J. (2020). The 'Developmental Gradient' Revisited: Australian Children's Time with Adult Caregivers from Infancy to Middle Childhood. *Social Science Research* 86: 102397.

Pfost, M.; Schiefer, I. M. and Artelt, C. (2016). Intergenerational Continuity in Attitudes toward Reading and Reading Behavior. *Learning and Individual Differences* 51:179–88.

Piper, A. T. (2015). The Benefits, Challenges and Insights of a Dynamic Panel Assessment of Life Satisfaction. *Danish – German Research Papers. ISSN: 1868-8160* 4.

Potter, D. and Roksa, J. (2013). Accumulating Advantages over Time: Family Experiences and Social Class Inequality in Academic Achievement. *Social Science Research* 42(4):1018–32.

Roodman, D. (2009). How to Do Xtabond2: An Introduction to Difference and System GMM in STATA. *The Stata Journal* 9(1):86–136.

Schiefele, U.; Stutz, F. and Schaffner, E. (2016). Longitudinal Relations between Reading Motivation and Reading Comprehension in the Early Elementary Grades. *Learning and Individual Differences* 51:49–58.

Schleicher, Andreas. (2019). PISA 2018 – Insights and Interpretations. OECD. https://www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf

Sikora, J.; Evans, M. D. R. and Kelley, J. (2019). Scholarly Culture : How Books in Adolescence Enhance Adult Literacy, Numeracy and Technology Skills in 31 Societies. *Social Science Research* 77:1–15.

Silinskas, G.; Lerkkanen, M. K.; Tolvanen, A; Niemi, P; Poikkeus, A. M. and Nurmi, J. E. (2012). The Frequency of Parents' Reading-Related Activities at Home and Children's Reading Skills during Kindergarten and Grade 1. *Journal of Applied Developmental Psychology* 33(6):302–10.

Stutz, F., Shaffner, E. and Schiefele, U. (2016). Relations among reading motivation, reading amount, and reading comprehension in the early elementary grades. *Learning and Individual Differences* 45:101-113.

Sullivan, A. (2001). Cultural Capital and Educational Attainment. *Sociology* 35(4):893–912.

Sullivan, A. (2007). Cultural Capital, Cultural Knowledge and Ability. *Sociological Research Online* 12(6):1–14.

Tucker-Drop, E. M. (2009). Differentiation of Cognitive Abilities Across the Life Span. *Developmental Psychology* 45(4):1097–1118.

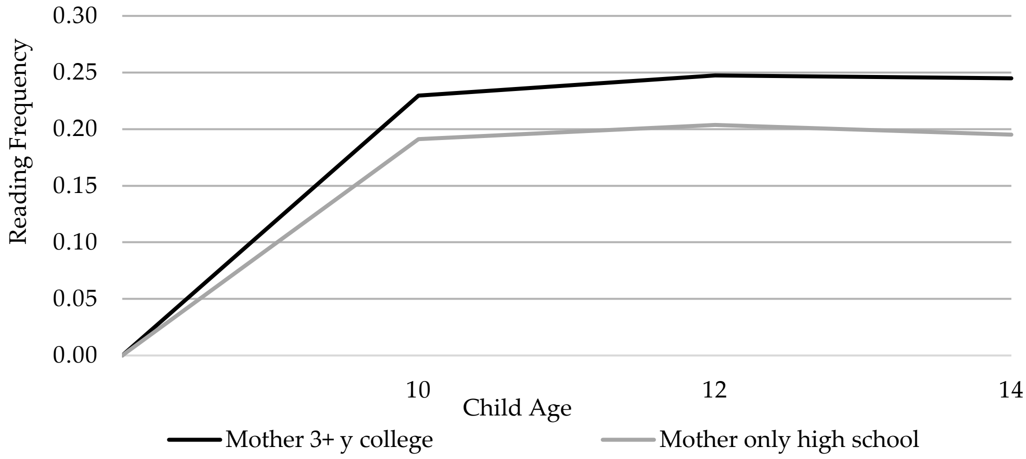
U.S. Department of Education. (2019). National Assessment of Educational Progress (NAEP), 1992–2019 Reading Assessments. Institute of Education Sciences, National Center for Education Statistics.

VanderWheele, T. J., and Mathur, M. B. (2019). Some desirable properties of the conferroni correction: Is the bonferroni correction really so bad?. *American Journal of Epidemiology* 188(3):617-618.

Wilson, J. D, and Spangler, P. F. (1974). The Peabody Individual Achievement Test as a Clinical Tool. *Journal of Learning Disabilities* 7(6):384-387.

Online supplementary materials: Tables and Figures

APPENDIX FIG. A1. AVERAGE INPUTS AT AGE 10, 12, 14



APPENDIX TABLE A2. ALTERNATIVE SPECIFICATIONS OF MODEL 1 FROM TABLE 2

	No variables predetermined	Reading inputs predetermined	System gmm; level	System gmm; diff
Children's reading (t-1)	.099 **	.089 *	.176 ***	.130 **
	(.038)	(.038)	(.031)	(.046)
Highbrow inputs	.122 ***	.125 ***	.220 ***	.125 ***
	(.025)	(.025)	(.025)	(.026)
Reading inputs	.180 ***	.148 **	.235 ***	.182 ***
	(.021)	(.052)	(.020)	(.022)
Newspaper subscription	.020 *	.020 *	.029 ***	.019
	(.010)	(.010)	(.008)	(.010)
Instrument in the home	.002	.002	.017	.002
	(.009)	(.009)	(.010)	(.009)
Hobby	.028	.027	.028	.026
	(.016)	(.016)	(.017)	(.016)
Lessons	.005	.005	.006	.004
	(.008)	(.009)	(.009)	(.009)
Hansen (J) test *P* value	.368	.293	.026	.678
N	4,831	4,831	4,831	4,831

Note. – Two-tailed tests. **P*<.05, ***P*<.01, ****P*<.001. Controls: Family income family size, child age, and year dummies. Hansen (j) test = exogeneity of the instruments; null hypothesis of exogenous instruments. P-values above .250 suggest valid instruments (Piper, 2015).

APPENDIX TABLE A3. ALTERNATIVE SPECIFICATIONS OF MODELS 2 AND 3 FROM TABLE 2. ONLY COEFFICIENTS ON INTERACTION TERMS ARE SHOWN

	No variables predetermined		Reading inputs predetermined		System gmm; level		System gmm; diff	
	Model 2	Model 3	Model 2	Model 3	Model 2	Model 3	Model 2	Model 3
PIAT reading * Highbrow inputs	.029		.142		.460*		.192	
	(.092)		(.181)		(.193)		(.170)	
PIAT reading * Reading inputs	.079		.446		1.077***		.395	
	(.070)		(.423)		(.311)		(.298)	
PIAT reading * News inputs	.004		.023		.053		.023	
	(.032)		(.050)		(.039)		(.042)	
PIAT math * Highbrow inputs	−.073		−.233		−.289*		−.333	
	(.093)		(.137)		(.146)		(.177)	
PIAT math * Reading inputs	.004		−.191		−.529		−.590	
	(.071)		(.356)		(.299)		(.358)	
PIAT math * News inputs	.008		−.011		−.075		−.033	
	(.033)		(.038)		(.043)		(.042)	
Mother AFQT * Highbrow inputs		−.007		−.021		.097		−.016
		(.087)		(.089)		(.084)		(.089)
Mother AFQT * Reading inputs		−.054		.098		−.020		−.073
		(.087)		(.229)		(.039)		(.091)
Mother AFQT * News inputs		-.042		-.045		-.055*		-.048
		(-.034)		(.034)		(.028)		(.034)
Hansen (J) test *P* value	.407	.362	.327	.309	.018	.026	.792	.693
N	4,831	4,831	4,831	4,831	4,831	4,831	4,831	4,831

Note. – Two-tailed tests. *P<.05, **P<.01, ***P<.001. Controls: Family income family size, child age, and year dummies. Hansen (j) test = exogeneity of the instruments; null hypothesis of exogenous instruments. P-values above .250 suggest valid instruments (Piper, 2015).

APPENDIX TABLE A4. OLS REGRESSIONS OF PARENTS' EDUCATION AND INCOME ON AMOUNT OF CULTURAL INPUTS

	Highbrow inputs	Reading inputs	Newspaper subscription
Mother's education	.017 ***	.025 ***	.017 ***
	(.001)	(.002)	(.004)
Family income	.0001 ***	.0002 ***	.0006 ***
	(.000)	(.000)	(.000)
N	15,875	14,377	15,896

	Instrument	Hobby	Lessons
Mother's education	.050 ***	.007 ***	.046 ***
	(.003)	(.002)	(.002)
Family income	.0005 ***	.0001 *	.0003 ***
	(.000)	(.000)	(.000)
N	15,893	15,903	15,901

Note. – Two-tailed tests. *P<.05, **P<.01, ***P<.001. Standard errors clustered at the family level; custom sample weights are applied.

APPENDIX TABLE A5. SIBLING FIXED-EFFECT MODEL OF CHILDREN'S EDUCATIONAL ATTAINMENT AT AGE 26+ ON CHILDREN'S READING FREQUENCY AT AGE 14.

	Model 1
Children's reading frequency age 14	.727***
	(.173)
Child PIAT math score age 14	.869***
	(.223)
Child PIAT reading score age 14	.753***
	(.209)
N	3,578

Note. – Two-tailed tests. *P<.05, **P<.01, ***P<.001. Control variables: Cultural inputs at age 14 (highbrow, newspaper subscription, instrument in the home, encourage hobbies, encourage lessons, and number of books), family income at age 14, age when education is measured, and year dummies.