

A Dynamic Model of Cultural Reproduction

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Abstract:

Although widely acclaimed, Bourdieu's theory of cultural reproduction does not provide a coherent explanation of how cultural reproduction leads to educational success. This paper proposes a simple formal model of cultural reproduction which incorporates, first, a dynamic account of how parents invest over time in transmitting cultural capital to children and second, a dynamic account of how children accumulate cultural capital. The paper uses data from the National Longitudinal Survey of Youth - Children and Young Adults (NLSY-CYA) to estimate key parameters in the formal model. Results suggest that (1) parents persistently transmit cultural capital to children throughout childhood, (2) parents adjust investments in light of new information they receive on the outcomes of past investments and (3) children accumulate cultural capital from parents throughout childhood.

Introduction

Bourdieu's theory of cultural capital and cultural reproduction (e.g., Bourdieu 1977a; 1984; Bourdieu and Passeron 1990) is one of the most influential explanations in social stratification research of why inequalities in educational and socioeconomic outcomes persist over generations. The theory outlines a complex system in which parents transmit cultural capital to children, children exploit their acquired cultural capital in the educational system and, as a consequence, families who possess cultural capital have a comparative advantage which helps them to reproduce privileged socioeconomic positions.

But how much do we really know about cultural reproduction? This paper starts from the observation that despite the enormous popularity of the theory of cultural reproduction and the existence of an extensive empirical literature, we have only limited understanding of how cultural reproduction takes place. This observation is in line with growing theoretical and empirical criticism of Bourdieu which has been voiced in recent years. Critics argue that, first, there is a fundamental lack of clarity in cultural reproduction theory regarding key concepts and processes (e.g., Lamont and Lareau 1988; van de Werfhorst 2010), second, it is unclear how one should operationalize cultural reproduction theory in empirical research (e.g., Kingston 2001; Sullivan 2002; Lareau and Weininger 2004) and, third, results from empirical provide only limited support for cultural reproduction theory (e.g., Kingston 2001; Goldthorpe 2007). This criticism poses an important challenge to cultural reproduction theory. While some critics argue that the theory of cultural reproduction and the concept of cultural capital should be abandoned altogether (e.g., Goldthorpe 2007), most scholars argue that Bourdieu's core ideas are valid but need to be recast in order to be relevant for social stratification research (e.g., Lamont and Lareau 1988; Kingston 2001; Sullivan 2002; van de Werfhorst 2010).

This paper takes up the challenge of attempting to recast Bourdieu's theory of cultural reproduction. The paper extends previous research in three regards. First, the paper presents the core ideas in the theory of cultural reproduction within a simple formal model. This formal model provides a conceptual framework for analyzing cultural reproduction which has been lacking in previous research. The model formalizes concepts and mechanisms which are familiar to interpreters of Bourdieu; it does not impose strong behavioral assumptions; results from previous research can be interpreted within the model; and the model can be used as a starting point for developing more refined accounts of cultural reproduction. The paper's second contribution consists in treating the process through which parents transmit cultural capital to children and the process through which children accumulate cultural capital as dynamic. These processes are largely black boxes in cultural reproduction theory and in most previous research. By explicitly theorizing the mechanisms which drive the intergenerational transmission of cultural capital as dynamic, we may improve understanding of how cultural reproduction actually takes place. The paper's third contribution consists in testing key features of the formal model using US data from the National Longitudinal Survey of Youth – Children and Young Adults.

A novel feature of the formal model is that it treats the intergenerational transmission of cultural capital as a dynamic and accumulative process. The model begins from Bourdieu's account of cultural reproduction but, given the lack of clarity in several key areas in the theory, I draw on related models of intergenerational transfers of cultural endowments in economics (e.g., Becker and Tomes 1986; Goldberger 1989; Cunha and Heckman 2006; Bisin and Verdier 2011). In cultural reproduction theory children acquire cultural capital from parents' active investments in transmitting cultural capital and from passive exposure to cultural capital in the home. My formal model treats parents' active investments in cultural capital as a dynamic process in which parents' present investments depend on past investments and on signals they receive about the effectiveness

of past investments. Consequently, the model incorporates the notion that parents make deliberate investments in transmitting cultural capital to children over a prolonged period of time and, furthermore, that they may adjust investments when learning about the effect of past investments (for example via new information on children's cultural, academic, and social development). The model also treats the process through which children accumulate cultural capital as dynamic. Specifically, in the model children's stock of cultural capital in the present is a function of parents' active investments, passive transmission of cultural capital, and the accumulative effect of past investments. Consequently, the model incorporates the notion in cultural reproduction theory that children internalize parents' cultural capital.

In addition to proposing a formal model, the paper also tests key aspects of this model. I analyze data from the National Longitudinal Survey of Youth – Children and Young Adults (NLSY-CYA) which, in addition to longitudinal information on children from birth, also includes detailed information on cultural capital both for parents and children. I use dynamic panel data models to analyze processes of cultural capital investments and accumulation. My empirical results are consistent with the idea that that processes of cultural capital investments and accumulation are dynamic. Specifically, results suggest that parents invest persistently in transferring cultural capital to children and, furthermore, parents adjust investments in light of information about the effect of past investments. For example, I find that parents tend to invest less in cultural capital if children exhibit lower math and reading test scores than usual (or more behavioral problems) which might render them less able to “absorb” parents' cultural capital. I also find that children's present stock of cultural capital depends on parents' cultural capital investments and on children's past stock of cultural capital. This results suggests that an accumulative process exists in which past stock of cultural capital has a positive effect on present stock of cultural capital.

A Formal Model of Cultural Reproduction

This section presents Bourdieu's theory of cultural reproduction within a formal model. The model is not intended to capture all aspects of cultural reproduction theory, but rather the core mechanisms in this theory. I begin by defining the concept of cultural capital which is at the center of cultural reproduction theory. I then proceed by, first, presenting a simple static model of cultural reproduction and, second, extending this static model by incorporating the dynamic nature of cultural capital investments and accumulation.

The Concept of Cultural Capital

At the general level cultural capital refers to familiarity with the dominant culture in a society. Lamont and Lareau (1988: 156) define cultural capital as "... widely shared, high-status cultural signals (attitudes, preferences, formal knowledge, behaviors, goods and credentials) used for social and cultural exclusion." Cultural capital exists in three states: *embodied* (linguistic competence, cultural knowledge, etc.), *objectified* (cultural goods, pictures, books, etc.), and *institutionalized* (educational credentials) (Bourdieu 1977a; 1986; Bourdieu and Passeron 1990). Along with economic and social capital, cultural capital is a scarce resource which can be used to promote relative socioeconomic advantage. According to Bourdieu, cultural capital is a particularly valuable resource in the educational system. The educational system is intrinsically biased towards cultural capital and ascribes other positive qualities (intellect, academic brilliance, etc.) onto individuals who possess cultural capital. Consequently, cultural capital conveys a (possibly falsely) impression of academic competence, which leads to favorable treatment by teachers and peers and to educational success.

A Static Model of Cultural Capital Transmission

Cultural reproduction theory begins from the observation that parents transmit cultural to children. I write this mechanism

$$C_c = \mu_1 C_p, \quad (1)$$

where C refers to cultural capital and subscripts c and p refer to respectively children and parents. The parameter μ_1 captures the strength of the intergenerational transmission of cultural capital from parents to children and ranges from 0 (no transmission of cultural capital) to 1 (deterministic transmission). Cultural reproduction theory assumes that $\mu_1 > 0$. For simplicity, I assume that cultural capital is one-dimensional. However, it is easy to extend the model to accommodate multiple dimensions of cultural capital.¹

I extend Equation 1 in two regards. First, in most interpretations of Bourdieu the transmission of cultural capital from parents to children originates in two different mechanisms: parents' active investments in transferring cultural capital to children (for example, by taking children to the theater or by reading to children) and passive transmission of cultural capital which exists in the family (for example, through children's exposure to works of art in the home or parents' discussions about politics over dinner). Both mechanisms affect children's cultural capital,

¹ The model would then instead be written $C_{dc} = \mu_{1d} C_{dp}$ where d indexes dimensions of cultural capital (for example, embodied, objectified, and institutionalized cultural capital).

although only parents' active investments are made deliberately.² Second, children's cultural capital also depends on parental resources other than cultural capital (for example economic and social capital) and on child-specific characteristics. I extend Equation 1 to accommodate these features

$$C_c = \beta_1 CA_p + \beta_2 CP_p + \beta_3 X_p + \alpha_c, \quad (2)$$

where CA_p refer to parents' active investments in cultural capital and CP_p refers to passive transmission of cultural capital. The effect of either input is captured by β_1 and β_2 , which are both assumed to be greater than zero. Bourdieu is not clear with regard to the relative importance of active investments and passive transmission. Some scholars interpret Bourdieu as suggesting that the transmission of cultural capital occurs mainly via parents' active investments, while others suggest that passive exposure to cultural capital in the home is more important. Both interpretations are arguably valid. Equation 2 also includes X_p which captures family characteristics (for example income and family size) and α_c which captures child-specific endowments (for example innate IQ and health).

According to cultural reproduction theory, children use their cultural capital to promote educational success. Bourdieu (1986: 247) writes that cultural capital is "... a symbolically and materially active, effective capital insofar as it is appropriated by agents and implemented ..." and, furthermore (1977a: 504), that "... academic success is directly dependent upon cultural capital

² Bourdieu (1986: 248-49) writes that "Cultural capital can be acquired (...) in the absence of any deliberate inculcation, and therefore quite unconsciously."

and on the inclination to invest in the academic market.” I write the mechanism through which cultural capital leads to educational success

$$E_c = \eta_1 C_c + \eta_2 CA_p + \eta_3 X_p + \alpha_c. \quad (3)$$

According to Equation 3 children’s educational success E_c depends on their cultural capital C_c , parents’ active cultural capital investments CA_p , family characteristics X_p , and child-specific endowments α_c . Effects of different inputs are represented by the η 's. Cultural reproduction theory assumes that children’s cultural capital has a positive effect on educational success, i.e., $\eta_1 > 0$. Two aspects of Equation 3 should be noted. First, it is natural to assume that η_1 varies across contexts, individuals, and dimensions of cultural capital. For example, some aspects of cultural capital (say, familiarity with highbrow culture) may be more valuable in some contexts than in others.³ η_1 might also vary across individuals. This observation fits Bourdieu’s contention that children’s *habitus*, i.e., their acquired dispositions and the ways in which they “live out” these dispositions in different contexts (for example, in schools), plays a key role in shaping returns to cultural capital.⁴ Second, Equation 3 includes CA_p , thereby allowing for parents’ active cultural

³ Using Bourdieu’s terminology, one might expect that the effect of cultural capital on educational success varies across *subfields* within the field of education. Empirical research provides rich evidence that different aspects of cultural capital have different effects on educational success across countries, school types, and socioeconomic environments. For example, Barone (2006) shows that the effect of cultural capital on academic achievement varies across countries, and Jæger (2011) shows that highbrow culture has a positive effect on academic achievement in high-SES environments but no effect in low-SES environments.

⁴ Bourdieu defines *habitus* as “a system of lasting, transposable dispositions which, integrating past

capital investments to affect children's educational success over and above its impact running through children's cultural capital. Bourdieu does not seem to consider this possibility (in cultural reproduction theory the effect of parents' cultural capital runs exclusively through children's cultural capital, i.e., $C_p \rightarrow C_c \rightarrow E_c$), but some interpreters of Bourdieu argue that, in addition to transmitting cultural capital to children, parents actively use their cultural capital in interactions with teachers to negotiate advantages for their children (e.g., Lareau 1987; Lareau and Horvat 1999; Lareau 2003). Passive transmission of cultural capital, CP_p , is assumed to affect E_c only via C_c .

Equations 2 and 3 present a simple model of the link between parents' cultural capital and children's cultural capital and, second, the link between children's cultural capital and educational success. Existing empirical research addresses different parts of this model. Most empirical studies analyze the effect of cultural capital on educational success, i.e., the mechanism described in Equation 3 (e.g., DiMaggio 1982; Teachman 1987; Kalmijn and Kraaykamp 1996; Aschaffenburg and Maas 1997; Crook 1997; Roscigno and Ainsworth-Darnell 1999; De Graaf, de Graaf, and Kraaykamp 2000; Dumais 2002; Jæger and Holm 2007; van de Werfhorst and Hofstede 2007; Bodovski and Farkas 2008; Covay and Carbonaro 2010; Flere, Krajnc, Klanjek, Musil, and Kirbis 2010; Tramonte and Willms 2010; Jæger 2011). Some studies also take into account the process through which parents transmit cultural capital to children (i.e., Equation 2) (e.g., Georg 2004; Jæger 2009; Kraaykamp and van Eijck 2010). Finally, some studies analyze how children convert cultural capital into educational success (i.e., mechanisms generating η_1 in Equation 3), for example by shaping teachers' perceptions of children (e.g., Dumais 2006; Wildhagen 2009), and how parents use cultural capital in interactions with institutional gatekeepers to negotiate

experiences and actions, functions at every moment as a *matrix of perceptions, appreciations, and actions*." (Bourdieu 1977b: 82-83, emphasis in original).

advantages for their children (i.e., mechanisms generating η_2 in Equation 3) (e.g., Lareau 1987; Lareau and Horvat 1999; Lareau 2003; Lee and Bowen 2006).

To summarize, the static model presented in Equations 2 and 3 describes, first, intergenerational transmission of cultural capital from parents to children and, second, the link between acquired cultural capital and educational success. In doing so, the model describes the main features of cultural reproduction theory. Furthermore, results from most existing research can be interpreted within the model.⁵

Dynamic Cultural Capital Investments

In the following sections I extend the simple model into a dynamic context. The extensions I propose are inspired by recent research in economics which treats parental investments in children as dynamic (e.g., Cunha and Heckman 2006; 2007; Todd and Wolpin 2007). As it stands, my model is static in the sense that it describes the outcomes of cultural capital investments rather than the processes that drive investments. The processes that drive cultural capital investments are of central theoretical interest because they describe how parents invest their cultural capital and how children acquire cultural capital. They are also of empirical interest because they may be informative about the actual magnitude of cultural reproduction (for example, it is important to know why some parents are more likely to invest in cultural capital than others and, consequently, why some children accumulate more cultural capital than others). Unfortunately, the processes underlying

⁵ In its present form the theoretical model describes processes of cultural capital investments and accumulation *within the family*. Consequently, apart from incorporating the outcomes of these mechanisms (η_1 and η_2 in Equation 3), the model does not describe the mechanisms through which children and parents convert cultural capital into academic success *within the educational system*. However, the model can be extended to include these mechanisms.

cultural capital investments have received little attention in previous research (exceptions are the work of Lareau and colleagues, see e.g., Lareau and Horvat 1999; Lareau 2003).

Dynamic Parental Investments

I extend the static model into a dynamic context by specifying how parents invest in cultural capital over time. After birth parents have a finite time horizon in which they can invest in children's cultural capital (and other child endowments such as human capital). Bourdieu (1986: 249) writes that "... the initial accumulation of cultural capital, the precondition for the fast, easy accumulation of every kind of useful cultural capital, starts at the outset, without delay, without wasted time (...) the accumulation period covers the whole period of socialization." Assuming that childhood is divided into T time periods, I write the process of cultural capital investments

$$CA_{pt} = \gamma_1 CA_{pt-1} + \phi_1 X_{pt} + \phi_2 K_{ct}, \quad (4)$$

where CA_{pt} is active parental investment in cultural capital at time t ($t = 1, \dots, T$).⁶ Parental investment at time t depends on three factors: (1) investment in time period $t-1$, CA_{pt-1} , family characteristics in time period t , X_{pt} (for example income), and child outcomes in time period t , K_{ct} . The first part of Equation 4 states that parents' investments in cultural capital are accumulative; i.e., investments in the past affect investments in the present. Consequently, the parameter γ_1 captures

⁶ Since CP_p in Equation 2 refers to passive transmission of cultural capital which is not the result of purposeful action it does not make sense to treat this aspect of cultural capital transmission as dynamic.

persistence over time in parental investments. The second part of Equation 4 states that investments are constrained by the amount of available resources in the family (X_{pt}). The third part states that parents adjust their investments in cultural capital in light of signals they receive the effectiveness of past investments (which are observed in the present). For example, parents may invest more in cultural capital if their child demonstrates improvements in cultural, cognitive, and social skills, and they may invest less (or differently) if the child demonstrates increasing behavioral problems or social maladjustment. Note that the model does not assume that parents have perfect information on returns to cultural capital investments, only that they respond to the perceived outcomes of past investments.

Dynamic Accumulation of Cultural Capital

Equation 2 provides a static description of how children acquire cultural capital. However, my theoretical model of cultural reproduction also treats the process through which how children accumulate cultural capital as dynamic. Assuming that childhood consists of T time periods, I write this process

$$C_{ct} = \gamma_2 C_{ct-1} + \delta_1 CA_{pt} + \delta_2 CP_{pt} + \delta_3 X_{pt} + \alpha_c, \quad (5)$$

where C_{ct} is children's stock of cultural capital at time t , ($t = 1, \dots, T$). Children's stock of cultural capital at time t depends on their stock of cultural capital in the previous period, C_{ct-1} , parents' active investments and passive transmissions of cultural capital, CA_{pt} and CP_{pt} , family

resources, X_{pt} , and child-specific endowments α_c . The parameters δ_1 and δ_2 capture the strength of the transmission of cultural capital from parents to children, which is assumed to be larger than zero. The model is dynamic because it allows for children's present stock of cultural capital to depend on past stocks of cultural capital, i.e., it allows for children to accumulate cultural capital over time. The parameter γ_2 captures the rate at which children accumulate cultural capital over time.

Summary

The previous sections have presented a simple formal model of cultural capital investments and accumulation. This model is consistent with the core ideas in Bourdieu's theory of cultural reproduction. The model describes the ways in which, first, parents transmit cultural capital to children and, second, how children use cultural capital to promote educational success. Bourdieu does not clarify exactly how parents invest in transmitting cultural capital to children. However, building on recent theoretical models in economics (e.g., Cunha and Heckman 2006; 2007; Todd and Wolpin 2007), I conceptualize cultural capital investments and accumulation as dynamic processes in which parents make deliberate investments in transferring cultural capital to children and in which they respond to the outcomes of past investments.

My formal model can be extended to accommodate more complex situations not originally covered by Bourdieu. For example, the model assumes that there is only one child in each family (or that every child is treated in the same way). However, in families with several children parents may make differential investments in children, for example if they have a stronger preference for one child or if one child is more responsive to cultural capital investments than another child (e.g., Becker and Tomes 1986; Cunha and Heckman 2006). Furthermore, it may be

that children differ with respect to how well they internalize cultural capital and how well they are able to convert their cultural capital into educational success. These extensions can be incorporated into the model in future research.

Empirical Analysis

In the remainder of the paper I test some of the core features of the formal model. Most previous research analyzes the link between cultural capital and educational success (the mechanism described by Equation 3). Generally, this research demonstrates positive correlations between cultural capital and educational success. I extend previous research by analyzing the processes through which parents invest in transmitting cultural capital to children and the process through which children accumulate cultural capital (the processes described by Equations 4 and 5). My empirical analysis is not intended as stringent tests of the dynamic aspects of cultural reproduction theory. Rather, it is intended as a first step towards clarifying the mechanisms that characterize cultural reproduction. The following sections present the data and methods used in the empirical analysis.

Data

I use data from the National Longitudinal Survey of Youth – Children and Young Adults survey (NLSY-CYA). The NLSY-CYA is an ongoing panel study which started in 1986 and which samples all children born to female participants in the National Longitudinal Survey of Youth 1979 (NLSY79) (see CHRR 2006a). The NLSY79 is a nationally representative sample of 12,686 men and women who were between 14 and 22 years old when they were first interviewed in 1979

(CHRR 2006b). The NLSY-CYA is conducted bi-annually (so far in the period 1986-2008) and it collects information on all biological children of female NLSY79 respondents from birth onward and, from age 10 onward, from children themselves.

I use the NLSY-CYA because it includes longitudinal information on cultural capital for NLSY79 mothers and, from age 10 onwards, also for children. Longitudinal information on mothers' cultural capital allows me to model the process of cultural capital investments. Most of my indicators of parents' cultural capital are observed bi-annually during the period in which children are 6-14 years old. With one exception, my indicators of children's cultural capital are collected from children themselves from age 10-14. In addition to information on cultural capital, the NLSY-CYA also includes rich longitudinal information on children's cognitive skills, social behavior, and on the socioeconomic characteristics of the family in which they live. This information allows me to take into account a wide range of individual and family characteristics. Although very comprehensive, the NLSY-CYA is limited in some regards. In particular, there are no indicators of children's cultural capital in early childhood and, furthermore, the indicators of children's cultural capital were not included in all survey years.

– TABLE 1 HERE –

Variables

Table 1 shows summary statistics for all variables used in the analysis. Appendix Table A1 provides detailed information on all variables.

Parents' Cultural Capital

I include seven variables to capture parents' cultural capital. Five variables are proxies for parents' active cultural capital investments and two variables are proxies for cultural capital in the family. All cultural capital variables are measured in each survey year and, in the case of the variables for parents' active investments, for each child in the family.

The first of five variables capturing parents' *active cultural capital investments* measures how often in the last year a family member has taken the child to any type of museum. The response categories are: 1 = never; 2 = once or twice; 3 = several times; 4 = about once a month; 5 = about once a week or more often). The second variable measures how often in the last year a family member has taken the child to any type of musical or theatrical performance. The response categories are the same as above. The third variable measures how often the mother reads to the child with response categories: 1 = never; 2 = several times a year; 3 = several times a month; 4 = once a week; 5 = about 3 times a week; 6 = every day. The fourth variable measures how many books the child has with response categories: 1 = none; 2 = 1 or 2 books; 3 = 3-9 books; 4 = 10 or more books. The fifth variable is a dummy variable indicating whether the family encourages the child to start and keep doing hobbies with response categories: 1 = yes; 0 = no. These variables capture three dimensions of cultural capital: familiarity with legitimate culture (attending museum/music/theater), reading/literary climate (how much the mother reads to the child/how many books the child has), and extracurricular activities (hobbies) (e.g., DiMaggio 1982; Aschaffenburg and Maas 1997; De Graaf, de Graaf, and Kraaykamp 2000; Kaufman and Gabler 2004; Covay and Carbonaro 2010).

The first of two indicators capturing cultural capital in the home which may be transmitted passively to children is a dummy variable indicating whether parents subscribe to a

daily newspaper (with response categories: 1 = yes; 0 = no). The second variable is a dummy variable indicating whether there is a musical instrument in the home which the child can use.

Children's Cultural Capital

I include three variables to capture children's cultural capital. One of these variables is from the mother questionnaire and pertains to the age interval 6-14. Two other variables were collected from the child from age 10-14. The first variable measures how often the child reads for enjoyment, as reported by the mother. The response categories are 1 = never; 2 = several times a year; 3 = several times a month; 4 = several times a week; 5 = every day. The second variable is a dummy variable of the child's report of whether he or she typically reads a book or magazine not assigned at school (with response categories 1 = yes; 0 = no). The third variable is a dummy variables measuring whether the child belongs to any (non-sports) clubs, teams, or school activities, either in or out of school. These indicators of children's cultural capital mainly capture reading/literary interests and participation in extracurricular activities. Unfortunately, the NLSY-CYA does not include indicators of participation in cultural activities or indicators of cultural capital in early life.

Child Outcomes

I include three indicators of children's outcomes. The first two variables measure the child's academic achievement, and specifically scores on the Peabody Individual Achievement Tests (PIAT) in math and reading recognition. The Math test was designed to measure the child's attainment in mathematics as taught in mainstream education. The Reading Recognition test was designed to measure word recognition and pronunciation ability. I use percentile scores for each

PIAT test which are normed relative to children's age. The third variable is the child's score on the Behavior Problems Index, which is a summary measure of behavioral problems (measuring, for example, antisocial, hyperactive, and impulsive behavior). I use percentile scores on the Behavior Problem Index and use scores calculated separately for each sex.

Control Variables

I include a range of demographic and socioeconomic control variables. First, I include four variables pertaining to children. These variables include children's sex (dummy variable for girls), age in months, birth order, and birth weight in kilograms. Second, I include a range of variables pertaining to the child's family. These variables include family income (log of total family income in USD, indexed to 2008 level), mother's education (years of schooling), mother's IQ (AFQT test score), family size, and race (dummy variables for white, black, Hispanic, and other).

Empirical Approach

The objective of the empirical analysis is to estimate several key parameters in the dynamic model of cultural capital investments and accumulation. Specifically, the objectives are to analyze, first, whether parents invest consistently over time in cultural capital and adjust investments in light of signals they receive on the outcomes to past investments and, second, whether children accumulate cultural capital over time. The NLSY-CYA includes repeated observations of parental investments and children's cultural capital. This information allows me to model the process through which parents invest in cultural capital (Equation 4 in the formal model) and the process through which children accumulate cultural capital (Equation 5).

Dynamic Panel Data Models

I use linear dynamic panel data (DPD) models to estimate the key parameters in my formal model (e.g., Arellano and Bond 1991; Arellano and Bover 1995; Blundell and Bond 1998; Wawro 2002). DPD models are a class of regression models for panel data in which the process that generates present realization of the dependent variable is dynamic in the sense that it may depend on past realization of the dependent variable, as well as on present and past values of explanatory variables. First, I present the DPD models which describe parents' investments in cultural capital and children's accumulation of cultural capital. Second, I discuss the estimation methods used.

The DPD model for parents' investments in cultural capital, defined theoretically by Equation 4, can be written

$$Y_{li,t} = \gamma_1 Y_{li,t-1} + \phi_1 X_{i,t} + \phi_2 K_{i,t} + \phi_3 Q_i + \alpha_i + \varepsilon_{i,t}, \quad (6)$$

where $Y_{li,t}$ refers to any of the measures of parents' active cultural capital investments (CA_p in Equation 4) and where i indexes individuals ($i = 1, \dots, N$) and t indexes time ($t = 1986-2008$). The model states that parents' cultural capital investments in time period t depend on investments in time period $t-1$, with γ_1 capturing over-time persistency in parents' investments. Parents' investments in time period t also depend on present family characteristics, $X_{i,t}$ (family income, mother's education, family size, etc.), child outcomes, $K_{i,t}$ (PIAT math and reading test scores, behavior problems), and on other observed child characteristics, Q_i (sex, age, birth order, and birth

weight). Finally, the error structure includes the child-specific effect α_i (which is unobserved) and the idiosyncratic error term $\varepsilon_{i,t}$.⁷

The DPD model for children's accumulation of cultural capital, defined theoretically by Equation 5, can be written

$$Y_{2i,t} = \gamma_2 Y_{2i,t-1} + \delta_1 CA_{i,t} + \delta_2 CP_{i,t} + \delta_3 X_{i,t} + \delta_4 Q_i + \alpha_i + \varepsilon_{i,t}, \quad (7)$$

where $Y_{2i,t}$ refers to any of the measures of children's cultural capital (C_c in Equation 5). The DPD model states that children's cultural capital in time period t depends on their cultural capital in time period $t-1$, with γ_2 capturing over-time persistence in the rate of accumulation. The parameter γ_2 thus captures self-complementary in the sense that cultural capital in the past has an accumulative effect on cultural capital in the present (cf. Cunha and Heckman 2006; Todd and Wolpin 2007). The model also states that children's cultural capital in time period t depends on parents' active cultural capital investments in the same period, $CA_{i,t}$ (for example, how often parents take the child to the theater and how often the mother reads to the child), passive transmission of cultural capital, $CP_{i,t}$ (captured by whether parents subscribe to a newspaper and whether there is a musical instrument in

⁷ Equation 6 (and 7 below) includes both observed (Q) and unobserved (α_i) child characteristics. I need both components in the DPD model because, unlike parents, I observe only some of the child characteristics that affect parental investments. In the theoretical model in Equation 4 all relevant child characteristics which affect parental investments are summarized by α_i .

the home), family and child characteristics, $X_{i,t}$ and Q_i , and the unobserved child-specific effect α_i .

Estimation

The parameters in the DPD model can be estimated using a range of different methods (see Arellano and Bond 1991; Arellano and Bover 1995; Wawro 2002). I do not survey all available methods but describe the most important aspects of the DPD model and the estimation method used in the present analysis.

The key advantage of the DPD model is that it incorporates a lagged dependent variable, i.e., it allows for current realizations of the dependent variable to depend on past realizations of the dependent variable. The main inferential challenges are that, first, the lagged dependent variable is endogenous by construction (since $y_{i,t-1}$ is correlated with $\varepsilon_{i,t}$) and, second, fixed individual-specific effects may exist in the dynamic which cause the dependent variable to change faster for some individuals than for others. The traditional approach to solving these challenges in the DPD literature is to carry out a first-difference transformation of Equation 6/7 (thereby differencing out the individual-specific fixed effects, α_i) and to instrument the first-differenced lagged dependent variable with its own lag going back in time (at least) one period. The idea behind this instrumental variable approach is that, after doing first differencing, past values of the dependent variable obtained from going back in the panel (at least to $y_{i,t-3}$) are likely to be uncorrelated with the residuals in the present ($\varepsilon_{i,t}$), thus providing valid internal instruments for the lagged dependent variable. Instruments for the lagged dependent variable may include both further lags in differences, levels, or both (Wawro 2002). More complex estimators building on the

Generalized Method of Moments (GMM) have been developed and are now routinely used (see Arellano and Bover 1995; Blundell and Bond 1998). I apply the standard one-step system GMM estimator which is available in the Stata ado xtabond2 (Roodman 2009).

Different specification tests exist which can be used to infer whether the assumptions underlying the DPD model are plausible. The DPD model assumes that the residuals in Equation 6/7 are serially uncorrelated. Arellano and Bond (AB; Arellano and Bond 1991; Arellano and Bover 1995) have developed tests for first- (AR1) and second-order (AR2) serial correlations in the residuals. The rationale behind these tests is that, if serially uncorrelated, the first-differenced residuals should display a negative first-order serial correlation (AR1) but no second-order serial correlation (AR2). The AB tests are designed to test for AR(1) and AR(2).⁸ Finally, the Sargan/Hansen test for overidentifying restrictions is a standard test of the joint validity of the instrument set used in the DPD model.

Results

The results section is divided into three parts. In the first part I present results from DPD models predicting parents' investments in cultural capital. This analysis is informative about the dynamics of parents' cultural capital investments and the extent to which parents adjust present investments in light of information about the outcomes of past investments. In the second part of the analysis I present results from DPD models predicting children's cultural capital. This analysis is informative about the rate at which children accumulate cultural capital and the effect of parental cultural capital on children's cultural capital. Finally, in the third part I present summary evidence on the effect of

⁸ The AR(2) test is only available for dependent variables in which I have at least four observations per respondent (i.e., where $t \geq 4$).

parents and children's cultural capital on children's educational attainment. This analysis is informative about returns to cultural capital investments.

– TABLE 2 HERE –

Parental Cultural Capital Investments

Table 2 presents results from DPD models using the NLSY-CYA data to predict parents' cultural capital investments. These models pertain to the dynamic process described theoretically by Equation 4 and empirically by Equation 6. I estimate a DPD model for each of the five indicators of parents' active cultural capital investments. Table 2 shows parameter estimates for variables of particular theoretical interest, here the lagged dependent variable and the child outcome variables. The table omits estimates for the control variables (see Table A2) but includes information from the specification tests.

Estimates for the lagged dependent variables are positive and statistically significant for all five cultural capital variables. These results suggest that cultural capital investments in time period $t-1$ affect investments in time period t or, in other words, there is persistence over time in parents' cultural capital investments.⁹ This finding is consistent with the argument in cultural

⁹ It is important to point out that the coefficient on the lagged dependent variable in DPD models is intended to capture the causal effect of past outcomes on present outcomes and not simply serial (i.e., over-time) correlation in the dependent variable. In order to distinguish serial correlation, which may be due to variables which are not observed from causal effects, the DPD model, first, employs first-differencing to wash out individual-specific fixed effects and, second, instruments the lagged dependent variable.

reproduction theory (and described in Equation 4) that parents make sustained investments in transmitting cultural capital to children. The coefficients on the lagged dependent variable (γ_1 in Equations 5 and 7), which describe the average over-time persistence in cultural capital investments, differs across the indicators of cultural capital. Coefficients are very low for the indicators capturing participation in legitimate culture (how often the child is taken to a museum and to a concert/theater) and parental encouragement to start and keep doing hobbies. By contrast, persistence in parental investments is higher for the indicators capturing literary inputs and provision of a reading climate (how much the mother reads to the child and how many books the child has). My results thus suggest that parents tend to be more persistent in providing literary inputs than cultural activities.

Table 2 also shows effects of the child outcome variables: PIAT math and reading ability test scores and behavioral problems, on parents' cultural capital investments. There is some evidence that higher scores in math and reading ability in time period t are associated with higher cultural capital investments in the same time period. Furthermore, there is strong evidence that behavioral problems are negatively associated with parents' cultural capital investments. Together, these results support the idea that parental investments in cultural capital are partly driven by the outcomes of past investments (which are captured by the academic achievement and behavioral problems variables and which are observable to parents in the present) and, furthermore, that children who display strong academic and social skills in the present are subject to more intense cultural capital investments than children who do not perform well.¹⁰ Since the DPD models control

¹⁰ Bias from reverse causality might be an issue in my empirical model specification since, in addition to children's academic ability affecting parents' cultural capital investments (which is how the model is specified), parents' cultural capital investments also affect children's academic achievement. Existing research which controls effectively for unobserved heterogeneity suggests that parents' cultural capital has a statistically significant but substantively small

for child-specific fixed effects, the effects of the child outcome variables capture the effect of deviations (either positive or negative) from the child's "usual" academic and social skills. The child's "usual" skill level is likely to be known to parents, so it makes sense to interpret the effect of the child outcome variables on parents' cultural capital investments as capturing the effect on parents' responses to new information they receive on the child's academic and social development.

It should be noted that the specification tests also reported in Table 2 suggest that in most cases my models do not meet all the assumptions underlying the DPD model. Consequently, my models are biased to some extent.

– TABLE 3 HERE –

Child Cultural Capital

Table 3 presents results from DPD models predicting children's cultural capital. The theoretical mechanism which explains children's accumulation of cultural capital is described theoretically by Equation 5 and empirically by Equation 7. I use three indicators of children's cultural capital: How often the child reads for enjoyment (age 6-14), whether the child reads a book or a magazine after effect on academic achievement (e.g., Gaddis and Payton 2011; Jæger 2011). One way to address potential reverse causality in the DPD context is to use lagged child outcomes instead of contemporaneous child outcomes in Equation 6 (i.e., $K_{i,t-1}$ instead of $K_{i,t}$). In this model specification past (rather than contemporaneous) child outcomes affect parents' present cultural capital investments. Tables A3 and A4 summarize results from DPD models which include respectively (1) contemporaneous, (2) lagged (one time period) and (3) both contemporaneous and lagged child outcomes. Results from these models suggest that using lagged instead of contemporaneous child outcomes (or both) does not have any substantial impact on my results.

school (age 10-14), and whether the child belongs to (non-sports) clubs/teams/activities out of school (age 10-14). Two things should be kept in mind before interpreting the empirical results. First, my indicators capture mainly literary or “book oriented” dimensions of cultural capital. Unfortunately, no suitable indicators of other dimensions of cultural capital are available in the NLSY-CYA. Second, two out of three indicators of children’s cultural capital were collected from children from age 10-14 (and only in some survey years), which means that sample size (and panel length) is smaller than in the previous analyses.

Table 3 shows that the coefficients on the lagged dependent variable is statistically significant for the indicators measuring whether the child reads for enjoyment and reads a book or magazine after school, but only marginally significant for the indicator measuring whether he or she belongs to (non-sports) clubs/teams/activities. These results suggest that the child’s stock of cultural capital in time period $t-1$ has a positive effect on the stock of cultural capital in time period t or, in other words, that there is persistence over time in children’s accumulation of cultural capital. The table also shows that the indicators of parents’ active cultural capital investments and the indicators of cultural capital in the home which may be transmitted passively to children (daily newspaper, musical instrument) have mostly positive effects on children’s cultural capital. This result is in line with the core idea in cultural reproduction theory that parents transmit cultural capital to children both actively and passively (cf. Equation 4) and with previous findings (e.g., Georg 2004; Kraaykamp and van Eijck 2010). Together, my findings suggest that children accumulate cultural capital over time: Parents’ cultural capital in time period $t-1$ has a positive effect on the child’s stock of cultural capital in time period t , and the child’s stock of cultural capital in period $t-1$ (which also summarizes the positive contribution from parents’ cultural capital investments in the

previous period) has a positive effect on his or her stock of cultural capital in time period t (as described by the positive coefficient on the lagged dependent variable).¹¹

– TABLE 4 HERE –

Cultural Capital and Educational Success

The previous analyses provide evidence that processes of cultural capital investments and accumulation are dynamic. In doing so, the analyses have sought to identify some of the core mechanisms through which cultural reproduction operates which have remained black boxes in previous research. However, in cultural reproduction theory the final objective of cultural capital is to facilitate educational success. Equation 3 in my formal model describes the link between cultural capital and educational success. In this last part of the empirical analysis I provide summary evidence on the effect of cultural capital on educational success.

The NLSY-CYA tracks respondents over long periods of time and, as a consequence, I have information on final educational attainment for some respondents. Table 4 shows results from an Ordinary Least Squares (OLS) regression of years of completed schooling for NLSY-CYA respondents who were at least 25 years old in 2008. This static OLS regression emulates Equation 3 in the theoretical model. In this analysis the cultural capital variables which are included in the

¹¹ I have also estimated the DPD models including both contemporaneous and lagged (one period) parental cultural capital indicators. The idea motivating this model specification is to analyze whether past parental cultural capital inputs affect the child's stock of cultural capital over and above parents' contemporaneous inputs. I find some but not strong evidence that lagged cultural capital inputs matter.

model are calculated as the mean of all survey years in which observations are available for each respondent. Consequently, the cultural capital variables approximate the mean level of cultural capital which was provided to the child in the home and which the respondent acquired. Even if less than ideal, this coding scheme provides proxy measures for parents' cultural capital investments and their outcomes.

Although the NLSY-CYA subsample which can be used in this analysis is rather small, results presented in Table 4 suggest that children's cultural capital affects educational success. I find positive coefficients on all three indicators of children's cultural capital, and two indicators are statistically significant. Consequently, as hypothesized by cultural reproduction theory and described by the assumption in Equation 3 that $\eta_1 > 0$, there is some empirical evidence that children's cultural capital has a positive effect on educational success. Table 4 also shows estimated direct effects of parents' cultural capital on children's educational success, i.e., η_2 in Equation 3. There is only weak evidence that parents' cultural capital has any direct effects on educational success net of its effect running thorough children's cultural capital.

Conclusion

Bourdieu's theory of cultural capital and cultural reproduction is widely acclaimed in social stratification research. Yet, in recent years critics have highlighted a lack of clarity regarding core concepts and mechanism in the theory, a lack of consensus regarding how to operationalize cultural reproduction theory, and a lack of convincing empirical support for cultural reproduction theory. Together, these critical voices call for a reappraisal of cultural reproduction theory.

This paper recasts cultural reproduction theory in a simple formal model. The motivation for developing a formal model is to be better able to describe core concepts and mechanisms in cultural reproduction theory. The formal model incorporates core concepts and mechanisms in Bourdieu's theory of cultural reproduction, it does not impose strong behavioral assumptions, and existing empirical research can be interpreted within the model. In addition to describing the core ideas in cultural reproduction theory, my formal model also addresses the dynamic process through which parents invest in transmitting cultural capital to children and the process through which children accumulate cultural capital. These processes have largely been black boxes in previous research on cultural reproduction, but recent theoretical models of parental investments in economics provide some building blocks for conceptualizing the intergenerational transmission of cultural capital. Finally, the paper tests key features of the formal model using data from the National Longitudinal Survey of Youth – Children and Young Adults.

My empirical results suggest that processes of cultural capital investments and accumulation are dynamic. First, I find that parents' cultural capital investments are persistent over time. Thus, as hypothesized in cultural reproduction theory parents invest in transmitting cultural capital to children throughout childhood. Second, I find that parents adjust cultural capital investments in light of signals they receive on the outcomes of past investments. For example, parents take their child more often to a museum or concert if the child demonstrates improvements in academic achievement, and vice versa if the child exhibits poorer achievement or more behavioral problems. These results are consistent with the idea that parents are responsive to children's development and adjust their investments in cultural capital accordingly. Third, I find that as would be expected parents' cultural capital has a positive effect on children's cultural capital. I also find evidence of persistence in children's stock of cultural capital over time which suggests that children accumulate cultural capital throughout childhood. Finally, I find that

children's cultural capital has a positive effect on final educational attainment. These results are consistent with expectations from cultural reproduction theory and are described in my formal model.

[Some more stuff to come ...]

Table 1. Summary Statistics. Means with Standard Deviations in Parenthesis

	Mean	SD	N
<i>Parental cultural capital:</i>			
How often child is taken to museum	2.166	.966	41,923
How often child is taken to concert/theater	1.876	.896	31,332
How often mother reads to child	4.228	1.504	33,228
Number of books child has	3.499	.852	51,130
Family encourages child to take on hobbies	.907	.291	31,337
Family subscribes to daily newspaper	.452	.498	31,316
Musical instrument available in child's home	.474	.499	31,461
<i>Child cultural capital:</i>			
How often child reads for enjoyment	3.805	1.132	31,028
Child reads book/magazine after school	.578	.494	12,552
Child belongs to clubs/teams/activities in or out of school (not sport)	.540	.500	10,794
<i>Child outcomes:</i>			
PIAT math	50.884	27.889	33,081
PIAT reading recognition	57.646	28.518	32,954
Behavior Problems Index	59.298	28.037	37,479
Years of completed schooling by 2008*	12.771	2.092	24,984
<i>Child characteristics:</i>			
Child's sex	.489	.500	137,940
Child's age (months)	147.874	89.845	92,180
Birth order	1.964	1.145	137,916
Birth weight	3.289	.620	123,864
<i>Family characteristics:</i>			
Family income (log)	10.397	1.790	91,618
Mother's education	12.479	2.565	108,991
Mother's IQ	34.335	28.075	137,940
Family size	2.026	1.369	109,175
Mother's race:			
White	.437	.496	135,420
Black	.275	.444	135,420
Hispanic	.162	.368	135,420
Other	.126	.332	135,420

Note: N is child-by-year observations. * Respondents age 25 and older.

Table 2. Results from Dynamic Models of Parental Active Cultural Capital Investments

Parental cultural capital:	Taken to museum	Taken to Concert/ Theater	Reads to Child	Number of Books	Encourages hobbies
Age range	3-14	6-14	0-9	0-14	6-14
Lagged cultural capital	.052 (.012)***	.030 (.015) [#]	.183 (.021)***	.237 (.012)***	.049 (.015)**
<i>Child outcomes:</i>					
Math test score	.0009 (.0003)**	.0003 (.0003)	-.0002 (.0006)	.0004 (.0002)*	.0001 (.0001)
Reading test score	-.0002 (.0003)	-.0001 (.0003)	-.001 (.001)	.001 (.0002)***	.0003 (.0001)**
Behavior problems	-.002 (.0002)***	-.002 (.0002)***	-.003 (.0005)***	-.0009 (.0001)***	-.0002 (.0001)*
Number of observations	20,817	14,650	10,546	20,512	14,644
Max observations per unit	5	4	3	5	4
Specification tests (<i>p</i> -values):					
AB test for AR(1) in first differences	.000	.000	.000	.000	.000
AB test for AR(2) in first differences	.072	.824	-	.000	.426
Sargan Test	.028	.620	.000	.000	.000

Notes: *** $p < .001$, ** $p < .01$, * $p < .05$, [#] $p < .10$. Estimator is one-step system GMM. Models also include all demographic and socioeconomic variables listed in Table 1 and dummy variables for survey year (1986-2008). See Table A2 for results.

Table 3. Results from Dynamic Models of Child Cultural Capital

Child cultural capital:	Reads for enjoyment	Reads book/magazine after school	Belongs to clubs/teams/activities out of school
Age range	6-14	10-14	10-14
Lagged cultural capital	.176 (.016)***	.156 (.053)**	.094 (.051) [#]
<i>Parental cultural capital:</i>			
Taken to museum	.070 (.010)***	.003 (.010)	-.0006 (.010)
Taken to concert/theater	.060 (.011)***	.019 (.010) [#]	.017 (.010) [#]
Number of books	.252 (.012)***	.041 (.011)***	.043 (.010)***
Encourages hobbies	.188 (.034)***	.037 (.031)	.056 (.031) [#]
Daily newspaper	.078 (.017)***	.018 (.015)	.075 (.015)***
Musical instrument	.030 (.018) [#]	-.010 (.017)	.066 (.016)***
Number of observations	15,312	4,436	4,036
Max observations per unit	4	3	3
Specification tests (<i>p</i> -values):			
AB test for AR(1) in first differences	.000	.052	.726
AB test for AR(2) in first differences	.235	-	-
Sargan Test	.045	.349	.308

Notes: *** $p < .001$, ** $p < .01$, * $p < .05$, [#] $p < .10$. Estimator is one-step system GMM. Models also include all demographic and socioeconomic variables listed in Table 1 and dummy variables for survey year (1986-2008). Indicator of how much mother reads to the child cannot be included since it pertains to children age 0-9 only and, thus, there are no valid observations. See Table A5 for results.

Table 4. Results from OLS Regression of Years of Completed Schooling by 2008

Child cultural capital:	
<i>Child cultural capital:</i>	
Reads for enjoyment	.122 (.072) [#]
Reads book/magazine after school	.172 (.123)
Belongs to clubs/teams/activities out of school	.604 (.121)***
<i>Parental cultural capital:</i>	
Taken to museum	-.184 (.103) [#]
Taken to concert/theater	.229 (.115)*
Number of books	.088 (.104)
Encourages hobbies	-.071 (.242)
<i>Child outcomes:</i>	
Math test score	.022 (.004)***
Reading test score	.010 (.003)**
Behavior problems	-.011 (.003)***
Number of observations	1,901
R^2	.358

Notes: *** $p < .001$, ** $p < .01$, * $p < .05$, [#] $p < .10$. Models estimated for respondents age 25 and older. Each cultural capital variable is calculated as the mean of all survey years in which observations are available. Models also include all demographic and socioeconomic variables listed in Table 1. Indicator of how much mother reads to the child cannot be included since it pertains to children age 0-9 only and, thus, there are no valid observations.

Table A1: Summary of Variables

Indicators	Response categories/ description	Who reports	Year(s) collected	Age restriction
<i>Parental cultural capital:</i>				
How often child is taken to museum	1 = Never; 2 = Once or twice; 3 = Several times; 4 = About once a month; 5 = About once a week or more often	Mother	1986-2008	3-14
How often child is taken to concert/theater	1 = Never; 2 = Once or twice; 3 = Several times; 4 = About once a month; 5 = About once a week or more often	Mother	1986-2008	6-14
How often mother reads to child	1 = Never; 2 = Several times a year; 3 = Several times a month; 4 = Once a week; 5 = About 3 times a week; 6 = Every day	Mother	1986-2008	0-9
Number of books child has	1 = None; 2 = 1 or 2 books; 3 = 3-9 books; 4 = 10 or more books	Mother	1986-2008	0-14
Family encourages child to take on hobbies	0 = No; 1 = Yes	Mother	1986-2008	6-14
Family subscribes to daily newspaper	0 = No; 1 = Yes	Mother	1986-2008	6-14
Musical instrument available in child's home	0 = No; 1 = Yes	Mother	1986-2008	6-14
<i>Child cultural capital:</i>				
How often child reads for enjoyment	1 = Never; 2 = Several times a year; 3 = Several times a month; 4 = Several times a week; 5 = Every day	Mother	1986-2008	6-14
Child reads book/magazine after school	0 = No; 1 = Yes	Child	1992-2004	10-14
Child belongs to clubs/teams/activities out of school (not sport)	0 = No; 1 = Yes	Child	1992-2004	10-14
<i>Child outcomes:</i>				
PIAT math	Peabody Individual Achievement Test, percentile score (0-100)	Test	1986-2008	5-14
PIAT reading recognition	Peabody Individual Achievement Test, percentile score (0-100)	Test	1986-2008	5-14
Behavior Problems Index	Summary index of behavior problems, percentile score for same sex (0-100)	Mother	1986-2008	4-14

Years of completed schooling	Years of completed schooling for respondents who are at least 25 years old	Child	2008
<i>Child characteristics:</i>			
Child's sex	1 = female, 0 = male	Mother	1986-2008
Child's age	Child's age in months	Mother	1986-2008
Birth order	Birth order	Mother	1986-2008
Birth weight	Birth weight in kilograms	Mother	1986-2008
<i>Family characteristics:</i>			
Family income	Log of total family income, indexed to 2008	Mother	1986-2008
Mother's education	Years of schooling	Mother	1986-2008
Mother's IQ	Mother's score on AFQT test, percentile score	Test	1980
Family size	Total number of children living in mother's household	Mother	1986-2008
Mother's race	Dummy variables for White, Black, Hispanic, and other	Mother	1979

Table A2. Results from Dynamic Models of Parental Cultural Capital Investments. Full Model Specification

Parental cultural capital:	Taken to museum	Taken to Concert/ Theater	Reads to Child	Number of Books	Encourages hobbies
Age range	3-14	6-14	0-9	0-14	6-14
Lagged cultural capital	.052 (.012)***	.030 (.015) [#]	.183 (.021)***	.237 (.012)***	.049 (.015)**
<i>Family characteristics:</i>					
Log family income	.018 (.005)***	.009 (.005) [#]	.018 (.012)	.012 (.003)***	.002 (.002)
Mother's education	.048 (.003)***	.048 (.004)***	.088 (.027)**	.016 (.002)***	.006 (.001)***
Family size	-.022 (.006)***	.003 (.006)	-.285 (.132)*	-.058 (.004)***	-.011 (.002)***
Mother's IQ	.0008 (.0003)**	.003 (.0003)***	.0002 (.0008)	.002 (.0002)***	.0001 (.0001)
White	-	-	-	-	-
Black	.054 (.015)***	.123 (.017)***	-.487 (.113)***	-.186 (.010)***	-.011 (.005)*
Hispanic	-.019 (.016)	-.017 (.019)	-.265 (.042)***	-.169 (.011)***	-.040 (.006)***
Other	-.032 (.018) [#]	-.050 (.021)*	-.121 (.058)*	.001 (.012)	.015 (.007)*
<i>Child outcomes:</i>					
Math test score	.0009 (.0003)**	.0003 (.0003)	-.0002 (.0006)	.0004 (.0002)*	.0001 (.0001)
Reading test score	-.0002 (.0003)	-.0001 (.0003)	-.001 (.001)	.001 (.0002)***	.0003 (.0001)**
Behavior problems	-.002 (.0002)***	-.002 (.0002)***	-.003 (.0005)***	-.0009 (.0001)***	-.0002 (.0001)*
<i>Child characteristics:</i>					
Child's sex (female)	.030 (.010)**	.138 (.012)***	-.274 (.589)	.076 (.007)***	-.0003 (.004)
Child's age	-.002 (.0002)***	-.0006 (.0003)*	-.022 (.002)***	-.005 (.0001)***	.0002 (.0001)
Birth order	-.050 (.006)***	-.034 (.007)***	-.385 (.265)	-.034 (.004)***	-.004 (.002) [#]
Birth weight	-.009 (.009)	.017 (.010)	-.653 (.370) [#]	.012 (.006)*	.006 (.003) [#]

Number of observations	20,817	14,650	10,546	20,512	14,644
Max observations per unit	5	4	3	5	4
Specification tests (p -values):					
AB test for AR(1) in first differences	.000	.000	.000	.000	.000
AB test for AR(2) in first differences	.072	.824	-	.000	.426
Sargan Test	.028	.620	.000	.000	.000

Notes: *** $p < .001$, ** $p < .01$, * $p < .05$, # $p < .10$. Estimator is one-step system GMM. Models also include dummies for survey year (1986-2008).

Table A3. Results from Dynamic Models of Parental Cultural Capital Investments (Taken to Museum, Taken to Concert/Theater). Models Include Contemporaneous and/or Lagged Child Outcomes

Parental cultural capital:		Taken to museum			Taken to Concert/Theater		
Age range	3-14	3-14	3-14	6-14	6-14	6-14	
Lagged cultural capital	.052 (.012)***	.030 (.012)*	.039 (.012)**	.030 (.015) [#]	.023 (.015)	.030 (.016) [#]	
<i>Contemporaneous child outcomes:</i>							
Math test score	.0009 (.0003)**		.0005 (.0004)	.0003 (.0003)		.0003 (.0004)	
Reading test score	-.0002 (.0003)		-.0002 (.0004)	-.0001 (.0003)		-.0002 (.0004)	
Behavior problems	-.002 (.0002)***		-.002 (.0003)***	-.002 (.0002)***		-.002 (.0003)***	
<i>Lagged child outcomes:</i>							
Math test score		.0007 (.0003)*	.0005 (.0003)		.0002 (.0003)	-.0001 (.0004)	
Reading test score		.00004 (.0003)	-.00003 (.0004)		.00005 (.0003)	.00001 (.0004)	
Behavior problems		-.002 (.0003)***	-.001 (.0003)**		-.001 (.0003)***	-.001 (.0003)*	
Number of observations	20,817	16,924	15,426	14,650	14,654	13,369	
Max observations per unit	5	4	4	4	4	4	
Specification tests							
<i>(p-values):</i>							
AB test for AR(1) in first differences	.000	.000	.000	.000	.000	.000	
AB test for AR(2) in first differences	.072	.133	.091	.824	.468	.302	
Sargan Test	.028	.140	.015	.620	.793	.739	

Notes: *** $p < .001$, ** $p < .01$, * $p < .05$, [#] $p < .10$. Estimator is one-step system GMM. Models also control for family characteristics, child characteristics, and dummy variables for survey year (1986-2008), see Table 1.

Table A4. Results from Dynamic Models of Parental Cultural Capital Investments (Number of Books, Encourages Hobbies). Models Include Contemporaneous and/or Lagged Child Outcomes

Parental cultural capital:	Number of Books			Encourages Hobbies		
Age range	0-14	0-14	0-14	6-14	6-14	6-14
Lagged cultural capital	.237 (.012)***	.228 (.013)***	.249 (.014)***	.049 (.015)**	.027 (.015) [#]	.030 (.016) [#]
<i>Contemporaneous child outcomes:</i>						
Math test score	.0004 (.0002)*		.0001 (.0002)	.0001 (.0001)		.0003 (.0004)
Reading test score	.001 (.0002)***		.0014 (.0003)***	.0003 (.0001)**		-.0002 (.0004)
Behavior problems	-.0009 (.0001)***		-.001 (.0002)***	-.0002 (.0001)*		-.002 (.0003)***
<i>Lagged child outcomes:</i>						
Math test score		.0007 (.0002)**	.0004 (.0002)		.0002 (.0001) [#]	-.0001 (.0004)
Reading test score		.001 (.0002)***	.0003 (.0003)		.0002 (.0001)	.00001 (.0004)
Behavior problems		-.001 (.0002)***	-.0006 (.0002)***		-.0002 (.0001)*	-.001 (.0003)*
Number of observations	20,512	16,296	14,839	14,644	14,656	13,369
Max observations per unit	5	4	4	4	4	4
<i>Specification tests (p-values):</i>						
AB test for AR(1) in first differences	.000	.000	.000	.000	.000	.000
AB test for AR(2) in first differences	.000	.028	.039	.426	.665	.302
Sargan Test	.000	.000	.000	.000	.000	.739

Notes: *** $p < .001$, ** $p < .01$, * $p < .05$, [#] $p < .10$. Estimator is one-step system GMM. Models also control for family characteristics, child characteristics, and dummy variables for survey year (1986-2008), see Table 1.

Table A5. Results from Dynamic Models of Child Cultural Capital. Full Model Specification

Child cultural capital:	Reads for enjoyment	Reads book/magazine after school	Belongs to clubs/teams/activities out of school
Age range	6-14	10-14	10-14
Lagged cultural capital	.176 (.016)***	.156 (.053)**	.094 (.051) [#]
<i>Parental cultural capital:</i>			
Taken to museum	.070 (.010)***	.003 (.010)	-.0006 (.010)
Taken to concert/theater	.060 (.011)***	.019 (.010) [#]	.017 (.010) [#]
Number of books	.252 (.012)***	.041 (.011)***	.043 (.010)***
Daily newspaper	.078 (.017)***	.018 (.015)	.075 (.015)***
Musical instrument	.030 (.018) [#]	-.010 (.017)	.066 (.016)***
Encourages hobbies	.188 (.034)***	.037 (.031)	.056 (.031) [#]
<i>Family characteristics:</i>			
Log family income	-.005 (.006)	-	-
Mother's education	.008 (.004)*	-.0006 (.004)	.010 (.004)**
Family size	.042 (.007)***	.005 (.006)	-.017 (.006)**
Mother's IQ	.0007 (.0004) [#]	.0004 (.0003)	.0007 (.0003)*
White	-	-	-
Black	.062 (.019)**	.085 (.020)***	-.009 (.018)
Hispanic	.035 (.021)	.072 (.021)**	-.026 (.021)
Other	-.035 (.023)	.006 (.024)	-.059 (.023)*
<i>Child characteristics:</i>			
Child's sex (female)	.330 (.015)***	.112 (.015)***	.016 (.013)
Child's age	-.004 (.0003)***	-.001 (.0008)	.002 (.0008)

Birth order	-.030 (.008)**	-.018 (.008)*	-.008 (.008)
Birth weight	.009 (.011)	.010 (.012)	.028 (.012)*
Number of observations	15,312	4,436	4,036
Max observations per unit	4	3	3
Specification tests (<i>p</i> -values):			
AB test for AR(1) in first differences	.000	.052	.726
AB test for AR(2) in first differences	.235	-	-
Sargan Test	.045	.349	.308

Notes: *** $p < .001$, ** $p < .01$, * $p < .05$, # $p < .10$. Estimator is one-step system GMM. Models also include dummies for survey year (1986-2008). Mother reads to child cannot be included since it pertains to children age 0-9.

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