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Abstract:
We draw on Pierre Bourdieu's theory of cultural reproduction to develop a formal model of the pathways though which cultural capital acts to enhance children's educational success. We argue that our approach brings conceptual and empirical clarity to an important area of study that hitherto has been short of both. Our model describes how parents transmit cultural capital to their children and how children convert cultural capital into educational success. We review results from existing empirical research on the role of cultural capital in education to demonstrate the usefulness of our model for interpretative purposes and we use NLSY-CYA survey data to test its implications.

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Introduction

Pierre Bourdieu's theory of cultural capital and cultural reproduction 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 that helps them reproduce their privileged socioeconomic position (Bourdieu 1977a, 1984; Bourdieu and Passeron 1990). The theory of cultural reproduction has inspired a great deal of quantitative and qualitative empirical research that addresses the ways in which cultural capital facilitates educational success (for reviews, see Kingston 2001; Sullivan 2002; Lareau and Weininger 2004; van de Werfhorst 2010; Table 1 below).

Despite its enormous popularity, controversy surrounds the theoretical and empirical validity of the theory of cultural reproduction. In particular, critics have argued that core concepts and mechanisms are ill defined (Lamont and Lareau 1988; Kingston 2001; van de Werfhorst 2010): it is unclear exactly what constitutes cultural capital, how cultural capital gets transferred from parents to children, and how it leads to educational and socioeconomic success. This lack of clarity extends to empirical research, which is characterized by highly diverse approaches to measuring cultural capital and assessing its impact on educational success (Kingston 2001; Sullivan 2002; Lareau and Weininger 2004; Goldthorpe 2007; Jæger 2011; Xu and Hampden-Thompson 2012). The absence of theoretical transparency, and the difficulties this causes for empirical research, inevitably raises the question of whether the theory of cultural reproduction can, in fact, provide a useful perspective from which to analyze intergenerational inequalities in educational and socioeconomic outcomes.

In this paper we re-conceptualize the theory of cultural reproduction within a formal model. Debates on the exact meaning of Bourdieu's writings on cultural reproduction have been ongoing for decades (DiMaggio 1982; Lamont and Lareau 1988; Swartz 1997; Kingston 2001; van de Werfhorst 2010) with no sign of consensus, suggesting that effort might better be spent rethinking the core ideas of cultural reproduction rather than attempting to clarify Bourdieu's original thoughts. This is the main objective of our paper. We develop a formal model of cultural reproduction, expressed both verbally and mathematically, in which parents transmit their stock of cultural capital to children through active investments (for example, by taking children to cultural events) and through children's exposure to cultural capital in the home (for example, works of art, music, and literature) and this cultural capital is converted into educational attainments.

Our model rests on a set of behavioral assumptions that are necessary for the theory of cultural reproduction to be consistent, but which are not spelled out in Bourdieu's writings. His theory implicitly imposes assumptions on the desires and behaviors of parents, children, and institutions. For example, it assumes that parents in privileged socioeconomic positions have an intrinsic interest in transmitting their cultural capital to their children, and, furthermore, that they act in different ways to achieve this goal. It is not clear from Bourdieu, however, if parents make deliberate cost-benefit calculations when attempting to transmit their cultural capital to children or whether the intergenerational transmission of cultural capital happens more or less unconsciously. Our model proposes that, given the limitations they face (on money, time and energy), parents try to make the optimal investments in transmitting their cultural capital to children. Consequently, in addition to describing how parents invest in transmitting cultural capital to children, our model also seeks to explain why parents invest the way they do.

Our model addresses another black box in cultural reproduction theory. Although the theory argues that parents transmit cultural capital to children, it does not explain how this

transmission takes place. We draw on recent models of intergenerational transmissions in economics (Todd and Wolpin 2007; Cunha and Heckman 2008; Bisin and Verdier 2011) and treat childhood as a sequence of time periods in which parents invest in transmitting cultural capital to children. In our model, parents may change their investments over time; for example in response to limitations on resources (due to events such as unemployment or illness) or due to investments in other child endowments (for example, cognitive or social skills). Consequently, our model incorporates the idea that the process through which children acquire cultural capital from parents is dynamic.

While we seek to provide a new conceptual framework for analyzing cultural reproduction, we do not claim to have captured every aspect of Bourdieu's thoughts: our model builds on our interpretation of the theory of cultural reproduction. However, the model we propose is flexible, in the sense that it can be extended to cover more complex situations, key parameters can be modified in light of new theoretical or empirical insights, and the behavioral assumptions underlying our interpretation of mechanisms and parameters are open to modification. We hope, therefore, that that it will stimulate research on the potentially complex ways in which cultural capital may facilitate educational and socioeconomic success. Furthermore, because our model is expressed in mathematical terms it is highly transparent, so its empirical implications can readily be derived and empirically tested.

In addition to presenting a formal model of cultural reproduction, we also make several empirical contributions intended to illustrate its usefulness and validity. The first is that we interpret results from existing quantitative and qualitative research on cultural capital and educational success within our model. We believe that this demonstrates its utility as a framework for synthesizing results from a highly heterogeneous literature. Our second contribution is that we provide empirical evidence on the dynamic nature of cultural capital investments. We use

longitudinal data from the National Longitudinal Survey of Youth 1979 – Children and Young Adults (NLSY-CYA) and estimate dynamic panel data models describing how parents invest over time in transmitting their cultural capital to children and how cultural capital affects educational performance. Our findings suggest that children accumulate cultural capital from parents in a dynamic process that lasts throughout childhood and, furthermore, that cultural capital has a positive effect on educational performance. We also find that parents adjust their investments in cultural capital based on what they believe to be the educational payoffs of past investments.

In the next section of the paper we briefly review the basic elements of Bourdieu's theory. Then follows the development of our theory, first in a static, then in a dynamic, form. Our subsequent empirical analyses involve the reinterpretation of previous research in the light of our model and the direct testing of the model using the NLSY-CYA data. In the paper's conclusion we summarize our arguments and results and consider some of the ways in which our model could be extended.

Cultural Reproduction Theory: Basic Building Blocks

The theory of cultural reproduction provides an explanation of the intergenerational reproduction of socioeconomic position. Bourdieu argues that individuals and families possess resources in the form of different types of capital – economic, social, and cultural – that can be invested to generate more resources or converted from one type of capital into another (Bourdieu 1977a, 1986; Bourdieu and Passeron 1990). Economic capital refers to all forms of economic resources (income, wealth, property, etc.), while social capital refers to gainful social networks (Bourdieu 1986).

Although Bourdieu's definition of cultural capital is far from clear (Lamont and Lareau 1988; Kingston 2001; van de Werfhorst 2010), at the most general level it refers to

familiarity with the dominant culture in a society. Lamont and Lareau (1988:156) proposed an influential definition of cultural capital as "… widely shared, high-status cultural signals (attitudes, preferences, formal knowledge, behaviors, goods and credentials) used for social and cultural exclusion." We follow this definition in the present paper. As with economic and social capital, cultural capital is a resource which can be invested in order to promote one's relative position within a social hierarchy populated by individuals with different compositions and amounts of capital. According to Bourdieu, cultural capital exists in three states: *embodied* (linguistic competence, mannerisms, cultural knowledge, etc.), *objectified* (cultural goods, pictures, books, etc.), and *institutionalized* (educational credentials) (Bourdieu 1977a, 1986; Bourdieu and Passeron 1990) and it can contribute to social reproduction in all three states.

According to Bourdieu, cultural reproduction is an important mechanism through which social reproduction takes place. Society is comprised of different *fields*, that is, institutionalized subsystems in which the different types of capital carry different weight (Bourdieu 1986). Education is a major subfield, and one in which cultural capital carries particular power. Bourdieu argues that the educational system is biased towards valorizing cultural capital, ascribing positive qualities to individuals and families who possess it. This institutional bias means that cultural capital, and especially the embodied cultural capital that students put "on display" in school, conveys a false impression of academic brilliance which leads to favorable treatment by teachers and peers and to a higher probability of educational success. Since families in advantaged socioeconomic positions tend to possess more cultural capital than those in less advantaged families, and because children tend to inherit capital from parents, cultural capital contributes to social reproduction by increasing the likelihood of educational success (institutionalized cultural capital) and subsequent socioeconomic success.

Intergenerational Transmission of Cultural Capital

We begin the presentation of our formal model with a simple version describing the intergenerational transmission of cultural capital. We let *C* denote the child's cultural capital and subscripts *c* and *p* respectively the child and parents. For now we assume that there is only one child in the family. Cultural reproduction theory argues that parents possess a stock of cultural capital, and furthermore that they transmit some of this to their child. Transmission of cultural capital takes place through two channels: parents actively investing in transmitting their cultural capital to their child (for example, by taking the child to the theater and by reading to the child) and the child passively acquiring cultural capital via exposure to objectified cultural capital in the home (for example, works of art). The child's acquisition of cultural capital also depends on family resources other than cultural capital (for example, parents' socioeconomic resources) and on the child's academic ability. We let *S* denote parents' total stock of cultural capital and θ the amount that they actively invest in the child. We then write

$$C_c = \beta_1\theta_p + \beta_2 S_p + \beta_3 X_p + \beta_4 A_c + L, \quad (1)$$

which states that the child's cultural capital depends on parents' active investments in transmitting their cultural capital to the child ($\beta_1\theta_p$) and on the child's passive exposure to cultural capital in the home ($\beta_2 S_p$). β_1 is the return (in terms of the child's cultural capital) to parental investments in the child's cultural capital, and β_2 is the "passive" rate of transfer of cultural capital from parents to child. The child's cultural capital also depends on parents' socioeconomic resources X_p, the child's academic ability A_c, and on luck *L*. The relative sizes of β_1 and β_2 are not clear from Bourdieu's writings, but both are assumed to be greater than zero. Although equation 1 describes the mechanism that accounts for the intergenerational transmission of cultural capital, it does not

specify how parents decide how much of their cultural capital to invest in the child (i.e., the investments that generate β_1), and it does not take into account that the child acquires cultural capital in a process that lasts throughout childhood (i.e., the fact that C_c is the outcome of a long sequence of parental investments). Below, we extend the model to address these issues.

Cultural Capital, Educational Success, and Social Reproduction

In addition to arguing that parents transmit cultural capital to children, cultural reproduction theory also claims that children convert their (embodied) cultural capital into educational success (institutionalized cultural capital), which in turn promotes socioeconomic success. Consequently, cultural capital is a means to an end. Bourdieu (1986:247) writes that cultural capital is "… a symbolically and materially active, effective capital insofar as it is appropriated by agents and implemented …" He furthermore writes "… academic success is directly dependent upon cultural capital and on the inclination to invest in the academic market." (Bourdieu 1977a:504).

It is not entirely clear from Bourdieu how children convert their embodied cultural capital into educational success. He argues that the educational system is intrinsically biased towards misconceiving cultural capital as academic brilliance and, as a consequence, children who possess cultural capital use it to present a false impression of brilliance (Bourdieu and Passeron 1990; Moore 2004). Bourdieu uses the concept of the *habitus* to capture the ways in which children's cultural capital, acquired from parents through socialization and manifested in values, tastes, and behaviors, helps to create such a false impression.[1] And although the impression of

[1] Bourdieu defines habitus as "a system of lasting, transposable dispositions which, integrating past experiences and actions, functions at every moment as a *matrix of perceptions, appreciations, and actions*." (Bourdieu 1977b: 82-83, emphasis in original)

academic brilliance produced by cultural capital is false, its consequences are real. In particular, children who possess cultural capital are perceived as more academically gifted than is actually the case (thus leading to better evaluations by teachers and better grades). They are also treated in a more favorable way by teachers leading to a better learning environment and so to better educational performance. Thus, it follows that the main channel through which embodied cultural capital is converted into institutionalized cultural capital (educational credentials) is through educational performance. We now incorporate this idea into our model. Specifically, letting E_c denote final educational attainment, P_c educational performance and *U* luck, we write

$$\begin{aligned} E_c &= \eta_1 P_c + \eta_2 X_p + \eta_3 A_c + U, \\ P_c &= \sigma_1 C_c + \sigma_2 A_c. \end{aligned} \tag{2}$$

Equation 2 states that final educational attainment depends on educational performance, but furthermore that educational performance depends on the child's cultural capital and on academic ability. Consequently, the parameter σ_1 captures the "bonus" to educational performance from the false impression of academic brilliance generated by cultural capital. Cultural reproduction theory tells us that $\sigma_1 > 0$. Furthermore, the parameter η_1 captures the effect of educational performance on final educational attainment (again, net of actual academic ability) and we assume $\eta_1 > 0$.

The final stage in cultural reproduction theory is the link between educational attainment (institutionalized cultural capital) and socioeconomic success. Letting Y_c denote the child's socioeconomic position in adulthood and *Q* luck, we write

$$Y_c = \rho_1 E_c + \rho_2 X_p + \rho_3 A_c + Q_c. \tag{3}$$

In this model cultural capital has no direct effect on socioeconomic success but nevertheless contributes to it by improving educational performance, which in turn facilitates educational success, which directly affects socioeconomic position (so we assume $\rho_1 > 0$).

A Dynamic Model of Cultural Reproduction

The model presented above summarizes the main features of cultural reproduction theory. Equation 1 describes how parents transmit their cultural capital to the child, equation 2 describes how cultural capital is converted into educational success, and equation 3 describes how educational success is converted into socioeconomic advantage. Our model, however, and Bourdieu's writings on cultural reproduction, does not describe the actual processes that lead to the outcomes summarized in equations 1-3. Building on recent models of intergenerational transmissions in economics (Todd and Wolpin 2007; Cunha and Heckman 2008; Bisin and Verdier 2011), we now extend our model to address two important black boxes in Bourdieu's writings: (1) the process through which parents invest in transmitting cultural capital to the child and (2) the process through which the child converts cultural capital into educational success.

A necessary condition for the theory of cultural reproduction to be consistent is that children acquire cultural capital from parents. 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." We take this formulation to suggesting that children accumulate cultural capital throughout childhood and, furthermore, that parents actively seek to transmit their cultural capital to children.

After the child's birth, parents have a finite time horizon in which they can invest in her cultural capital (and in other endowments that facilitate educational success, such as human

capital). Parents seek to transmit as much as possible of their cultural capital to the child, and they begin investing when the child is young. For the purposes of our model we represent childhood as divided into T time periods (t=1,…,T), beginning at birth and ending at the time the child leaves compulsory education (around age 16 in most countries).[2] As described in equation 2, returns to cultural capital are manifest in educational performance, in the form of grades, test scores, or placement in a prestigious educational track. This occurs because cultural capital provides a false impression of academic brilliance, leading to favorable evaluations, more attention and ultimately better performance (captured by the parameter σ_1 in equation 2). However, equation 2 is silent as to the mechanism through which cultural capital is converted into educational performance and we now address that issue. We write

$$\begin{aligned} P_{ct} &= \alpha_1 T_t + \alpha_2 A_c + \alpha_3 X_{pt} + W_t \\ T_t &= \varphi_1 P_{ct-1} + \varphi_2 C_{ct} + V_t \end{aligned} \tag{4}$$

where P_{ct} is educational performance at time t, T_t is teacher inputs (evaluations, attention, etc.), C_{ct} is the child's cultural capital, A is academic ability, and X_{pt} is parental resources. W and V are random errors representing luck and other unmeasured factors that influence performance and teacher inputs, respectively. Equation 4 states that cultural capital affects educational performance by improving teachers' evaluations of the child (via φ_2) that help determine the inputs teachers provide to the child (via α_1). We expect $\varphi_2 > 0$ and $\alpha_1 > 0$. This captures Bourdieu's contention that cultural capital has no intrinsic value but exists solely for the purpose of being converted into other types of resources that promote educational success. Our model also argues that teachers'

[2] Parents may still transmit cultural capital to the child after age 16. However, we interpret Bourdieu as suggesting that the main thrust of parental investments in cultural capital takes place when the child is comparatively young. Also, it may be difficult for parents to transmit cultural capital when the child has left the home, for example to attend higher education. Instead, parents may rely on their economic or social capital.

inputs in period *t* depend on the child's educational performance in the previous period: teachers are not myopic and they adjust their inputs in the child based on her past educational performance (so, we expect $\varphi_1 > 0$). Equation 4 thus describes the process through which embodied cultural capital is converted into educational performance. High educational performance during elementary school leads to high educational attainment (Equation 2), which in turn leads to high socioeconomic status (Equation 3), thus completing the process of social reproduction.

Moving back in the causal chain, we now describe the process through which parents invest in transmitting cultural capital to their child. Parents possess a stock of cultural capital, *S*. In each time period they actively invest amount θ in their child. In addition, the child acquires cultural capital via passive exposure to cultural capital in the home. Finally, given the cumulative nature of cultural capital formation, the child's stock of cultural capital in time *t* also depends on how much cultural capital she had in the previous period. Putting these components together, we write the process through which the child acquires cultural capital

$$C_{ct} = \gamma_1 C_{ct-1} + \gamma_2 \theta_{pt} + \gamma_3 S_p + \gamma_4 X_{pt} + \gamma_5 A_c. \quad (5)$$

Equation 5 states that the child's stock of cultural capital in period *t* depends on her stock in the previous period, parents' active investments in the present period, her passive exposure to cultural capital in the home, parents' socioeconomic resources, and academic ability. Based on cultural reproduction theory we expect $\gamma_1 > 0$, $\gamma_2 > 0$ and $\gamma_3 > 0$. Note that θ_t can be larger than *S* since parents may try to inculcate cultural capital in their child that they do not themselves possess, for example by organizing suitable out of school activities (see Lareau 2003; Yamomoto and Brinton 2010; Lee and Rouse 2011; Buyn, Schofer, and Kim 2012).

What Motivates Parents' Investments?

Equations 4 and 5 describe the processes through which cultural capital is transmitted from parents to the child and how it is transformed into educational success. It is not clear from cultural reproduction theory, however, how parents decide on how much of their cultural capital to invest in each time period and, consequently, the preferences and behaviors that generate the parameters α_1, γ_1, γ_2, and γ_3 are unclear. In the following, we combine the two mechanisms described in equations 4 and 5 and provide a behavioral framework for interpreting these parameters. We assume that parents seek to transmit as much as possible of their cultural capital to the child, but also that they may differ in their beliefs about the returns to investments in cultural capital.

Putting together equations 4 and 5 yields the following expression for the child's educational performance in time period *t*:

$$\begin{aligned} P_{ct} &= \alpha_1[\varphi_1 P_{ct-1} + \varphi_2 C_{ct} + V_t] + \alpha_2 A_c + \alpha_3 X_{pt} + W_t \\ &= \alpha_1\varphi_1 P_{ct-1} + \alpha_1\varphi_2[\gamma_1 C_{t-1} + \gamma_2\theta_{pt} + \gamma_3 S_p + L_t] + \alpha_2 A_c + \alpha_3 X_{pt} + \alpha_1 V_t + W_t \\ &= \alpha_1\varphi_1 P_{ct-1} + \alpha_1\varphi_2\gamma_1 C_{t-1} + \alpha_1\varphi_2\gamma_2\theta_{pt} + \alpha_1\varphi_2\gamma_3 S_p + \alpha_2 A_c + \alpha_3 X_{pt} + \alpha_1\varphi_2 L_t + \alpha_1 V_t + W_t \\ &= m_0 P_{ct-1} + m_1 C_{t-1} + m_2\theta_{pt} + m_3 S_p + m_4 A_c + m_5 X_{pt} + \varepsilon_t. \end{aligned} \tag{6}$$

In this model, the child's educational performance in time *t* depends on her performance in the previous period, her cultural capital, parents' active investments in cultural capital, passive exposure to cultural capital, academic ability, and parental resources, as well as a term capturing luck and all other random influences on performances, ε_t.[3] The weight of each component is captured by the parameter *m* (*m* = 0,…,6). No-one knows the true values of the parameters *m*, but parents have beliefs about all of them originating in past experiences and socialization. Given the available information and their beliefs about *m*, they must choose how much of their stock of

[3] The error term in equation 6 is given by $\varepsilon_t = \alpha_1\varphi_2 L_t + \alpha_1 V_t + W_t$.

cultural capital (*S*) they wish to invest (θ) in each time period. We write the objective function that parents want to maximize in each time period

$$\mu P_{ct} - c(\theta_{pt}). \tag{7}$$

The objective function has two components that reflect the benefits and costs of investing cultural capital in the child's educational performance. The parameter μ captures both altruism (although all parents care about their child's performance, some care more than others) and parents' beliefs about the importance of educational performance relative to other factors that might affect their child's socioeconomic outcomes.[4] The term $c(\theta_{pt})$ is a cost function: it captures the costs associated with investing in the child's cultural capital. Costs principally include time and resources that could have been used for other purposes.

How do parents decide how much of their cultural capital to invest in each time period? We need to make several assumptions in order to provide an answer to this question. Our first is that, given their beliefs about the values of *m*, parents choose the optimum investment, θ^*_{pt}, by finding the value of θ_{pt} that maximizes the objective function described in equation 7. In other words, we assume that parents choose whatever amount of investment they think will yield the highest return for a given cost. Our second assumption is that $\frac{\partial c_c(\theta_p)}{\partial \theta_p}$ is greater than zero. This means that parents incur greater costs the greater their active investment in the child's cultural capital or, in other words, high investments are more costly than low investments. Our third assumption is that parents' relative cost of investing in cultural capital decreases with the size of

[4] Some families may use other means than education to promote social reproduction (for example, social connections or money).

their overall stock of cultural capital, *S*. This means that it is less costly for parents who have a lot of cultural capital to invest in their child's cultural capital compared with parents who have little cultural capital. Combining these assumptions, and letting the term $h\theta$ capture our third assumption that the relative cost of investing in cultural capital decreases when the stock of cultural capital *S* increases (and where *h* is smaller the larger is the stock of parental cultural capital), the optimum investment at time *t* is

$$\theta_{pt}^{*} = \frac{\mu \hat{m}_{2t}}{h}. \tag{8}$$

Here, $\hat{m}_{2t}$ is parents' belief at time *t* in the return (in terms of the child's educational performance) to active investment in the child's cultural capital. Equation 8 shows that the optimum investment at time *t* is given by the combination of parents' beliefs about the returns to investing in cultural capital $\hat{m}_{2t}$ and their altruism μ weighted by the cost of making the investment, which, as noted, is smaller for parents with a greater stock of cultural capital. In other words, the optimum investment is the one that reconciles parents' expectations about which investment will generate the highest return, how much they care about their child's educational performance, and how difficult it is for them to raise the cultural capital needed to make the investment. It also follows from our model that

$$\frac{\partial \theta_{t}^{*}}{\partial S_{p}} > 0; \ \frac{\partial \theta_{pt}^{*}}{\partial \mu} > 0; \ \frac{\partial \theta_{pt}^{*}}{\partial \hat{m}_{2}} > 0,$$

that is, parents invest more when they have a greater stock of cultural capital, when they care more about their child's educational performance, and when they believe that investing in their child's cultural capital has a bigger payoff in terms of educational performance. These behavioral assumptions fit Bourdieu's idea that cultural capital is principally a means for those who possess cultural capital to promote social reproduction.

Lastly we need to consider how parents' beliefs about the returns to cultural capital, $\hat{m}_2$, evolve over time. Bourdieu does not provide any insights into how parents might change their beliefs about the usefulness of investments in cultural capital. Here we make the simple assumption that they update their belief according to the following rule

$$\hat{m}_{2t} = \hat{m}_{2t-1}\left[1+\pi\left(\frac{P_{ct-1}-P_{ct-2}}{\theta_{t-1}-\theta_{t-2}}\right)\right]. \quad (9)$$

Equation 9 captures the idea that if increases (decreases) in cultural capital investments, θ, between one period and the next are associated with increases (decreases) in performance (that is, the sign of $\theta_{t-1}-\theta_{t-2}$ is the same as the sign of $P_{ct-1}-P_{ct-2}$) then parents increase their belief about the size of m_2, whereas, if they have opposite signs, their belief declines. In other words, if investing in cultural capital seems to pay off, parents strengthen their belief in the value of such investments; otherwise, their belief diminishes. The degree to which their belief increases or decreases for a given change in performance, relative to a change in investment, is captured by the adjustment parameter, π. Below, we provide empirical evidence that parents adjust their investments in cultural capital in the present in light of the outcomes of past investments.

We have proposed a formal model that summarizes the core ideas in Bourdieu's theory of cultural reproduction. We have extended Bourdieu's account by addressing two processes that are black boxes in the theory: how parents invest in transmitting cultural capital to the child and how cultural capital is converted into educational success. Finally, we have proposed a simple behavioral framework for analyzing how, in the light of expected costs and benefits, parents decide how much to invest in transmitting their cultural capital to the child.

Empirical Analysis

The empirical part of the paper has two objectives. The first is to demonstrate that results from existing empirical research on cultural capital and educational success can usefully be interpreted within our theoretical model. We review existing empirical research and assess the extent to which results from this research are informative about the key parameters in our model, and especially the parameters in the model describing the intergenerational transmission of cultural capital (equation 1) and in the model describing the effect of cultural capital on educational success (equation 2). We argue that results from existing research are mostly consistent with the assumptions in our model, but also that several important assumptions in our model (and in the theory of cultural reproduction) have yet to be tested.

The second objective is to analyze whether, as our model claims, processes of cultural capital investments and the outcomes of these investments are dynamic. We use longitudinal data from the NLSY-CYA and estimate empirical equivalents of equation 5 (describing the process through which the child accumulates cultural capital over time) and equation 6 (describing the process through which cultural capital is converted into educational performance). Consistent with our theoretical model, we find that processes of cultural capital investments, and the outcomes of these investments in terms of educational performance, can be characterized as dynamic. Furthermore, in order to qualify our idea that parents seek to make optimal investments in cultural capital, we present empirical evidence that parents adjust their investments in the light of the outcomes of past investments.

Results from Existing Research

Table 1 summarizes results from previous empirical research on cultural capital and educational success. We classify this research into three groups. The first addresses the link between parents' and children's cultural capital (equation 1 in our theoretical model). The second, making up the bulk of existing empirical research, deals with the (direct) effect of cultural capital on educational success. Finally, the third group focuses on the ways in which cultural capital is converted into educational success and, in particular, how cultural capital affects teachers' perceptions of children. Together, the second and third groups of studies address the process described in equation 2 in our model. Table 1 also provides information on the operational measures of cultural capital used in each study (distinguishing indicators of, respectively, highbrow cultural participation/objects, reading habits/climate, educational resources, cultural communication, and extracurricular activities), their main findings, and the country in which the study was conducted.

– TABLE 1 HERE –

Most of the studies that address the *transmission of cultural capital from parents to children* include indicators of parents' active investments in cultural capital (cultural activities, communication etc.) and their passive cultural capital (cultural objects, books etc.). Their main finding is that there is a positive effect of parents' cultural capital (both active investments and passive cultural capital) on children's cultural capital net of other factors. In the terminology of our model, there is empirical evidence that β_1 and β_2 in equation 1 are positive and larger than zero.

The second group of studies addresses *the effect of cultural capital on educational success*. Most of this research does not analyze the process through which cultural capital is converted into educational success, but only the outcomes of this process (as shown in equation 2, our model hypothesizes that children use their cultural capital to enhance teachers' perceptions of their academic skills, which in turn leads to better educational performance and subsequent

educational success). Most existing research estimates the direct effect of children or parents' cultural capital on children's academic achievement or educational attainment.[5] Studies that use academic achievement as the outcome measure find that children's cultural capital has a direct positive effect on academic achievement (e.g., DiMaggio 1982; Sullivan 2001; Covay and Carbonaro 2010), thus providing indirect evidence that, as assumed in our model, σ_1 in equation 2 is positive and larger than zero. We are not familiar with any research that attempts to isolate the indirect effect of children's cultural capital on educational attainment running through educational performance (i.e., η_1 in equation 2). However, most research using educational attainment as the outcome measure finds that children's cultural capital has a direct positive effect on educational attainment net of other factors (e.g., DiMaggio and Mohr 1985; Georg 2004; Kaufman and Gabler 2004) and, although the mechanisms are not clear, this research suggests that cultural capital does affect educational success, consistent with the effect captured by η_1.

The third group of studies addresses *the effect of cultural capital on teachers' perceptions of children*. In the terminology of our model, they deal with the mechanisms that generate σ_1 in equation 2. Results from this research are mixed, with some studies finding that, net of children's observed academic ability and other factors, cultural capital has a positive effect on teachers' perceptions of children's skills (Roscigno and Ainsworth-Darnell 1999; Dumais 2006; Dumais, Kessinger, and Ghosh 2012) and others finding no effect (Takei, Johnson, and Clark 1998; Bodovski and Farkas 2008; Wildhagen 2009). Consequently, the evidence on whether σ_1 is larger

[5] Using existing notation, most research in this group estimates either $P_c = \varpi_1 C_c + \varpi_2 \theta_p + \varpi_3 S_p + \varpi_4 X_p + \varpi_5 A_c + \psi$ (if the outcome variable is a measure of academic achievement) or $E_c = \varpi_1 C_c + \varpi_2 \theta_p + \varpi_3 S_p + \varpi_4 X_p + \varpi_5 A_c + \psi$ (if the outcome variable is a measure of educational attainment).

than zero is mixed. In addition to this research, a series of influential studies by Lareau and colleagues demonstrates that parents use extracurricular activities to "cultivate" cultural capital in children and furthermore that they use their cultural capital in interactions with teachers to modify teachers' perceptions of children and to negotiate advantages on behalf of their children (Lareau 1987, 1989, 2003; Lareau and Horvat 1999). These findings suggest that parental inputs may also make up part of the effect σ_1.

There is a comprehensive literature in economics that finds a positive return to education in terms of earnings. However, we are not familiar with any research that seeks to isolate the indirect effect of cultural capital on socioeconomic success running through educational attainment (i.e., institutionalized cultural capital).

Dynamic Analysis of Cultural Reproduction

Our literature review provides empirical evidence on several key parameters in equations 1 and 2, but not on those in equation 3. In the second part of the empirical analysis we use the NLSY-CYA data to estimate empirical equivalents of the key parameters in our dynamic model of cultural reproduction (equations 5 and 6). We also estimate regression models of parents' active investments in cultural capital in which we analyze if parents update their beliefs about returns to investments in cultural capital based on the outcomes of past investments. Unfortunately, because the NLSY-CYA, like many other datasets, lacks information on teacher evaluations of children, we cannot estimate an empirical equivalent of equation 4.

The National Longitudinal Survey of Youth 1979 (NLSY79) is a panel survey of 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 2006a). The National Longitudinal Survey of Youth 1979 – Children and Young Adults (NLSY-CYA), which we use here, is a panel study conducted bi-annually between 1986 and 2010, collecting information on all biological children of female NLSY79 respondents from birth onward (see CHRR 2006b). Children aged 10 and older are themselves interviewed. We use the NLSY-CYA because it includes longitudinal information on cultural capital for NLSY79 mothers and for children aged 10 and older. Our indicators of children's cultural capital are mainly collected from children themselves and, consequently, we focus on children aged 10-14 years old, for most of whom we have three observations. The NLSY-CYA also includes longitudinal information on children's academic achievement and socioeconomic background.

We include four types of variables to capture the core ingredients in our theoretical model. These variables measure (1) the child's cultural capital, (2) parents' cultural capital, (3) the child's educational performance, and (4) socioeconomic background and demographic controls. Table A1 presents detailed information and summary statistics for all variables included in the analysis. We use indicators of cultural capital similar to those used in previous quantitative research (see Table 1).

Child's cultural capital: We construct a composite index intended to proxy the child's cultural capital (*C* in equations 1, 2, and 4-6). The index comprises three items: (1) the mother's report of how much the child reads for enjoyment (1-5 scale); (2) whether the child reports that she typically reads a book or magazine not assigned at school (1 = yes; 0 = no); and (3) whether the child reports that she reads books or magazines for fun on a usual summer day (1 = yes; 0 = no). Our composite index, capturing the child's reading habits, is constructed by first rescaling the indicator of how much the child reads for enjoyment to lie in the range 0-1 and then summarizing

the child's total score on the three variables. In the empirical analysis, we rescale the index to lie in the range 0-1.[6]

Parents' cultural capital: We construct two indicators of parents' cultural capital. The first indicator, *active cultural investments*, is a composite index intended to capture how much parents actively invest in transmitting their cultural capital to the child (θ in equations 1, 5 and 6). The index is made up of five items capturing (1) how often in the last year a family member has taken the child to any type of museum (1-5 scale); (2) how often in the last year a family member has taken the child to any type of musical or theatrical performance (1-5 scale); (3) how many books the child has (1-4 scale); (4) whether the family encourages the child to start and keep doing hobbies (1 = yes; 0 = no); and (5) whether the child get special lessons or does extracurricular activities (1 = yes; 0 = no). The index summarizes parents' response to all five items, and it is rescaled to lie in the range 0-1. The second indicator, *passive cultural capital*, is intended to capture the influence of cultural capital in the home, net of parents' active investments (*S* in equations 1, 5, and 6). We use two indicators to create this index: (1) whether the family gets a daily newspaper (1 = yes; 0 = no) and (2) whether there is a musical instrument in the home which the child can use (1 = yes; 0 = no). The index summarizes parents' responses to these two questions and it is rescaled to lie in the range 0-1.

Educational performance: The NLSY-CYA includes two time-varying indicators of the child's academic achievement, the Peabody Individual Achievement Tests (PIAT) in math and reading recognition. We use these measures as proxies for educational performance (*P* in equations 2-4 and 6). The PIAT Math test was designed to measure the child's attainment in mathematics as

[6] We are aware that our indicator of the child's cultural capital is less than ideal since it only captures one dimension of cultural capital: reading habits. Unfortunately, limitations in the NLSY-CYA mean that we are unable to include more dimensions of cultural capital (e.g., DiMaggio 1982; Dumais 2002; Jæger 2009).

taught in mainstream education. The Reading Recognition test was designed to measure word recognition and pronunciation ability. We use percentile scores for each PIAT test, normed to children's age.

Controls: We include a range of socioeconomic and demographic control variables (*X* in equations 1-6), which are described in Table A1.

In the NLSY-CYA, the indicators of the child's cultural capital, parents' active cultural investments, and the child's academic achievement vary over time (due to repeated observations over the period 1986-2010) and within families (due to the presence of multiple siblings). The indicators of parents' passive cultural capital and socioeconomic characteristics (family income, mother's education, and family size) vary over time but not within families.

Analytical Strategy

We use linear dynamic panel data (DPD) models to estimate empirical equivalents of equation 5 and 6. DPD models are a variant of traditional panel regression models in which present values of the dependent variable are treated as dynamic in the sense that they may depend on past values of the dependent variable, as well as on present and past values of explanatory variables (e.g., Arellano and Bond 1991; Arellano and Bover 1995; Blundell and Bond 1998).

We estimate the following DPD model for the child's cultural capital (equation 5)

$$C_{i,t} = \tilde{\gamma}_1 C_{i,t-1} + \tilde{\gamma}_2 \theta_{i,t} + \tilde{\gamma}_3 S_{i,t} + \tilde{\gamma}_4 X_{i,t} + T + u_i + e_{1i,t}, \quad (10)$$

where $C_{i,t}$ is the child's cultural capital and where *i* indexes individuals (*i = 1,…,N*) and *t* indexes time (*t* = 1986-2010). The $\tilde{\gamma}$'s are parameters to be estimated and the tildes are used to indicate that

these are our empirical estimates of the parameters of equation 5. In this model the child's cultural capital in period *t* depends on her cultural capital in the previous period (thus capturing the idea that cultural capital accumulated in the past affects cultural capital in the present), parents' active cultural investments and passive cultural capital in the present period (θ and *S*, respectively), and parents' resources in the present period (*X*). Unlike equation 5, the DPD model does not include the child's academic ability *A* because we do not have information on ability in the NLSY-CYA. However, the model conditions on the individual-specific fixed effect *u*, which also captures the influence of the child's ability, so *A* is implicitly controlled. Finally, the model includes dummies for survey year *T* (1986-2010) to capture time trends and an error term e_1.

We estimate the following DPD model for the child's educational performance (equation 6)

$$P_{i,t} = \tilde{m}_0 P_{i,t-1} + \tilde{m}_1 C_{i,t-1} + \tilde{m}_2 \theta_{i,t} + \tilde{m}_3 S_{i,t} + \tilde{m}_4 X_{i,t} + T + u_i + e_{2i,t}, \quad (11)$$

where the child's performance on the PIAT math and reading recognition tests in period *t*, $P_{i,t}$, depends on her performance and cultural capital in the previous period, parents' active investments in cultural capital and passive cultural capital in the home, and parents' resources. Again, we do not observe academic ability *A*, but we condition on the individual-specific effect *u*. As before, the model includes dummies for survey year and an error term.

Finally, we use DPD models to substantiate our assumption that parents adjust their investments in cultural capital in light of the outcomes of past investments (described in equations 7-9). We estimate the following model

$$\theta_{i,t} = \tilde{\tau}_1 \theta_{i,t-1} + \tilde{\tau}_2 \theta_{i,t-2} + \tilde{\tau}_3 P_{i,t-1} + \tilde{\tau}_4 (\theta_{i,t-2} * P_{i,t-1}) + \tilde{\tau}_5 S_{i,t} + \tilde{\tau}_6 X_{i,t} + T + u_i + e_{3i,t}, \quad (12)$$

where $\theta_{i,t}$ is parents' active cultural investments in the child in period *t*. Parents' active cultural investments in period *t* depends on their investment in the previous period ($\theta_{i,t-1}$), their investment two periods ago ($\theta_{i,t-2}$), the child's educational performance in the previous period ($P_{i,t-1}$), and an interaction effect between parents' investment two periods ago and the child's educational performance in the previous period (*S*, *X*, *T*, *u*, and *e* are the same as above). The τ 's are parameters to be estimated. The idea is to test whether, as stipulated in equation 9, parents adjust their beliefs about the returns to cultural capital, and thus their active cultural investments in the present, based on the outcomes of past investments. If parents adjust their investments, the coefficient on the interaction term, $\tilde{\tau}_4$, should be positive and statistically significant. Parents know how much they invested two periods ago ($\theta_{i,t-2}$), they observed the outcome of this investment in the child's educational performance in the previous period ($P_{i,t-1}$), and if returns to past investments are positive parents should update their beliefs so as to invest more in the present ($\theta_{i,t}$). Thus, the coefficient on the interaction effect captures the adjustment in parents' active cultural investments in the present that follows from a combination of investments two periods ago and academic performance one period ago.

In terms of identification and estimation, the DPD model removes the fixed effect *u* through first-differencing (thus controlling for fixed individual traits such as innate ability) and instruments the lagged dependent variable by means of its own lag going back one period in the panel (Arellano and Bover 1995). This means that we need data for (at least) three time periods to estimate the DPD model. We estimate the parameters of the DPD models using the standard one-step system GMM estimator implemented in the Stata ado xtabond2 (Roodman 2009). Finally, because the NLSY-CYA includes several children from the same family, we adjust all standard errors for clustering of respondents within families.

Results

Table 2 presents results from DPD regressions of the child's cultural capital (column one) and the child's score on the PIAT math and reading recognition tests (columns two and three). In all models, we use data on three observations for each child collected between ages 10 and 14.

– TABLE 2 HERE –

Results from the DPD model for the child's cultural capital are consistent with the dynamic process described in Equation 5 in our theoretical model. The child's cultural capital (reading habits) in period *t* depends on her cultural capital in the previous period ($\tilde{\gamma}_1 = .341$, $p <$ .001), thus indicating that the child accumulates cultural capital over time. Net of this cumulative effect, we also find a positive and statistically significant effect of parents' active cultural investments in the present period on the child's cultural capital ($\tilde{\gamma}_2 = .144$, $p < .001$), and a positive effect of parents' passive cultural capital ($\tilde{\gamma}_3 = .048$, $p < .01$). Consistent with cultural reproduction theory and our formal model, these results suggest that the process through which the child accumulates cultural capital from parents is dynamic and, furthermore, that parents' active cultural investments and the child's passive exposure to cultural capital both contribute to the intergenerational reproduction of cultural capital.

We now turn to the results for the child's educational performance, as described in equation 6. Columns two and three show results from DPD regressions of the child's math and reading ability (percentile) test scores on the child and parents' cultural capital and on the controls. Results are very similar for the two measures of academic achievement. In addition to test scores in the present period depending on the test score in the previous period (reflecting a cumulative

effect), math and reading ability in the present period also depend on the child's cultural capital in the previous period ($\tilde{m}_{1math} = 4.408$, $\tilde{m}_{1reading} = 6.508$, both $p < .001$), and on parents' active cultural investments in the present period ($\tilde{m}_{2math} = 11.477$, $\tilde{m}_{2reading} = 8.800$, both $p < .001$) and passive cultural capital ($\tilde{m}_{3math} = 5.122$, $\tilde{m}_{3reading} = 4.348$, both $p < .001$). Keeping in mind that the DPD models control for the child's ability, we interpret the positive effect of the child's cultural capital on academic achievement as capturing the effect of the child converting her cultural capital into educational performance. We do not measure the actual mechanisms that generate this effect, but it is consistent with the idea that the child conveys a false impression of academic brilliance which is rewarded by teachers (as stipulated by our assumption in equation 4 that $\varphi_2 > 0$).

Finally, Table 3 presents results for DPD models of parents' active cultural investments. In equation 12 we stipulate that, in addition to other factors, parents' active cultural investments in the present depend on the outcomes of their investments two periods ago, manifested in the child's educational performance one period ago. If parents adjust their investments in cultural capital based on the outcomes of past investments, we expect a positive coefficient on the interaction effect between active cultural investments two periods ago and educational performance one period ago. Table 3 shows results from two model specifications that use, respectively, PIAT math and reading comprehension as the indicators of educational performance. As hypothesized, and net of other factors, we find a positive and statistically significant coefficient on the interaction terms $\theta_{i,t-2} * P_{i,t-1}$ in both models ($\tilde{\tau}_4 = .004, p < .001$). Although only suggestive, these results indicate, as implied by equation 9, that parents invest more in cultural capital in the present if higher investments in the past yielded higher educational performance.[7] In other words, our results are

[7] The main effect on parents' active investments two periods ago is not significant, while the main effect on the child's educational performance is negative and significant. Taken together with the positive interaction term this suggests that

consistent with the idea that parents update their beliefs about the returns to cultural capital based on the outcomes of past investments.

– TABLE 3 HERE –

Conclusion

This paper proposes a formal model that captures the core ideas in Bourdieu's influential theory of cultural reproduction. The main motivation for developing such a model is the lack of consensus in existing research on the interpretation of core concepts and mechanisms in Bourdieu's theory. This seems to us to have had a detrimental effect on research in the past decade, which has been characterized by little theoretical and empirical progress. The theoretical framework we have proposed brings together Bourdieu's ideas and may be used as a basis for interpreting results from previous research and as a conceptual starting point for future research. Our model describes the three components that make up the theory of cultural reproduction: how parents transmit their cultural capital to children, how children convert cultural capital into educational success, and how educational success promotes social reproduction. It extends the theory by describing the process through which parents invest in their children's cultural capital and the process through which children convert cultural capital into educational performance. We also set out the behavioral assumptions on the part of parents, children, and institutions that are required for the theory of cultural reproduction to be consistent but which are not clear from Bourdieu's writings.

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parents' investments in their child's cultural capital remain unchanged if she performs poorly. If, following low parental investment, the child performs well, parents reduce their investment further, perhaps because it seems to be unnecessary to their child's educational success. But if, following relatively high parental investment, their child performs well, parents increase their subsequent investment because, as we argue, they interpret this to mean that investing in their child's cultural capital pays off.

We interpreted the results of existing empirical research in the light of our model and used NLSY-CYA data to illustrate the dynamic nature of cultural capital investments and their implications for children's educational performance. Our literature review suggests that results from previous research are mostly (though not uniformly) consistent with the assumptions of our model, but also that several aspects of cultural reproduction theory have yet to be analyzed. Results from our analysis of the NLSY-CYA data are consistent with the idea that children accumulate cultural capital from parents, that cultural capital has a positive effect on educational performance, and that parents adjust their investments in cultural capital based on the outcomes of past investments.

Our model could be extended in several ways to accommodate a richer conceptual setup. Our model assumes that there is only one child in the family. When a family has more than one child, and assuming that there is a limit on how much a family can invest in all its children's cultural capital and that parents care equally about all their children, investment in children's cultural capital (given by θ_{ipt} where *i* indexes children) will be proportional to parents' belief about each child's m_2 parameter. That is, parents will invest in proportion to how much return their investment is expected to yield, in terms of educational performance, for each child. Children who more effectively translate parental investments into educational performance will receive greater investment than will their brother or sister whose performance is less sensitive to parental investment.

Secondly, our model does not take into account that returns to cultural capital may vary across socioeconomic or institutional contexts. The theory of cultural reproduction implies that not only do children from advantaged socioeconomic backgrounds possess more cultural capital than those from less advantaged families, they also tend to be in schooling environments that place a particularly strong emphasis on cultural capital (e.g., Jæger 2011). Thus, the parameter σ_1 in

equation 2, which captures the effect of the child's cultural capital on educational performance, may be higher in private than in public schools because the former are populated by teachers and peers who misconceive cultural capital as academic brilliance. By contrast, the *cultural mobility* hypothesis, a direct competitor to Bourdieu's cultural reproduction hypothesis, argues that cultural capital is a means for students from disadvantaged families (who also tend to be in disadvantaged schooling environments) to be upwardly mobile (DiMaggio 1982). This hypothesis suggests that returns to cultural capital (captured by σ_1) are higher in low-SES schooling environments than in high-SES environments. Our model could be extended to include these types of institutional heterogeneity, including differences in returns to cultural capital across subfields within the field of education.

Third, our model assumes that parents and children are rational agents who consider the costs and benefits of investing in cultural capital and we presented evidence supporting this hypothesis. Bourdieu is unclear about whether parents make deliberate decisions about investments in their children's cultural capital or whether the transmission of cultural capital from parents to children happens unconsciously. He is equally opaque about the way in which children convert cultural capital into educational performance in school: do they deliberately exploit their cultural capital to impress teachers or do they simply iterate cultural behaviors learnt at home and embedded in the *habitus*? In some texts Bourdieu describes families' strategies for reproducing social status as deliberate and strategic, while in others he describes social hierarchies as the product of families unconsciously reproducing preexisting patterns. We take the position that, in order to be analytically meaningful, a model of cultural reproduction should incorporate parents' resources and beliefs and should be able to account for the impact of these factors on parents' investments in their children.

Lastly, an influential literature argues that, in addition to transmitting their cultural capital to children, parents also use their cultural capital to shape teachers' perceptions of children and to negotiate advantages for their children (e.g., Lareau 1989, 2003; Lareau and Horvat 1999). Parents may volunteer at the school, be active in family-school relationships, or request preferential treatment for their child. These inputs may affect children's educational performance over and above the effect running through the child's cultural capital. Our model, and specifically equations 4 and 6 could be extended to accommodate such direct effects of parents' cultural capital on children's educational performance. Indeed, many plausible extensions of our model are possible. Whether they are necessary is an empirical question.

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TABLE 1
Summary of Results from Previous Research

Study	Dimension of cultural capital	Main Result	Country
Transmission of cultural capital from parents to children:			
Kraaykamp (2003)	R	Positive effect	Netherlands
Georg (2004)	H/R/C	Positive effect	Germany
Kraaykamp and Van Eijck (2010)	H	Positive effect	Netherlands
Yaish and Katz-Gerro (2012)	H	Positive effect	Israel
Cultural capital and educational success:			
Outcome: Academic achievement*			
DiMaggio (1982)	H	Positive effect	United States
de Graaf (1988)	R	Positive effect	Germany
Katsillis and Rubinson (1990)	H	No effect	Greece
Downey (1995)	H/E	Positive effect	United States
Sullivan (2001)	H	Positive effect	United Kingdom
Dumais (2002)	H	Positive effect	United States
Eitle and Eitle (2002)	H/E	Mainly positive effect	United States
Cheung and Andersen (2003)	R	Positive effect	United Kingdom
Barone (2006)	H/C	Positive effect	25 countries
Lee and Bowen (2006)	C	Positive effect	United States
van de Werfhorst and Hofstede (2007)	H	Positive effect	Netherlands
Bodovski and Farkas (2008)	H/R/X	Positive effect	United States
Cheadle (2008)	H/C	Positive effect	United States
Jæger (2009)	H/E/C	Positive effect	Denmark
Wildhagen (2009)	H	Positive effect	United States
Covay and Carbonaro (2010)	X	Positive effect	United States
Flere et al. (2010)	H	Positive effect	Slovenia
Tramonte and Willms (2010)	H/C	Positive effect	28 countries
Gaddis and Payton (2011)	H/R	Positive effect	
Jæger (2011)	H/R/X	Positive effect	United States
Byun, Schofer, and Kim (2012)	H	Positive effect	South Korea
Xi and Hampden-Thompson (2012)	H/C/E	Positive effect	22 countries
Outcome: Educational attainment***			
DiMaggio and Mohr (1985)	H	Positive effect	Denmark
De Graaf (1986)	H/R	Mainly positive effect	Netherlands
Teachman (1987)	E	Positive effect	United States

Graetz (1988)	H	Positive effect	Australia
Kalmijn and Kraaykamp (1996)	H	Positive effect	United States
Aschaffenburg and Maas (1997)	H	Positive effect	United States
Roscigno and Ainsworth-Darnell (1999)	H/E	Positive effect	United States
De Graaf, de Graaf, and Kraaykamp (2000)	H/R	Positive effect	Netherlands
Georg (2004)	H/R	Positive effect	Germany
Kaufman and Gabler (2004)	X	Positive effect	United States
Jæger and Holm (2007)	H/R	Positive effect	Denmark
Evans et al. (2010)	R	Positive effect	27 countries
Yamamoto and Brinton (2010)	H/R	Positive effect	Japan
Effect of cultural capital on teachers' perceptions***:			
Farkas et al. (1990)	Appearance; absenteeism; disruptiveness; work habits	Positive effect of student SES on teacher rating of classroom skills	United States
Takei, Johnson, and Clark (1998)	X	No effect of cultural capital on teacher rating of student's classroom skills	United States
Roscigno and Ainsworth-Darnell (1999)	H/E	Teacher perceptions of student's academic skills mediates some of the effect of cultural capital on academic achievement	United States
Dumais (2006)	H	Positive effect of cultural capital on teacher ratings of student's language and math skills; however, effect for low-SES children only	United States
Bodovski and Farkas (2008)	H/R/X	No effect of index of "concerted cultivation" on teacher rating of student's academic skills	United States
Wildhagen (2009)	H	No effect of cultural capital on teacher rating of student's classroom skills	United States
Lareau, Kessinger, and Ghosh (2012)	Parental	Effect of parental	United States

	involvement (volunteering)	involvement on teacher rating of children's academic skills varies by parental SES	
Lareau (1987, 1989, 2003); Lareau and Horvat (1999)	X	(1) Parents use extracurricular activities to foster cultural capital in children and (2) parents use cultural capital to promote children's success in school; (3) variations in effects by SES and race	United states

Note. * GPA, test scores etc., ** Years of schooling, college completion etc., *** Teachers' perceptions of children's academic ability. Type of cultural capital measure: H = Highbrow/legitimate culture, E = Educational resources/objects, C = Cultural communication/interaction/involvement; X = Extracurricular activities; R = Reading behavior/climate.

TABLE 2
Results from DPD Regressions of Child's Cultural Capital and PIAT Math and Reading Comprehension Test Scores

Dependent variable:	Child's Cultural Capital	Math	Reading Comprehension
Child:			
Lagged academic achievement		.110	.301
		(.032)***	(.033)***
Lagged cultural capital	.341	4.408	6.508
	(.061)***	(1.175)***	(1.158)***
Parents:			
Active cultural investments	.144	11.477	8.800
	(.035)***	(2.472)***	(2.278)***
Passive cultural capital	.048	5.122	4.348
	(.015)**	(1.120)***	(1.104)***
Controls:			
Family income	.0007	.602	.770
	(.004)	(.285)*	(.241)**
Mother's education	-.00004	.827	.785
	(.003)	(.216)***	(.204)***
Mother's AFQT score	.0005	.225	.164
	(.0002)	(.023)***	(.021)***
Family size	.005	-.722	-1.516
	(.004)	(.348)*	(.338)***
Race (ref: White)			
Black	.022	-8.726	-4.989
	(.013)	(1.205)***	(1.113)***
Hispanic	.038	-3.322	1.485
	(.015)*	(1.302)*	(1.239)
Other	-.018	-2.610	.531
	(.018)	(1.479)	(1.279)
Child's sex (dummy for girl)	.090	-4.334	1.178
	(.012)***	(.757)***	(.707)
Child's age in months	-.001	-.262	.032
	(.005)	(.032)***	(.031)
N	4,022	4,143	4,154

Note. Estimator is one-step system GMM. Models also include dummy variables for survey year (1986-2010). Standard errors corrected for clustering of respondents within families.
* $P < .05$.
** $P < .01$.
*** $P < .001$.

TABLE 3
Results from DPD Regressions of Parents' Active Cultural Investments

Measure of educational performance	Math	Reading Comprehension
Lagged active cultural investments:		
Lagged active cultural investments (t_{-1})	.203	.217
	(.025)***	(.025)***
Lagged active cultural investments (t_{-2})	-.096	-.117
	(.065)	(.072)
Lagged academic achievement:		
Lagged PIAT math (t_{-1})	-.002	
	(.0005)***	
Lagged PIAT reading comprehension (t_{-1})		-.002
		(.0005)***
Interaction effects:		
Lagged active cultural investments (t_{-2})* Lagged PIAT math (t_{-1})	.004	
	(.001)***	
Lagged active cultural investments (t_{-2})* Lagged PIAT reading comprehension (t_{-1})		.004
		(.001)***
Passive cultural capital	.084	.084
	(.006)***	(.006)***
Controls:		
Family income	.005	.005
	(.001)***	(.001)**
Mother's education	.009	.008
	(.001)***	(.001)***
Mother's AFQT score	.0004	.0004
	(.0001)***	(.0001)***
Family size	-.011	-.011
	(.002)***	(.002)***
Race (ref: White)		
Black	-.006	-.006
	(.006)	(.005)
Hispanic	-.026	-.025
	(.007)***	(.006)***
Other	-.004	-.004
	(.007)	(.007)
Child's sex (dummy for girl)	.016	.014
	(.003)***	(.003)***
Child's age in months	-.001	-.001
	(.0001)***	(.0001)***
N	9,612	9,597

Note. Estimator is one-step system GMM. Models also include dummy variables for survey year (1986-2010). Standard errors corrected for clustering of respondents within families.
* $P < .05$.
** $P < .01$.
*** $P < .001$.

TABLE A1
Descriptive Statistics and Summary of Variables

Indicators	Response categories	Year(s) collected	Age Range	Mean/ Percent	SD	*N*
Child's cultural capital[a]				.558	.328	12,303
Indicators:						
(1) 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*	1986-2010	6-14			
(2) Child reads book or magazine after school	0 = No; 1 = Yes	1992-2010	10-14			
(3) Child reads books or magazines for fun on a summer day	0 = No; 1 = Yes	1992-2010	10-14			
Parents' active cultural investments[b]				.582	.180	12,153
Indicators:						
(1) How often in the last year 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*	1986-2010	3-14			
(2) How often in the last year 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*	1986-2010	6-14			
(3) Number of books child has	1 = None; 2 = 1 or 2 books; 3 = 3-9 books; 4 = 10 or more books*	1986-2010	0-14			
(4) Family encourages child to take on hobbies	0 = No; 1 = Yes	1986-2010	6-14			
(5) Child gets special lessons/does extracurricular activities	0 = No; 1 = Yes	1986-2010	6-14			
Parents' passive cultural capital[c]				.493	.370	11,941
Indicators:						
(1) Family subscribes to daily newspaper	0 = No; 1 = Yes	1986-2010	6-14			
(2) Musical instrument available in child's home	0 = No; 1 = Yes	1986-2010	6-14			
Academic achievement						
PIAT math	Peabody Individual Achievement Test,	1986-2010	5-14	53.471	28.528	11,871

	percentile score (0-100)					
PIAT reading recognition	Peabody Individual Achievement Test, percentile score (0-100)	1986-2010	5-14	57.807	29.765	11,883
Controls						
Family income (log)	Log of total family income, indexed to 1986	1986-2010		10.754	1.706	10,479
Mother's education	Years of schooling	1986-2010		12.741	2.565	12,268
Mother's IQ	Mother's score on AFQT test, percentile score (0-100)	1980		36.090	28.362	12,303
Family size	Total number of children living in mother's household	1986-2010		2.611	1.207	12,285
Mother's race	Dummy variables for:	1979				
	White			.426		
	Black			.297		
	Hispanic			.179		
	Other			.098		
Child's sex	1 = female, 0 = male	1986-2010		.505	.50	12,303
Child's age	Child's age in months	1986-2010		147.458	17.024	12,285

Note. *N* is child-by-year observations. *N* is defined as all observations with valid response on child's cultural capital. * Variable rescaled to 0-1. Reliability: [a] First factor in Principal Component Analysis (PCA) accounts for 65.1 percent of the covariance between the items in the index (estimates based on polychoric correlation matrix since all indicators are categorical). Cronbach's Alpha is .484, [b] First PCA factor accounts for 44.7 percent of total variance. Cronbach's Alpha is .549, [c] Polychoric correlation between items is .168. Cronbach's Alpha is .193.