Working Paper Series
CSER WP No. 0001

Does Cultural Capital Really Affect Academic Achievement?

Mads Meier Jæger

August 2010

Centre for Strategic Research in Education
DPU, Aarhus University

Does Cultural Capital Really Affect Academic Achievement?

New Evidence from Combined Sibling and Panel Data

Mads Meier Jæger*

This version: 5 July 2010

Abstract:

This paper provides new estimates of the causal effect of cultural capital on academic achievement. I use a difference-in-difference design which addresses the problem of omitted variable bias which has led to too optimistic estimates of the effect of cultural capital on educational success in previous research. After controlling for family and individual fixed effects, I find that (1) cultural capital (measured by indicators of participation in cultural activities, reading climate, and extracurricular activities) has a positive effect on children's reading and math test scores; (2) the effect of cultural capital is generally smaller than previously reported; and (3) the effect of cultural capital varies across different SES groupings. My results also suggest that the effect of cultural capital on academic achievement varies in low-SES and high-SES environments.

* Danish School of Education, Aarhus University, Tuborgvej 164, DK-2400 Copenhagen NV, Denmark. E-mail: mmj@dpu.dk. I gratefully acknowledge funding from the Danish Social Science Research Council (grant 275-07-0046).

Total word count (including footnotes): 7,616, four tables.
Key words: cultural capital, educational success, causal effect, difference-in-difference, United States

Introduction

The core hypothesis in Pierre Bourdieu's famous cultural reproduction theory is that cultural capital, transferred over generations and possessed by families and individuals, is an important resource which contributes to individuals' educational success (e.g., Bourdieu 1977; Bourdieu and Passeron 1990). According to Bourdieu, cultural capital is a scarce resource which equips individuals with knowledge, practical skills, and a sense of "the rules of the game" in the educational system which is recognized and rewarded by institutional gatekeepers and peers.

Many empirical studies have tested the core hypothesis in cultural reproduction theory that cultural capital has a positive, direct effect on educational success. Beginning with DiMaggio (1982), a long series of quantitative papers have found that different measures of cultural capital are positively correlated with academic achievement and with educational attainment (e.g., Cheadle 2008; Crook 1997; De Graaf, de Graaf, and Kraaykamp 2000; DiMaggio and Mohr 1985; Dumais 2002; Farkas, Grobe, Sheehan, and Shuan 1990; Kalmijn and Kraaykamp 1996; Katsillis and Rubinson 1990; Robinson and Garnier 1985; Roscigno and Ainsworth-Darnell 1999; Sullivan 2001; van de Werfhorst and Hofstede 2007). In addition, several both quantitative and qualitative studies have sought to identify the mechanisms through which cultural capital generates educational success, for example via teachers' misconceptions of children's cultural capital as academic brilliance (e.g., Dumais 2006; Wildhagen 2009) or via parents' active investments in children's acquisition of cultural capital (e.g., Jæger 2009; Lareau 2003; Lareau and Horvat 1999; Lareau, Weininger, Swartz, and Zolberg 2004).

While existing empirical research has significantly expanded our understanding of the links between cultural capital and educational success, most studies are ill-equipped to address the perhaps most fundamental hypothesis in cultural reproduction theory: The hypothesis that cultural capital actually *causes* educational success? This critical limitation was pointed out by Kingston (2001) who argued that existing quantitative research is vulnerable to omitted variable bias; that is,

to bias arising from the fact that we almost never observe all the relevant explanatory variables which are correlated with cultural capital and which also affect educational success. Conceptually, omitted relevant variables might pertain to *family* characteristics: for example that families which possess high levels of cultural capital also tend to possess other socioeconomic resources which have a positive effect on children's educational success (e.g., Jæger 2009; Roscigno and Ainsworth-Darnell 1999; Sullivan 2001); or to *individual* characteristics: for example that children who possess high levels of cultural capital typically also possess other skills which promote educational success (for example high innate ability or high educational aspirations). If important family- and individual-specific variables are left out of the analysis, it is likely that we do not estimate the true causal effect of cultural capital on educational success because our cultural capital variables also capture the effect of omitted variables which are correlated with, but conceptually different from, cultural capital. Consequently, the problem of omitted variables pointed out by Kingston (2001) is not principally a methodological problem; it is a problem which has important implications for the validity of substantive conclusions regarding the effect of cultural capital on educational success.

This paper takes a new approach to analyzing if cultural capital affects educational success. The main reason why existing quantitative research is unable to address the problem of omitted variables is that in most cases it employs cross-sectional data and cross-sectional research designs. Cross-sectional data allow researchers to analyze the extent to which variation in individuals' (or families') observed cultural capital is associated with variation in individuals' observed educational outcomes. However, cross-sectional data is insufficiently rich to address the problem of omitted variables because it includes only "between-individual" information. One alternative design is to use sibling data to control for unobserved family-specific effects shared by siblings from the same family (e.g., Hauser and Wong 1989; Sandefur and Wells 1999; Sieben, Huinink, and de Graaf 2001). This "within-family" design deals with *family-specific* unobserved

effects. Another strategy is to analyze longitudinal panel data, i.e., data with repeated observations of the same individual over time. This "within-individual" design deals with *individual-specific* unobserved effects (Halaby 2004).

In this paper I combine the "within-family" and "within-individual" research designs in a difference-in-difference (DID) design. This research design allows me to address both family- and individual-specific unobserved effects when analyzing the effect of cultural capital on academic achievement. I analyze data from the National Longitudinal Survey of Youth – Children and Young Adults survey (NLSY-CYA) which, in addition to cross-sectional "between-individual" data, also includes "within-family" sibling data (because all children in the same NLSY family are interviewed) and "within-individual" panel data (because all children are interviewed repeatedly). By exploiting these multiple sources of variation in academic achievement and cultural capital, I estimate DID regression models which control for all fixed, unobserved characteristics of families and individuals. This research design allows me to analyze if, after taking into account many of the potentially confounding unobserved effects which have led to imprecise estimates in previous research, cultural capital actually affects academic achievement.

The results from the present analysis feed into larger discussions in cultural capital and social stratification research in three regards. First, given the discrepancy between, on the one hand, the widespread *prima facie* acceptance of Bourdieu's cultural reproduction theory and, on the other hand, the limited number of empirical studies which convincingly test the core causal hypotheses in this theory, it is important to mount better empirical tests of cultural reproduction theory. Second, because individuals and families' cultural capital tends to be positively correlated with other types of resources (economic, social, cognitive etc.) which are often only partially observed, it is most likely that previous research has overstated the effect of cultural capital on educational success. Consequently, even if cultural capital does affect educational success, it is

important to provide realistic estimates of the magnitude of this effect. In this paper I present fully standardized estimates of the effect of cultural capital on educational success in previous studies and compare these effect with the ones found in this study. This comparison allows me to assess the substantive (rather than merely the statistical) effect of cultural capital on academic achievement. Third, mainstream social stratification research has so far been slow in adopting research designs which are specifically designed to test causal hypotheses (for summary presentations of some of these designs see e.g., Angrist and Pischke 2009; Morgan and Winship 2007). This situation means that many important theories of socioeconomic inequalities in educational outcomes which include causal hypotheses have yet to be tested using methods designed especially for causal analysis. This paper seeks to contribute to the ongoing proliferation of research which attempts to identify causal effects.

The paper proceeds as follows. In the next section I present the theory of cultural reproduction, previous approaches to measuring cultural capital, and summarize results from existing research. Section 3 describes the data and variables. Section 4 introduces the methodological framework and section 5 presents my empirical results. Finally, section 6 concludes.

Theoretical Background

In this section I present the core ideas in Bourdieu's theory of cultural reproduction. First, I discuss the theoretical mechanisms though which cultural capital generates educational success. Second, I assess various approaches to measuring cultural capital and findings from previous research.

The Concept of Cultural Capital

The concept of cultural capital, and its hypothesized effect on educational success, originates in Pierre Bourdieu's cultural reproduction theory (e.g., Bourdieu 1977; Bourdieu 1984). Bourdieu argued that individuals and families' cultural resources comprise a form of "capital" which should be regarded on equal terms as economic resources (what Bourdieu calls "economic capital") and social networks and connections (called "social capital") (see Bourdieu 1986; Bourdieu and Passeron 1990). Although Bourdieu's definition of cultural capital is rather vague (e.g., Lamont and Lareau 1988; Sullivan 2002), at the most general level cultural capital pertains to knowledge of the dominant conceptual and normative codes inscribed in a culture. Cultural capital is used by individuals or groups positioned at different levels in social hierarchies as a means of either promoting relative social advantage or as a generalized currency which can be exchanged for other economic or social assets. Consequently, cultural capital enables individuals and families with knowledge of institutionalized high-status cultural signals (attitudes, preferences, formal knowledge, behaviors, goods and credentials) to exclude others from advantaged social positions or high-status groups (Lamont and Lareau 1988:156).

Cultural Capital and Educational Success

Cultural capital promotes educational success through different channels (Bourdieu 1977; Bourdieu 1984; Bourdieu and Passeron 1990). First, children inherit cultural capital from their parents, either passively via exposure to parents' cultural capital or actively via parents' deliberate efforts to transfer cultural capital to children (Cheung and Andersen 2003; Lareau 2003). This cultural capital is embedded in children's knowledge, language, and mannerisms; i.e., in what Bourdieu calls their *habitus* (Dumais 2002; Swartz 1997). Thus, cultural capital equips children with cultural endowments and, in its embodied state, with skills with which to demonstrate their cultural endowments.

Second, the educational system is designed to recognize and reward cultural capital. This structural mechanism implies that teachers and other gatekeepers systematically misinterpret children's cultural capital, i.e. their demonstrated familiarity with high-status cultural signals, as manifestations of actual academic brilliance and develop upwardly biased perceptions of children. These upwardly biased perceptions, which have been documented in previous research (e.g., Dumais 2006; Farkas, Grobe, Sheehan, and Shuan 1990), yield positive and possibly accumulative returns because children who possess cultural capital are given preferential treatment by teachers and peers already from very early stages in the educational career. Consequently, returns to cultural capital are symbolic, such as an aura of "academic brilliance," but also concrete such as higher rates of academic development due to preferential treatment and more inputs from teachers and peers.

How to Measure Cultural Capital?

Several approaches to measuring cultural capital, each focusing on cultural capital in its embodied, objectified, or institutionalized forms, have been proposed in the literature. Given the theoretical vagueness of the concept, there is little consensus in the empirical literature about which operational measures come closest to Bourdieu's theoretical concept of cultural capital. However, following DiMaggio (1982) the most frequently used measures of cultural capital in quantitative studies are children or parents' participation in highbrow cultural activities such as going to the museum or concerts or taking arts classes (e.g., Aschaffenburg and Maas 1997; Kalmijn and Kraaykamp 1996; Katsillis and Rubinson 1990; Wildhagen 2009). This approach has been criticized for being too narrow (e.g., Lareau, Weininger, Swartz, and Zolberg 2004), and it has been supplemented by indicators of reading habits or literary climate (e.g., Cheung and Andersen 2003; De Graaf, de Graaf, and Kraaykamp 2000; Georg 2004; Sullivan 2001), educational resources in the home (e.g., Downey 1995; Roscigno and Ainsworth-Darnell 1999; Teachman 1987), extracurricular activities

(e.g., Covay and Carbonaro 2010; Kaufman and Gabler 2004; Lareau 2003), and the frequency of parents' talks with their children about cultural, social, and political issues (e.g., Cheung and Andersen 2003; Downey 1995; Jæger 2009). The different indicators should be seen as proxies for different dimensions of cultural capital: familiarity with legitimate culture, a stimulating literary environment, extracurricular activities which foster cognitive and non-cognitive skills, and they supplement each other. In the present analysis I include indicators of children's cultural participation (going to a museum or to a musical/theatrical performance), reading habits (how many books the child has, how much he/she reads), and participation in extracurricular activities (whether child attends extracurricular activities, whether parents encourage the child to take on hobbies). Consequently, I include indicators of several important dimensions of cultural capital.

-- TABLE 1 ABOUT HERE --

How important is Cultural Capital for Educational Success?

Most previous research finds that empirical measures of cultural capital have statistically significant and positive effects on different measures of educational success (for example academic ability or educational attainment). However, there has been little debate about whether these cultural capital effects are substantively large, as cultural reproduction theory hypothesizes, or whether they are small in comparison with other family background effects.

To provide a meta-analytic review, Table 1 presents fully standardized effects of cultural capital on academic achievement (GPA, test score results, etc.) and on final educational attainment in a range of previous studies. (I only include studies which provide the information needed to calculate fully standardized effects) The fully standardized estimates express the change in the variable measuring educational success (GPA, test scores, years of completed schooling)

measured in fractions of a standard deviation (SD) that follows from a change of one SD in the variable measuring cultural capital. Consequently, although different studies use different data and different measures of educational success and cultural capital, the fully standardized estimates have the same metric and are (at least roughly) comparable. Table 1 also presents fully standardized estimates of an alternative measure of family background in each study such as parents' education or family socioeconomic status (SES), which can be roughly compared with the cultural capital effect.

The overall impression from Table 1 is that there is considerable heterogeneity across existing studies with regard to the effect of cultural capital on educational success. First, estimates of the effect of an increase in cultural capital of one SD on educational success vary from zero to just over .40 of a SD in the distribution of educational success. Second, it seems that in general cultural capital has a stronger effect on measures of academic achievement (GPA, test scores) than on final educational attainment (in most studies measured by years of completed schooling).[1] Third, there is little evidence that certain types of cultural capital measures (for example, those measuring highbrow cultural participation or educational resources) are better predictors of educational success than other measures. Fourth, in most cases the effect of cultural capital is somewhat smaller than, or is approaching the effect of an alternative family background measure (parents' education, SES, etc.). In sum, when compared to other traditional predictors it appears that cultural capital has a non-trivial effect on educational success.

However, the cultural capital effects reported in Table 1 are likely to be upwardly biased because the cultural capital variables used in previous studies also pick up the effect of unmeasured characteristics of families and individuals which affect educational success. This is the substantive research problem which motivates the present analysis. In the next sections I present the

data, variables, and methodological approach with which I wish to address this shortcoming in existing research.

Data and Variables

Data

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

I this paper I follow the NLSY-CYA children when they were between 6 and 14 years old. I use this age restriction because, first, the academic achievement tests which I use as my dependent variables were targeted at children in this age group and, second, information on the cultural capital variables is available for children from age 6 to 14. The NLSY-CYA collects longitudinal information on a range of topics such children's health, peer relationships, cognitive ability, schooling, and on the family environment in which children live. In addition, longitudinal socioeconomic data on mothers can be merged from the main NLSY79 file. The NLSY-CYA is well-suited for my research agenda because, first, in cases where NLSY79 mothers have more than one child I observe multiple siblings from the same family and, second, the NLSY-CYA collects longitudinal data on children which means that I have repeated observation of each child during the

period in which they are 6-14 years old (typically I have around 3 biannual observations per child). Table 2 shows descriptive statistics for all variables used in the analysis.

-- TABLE 2 HERE --

Dependent Variables

My dependent variables which measure academic achievement are children's performance on the Peabody Individual Achievement Tests (PIAT) measuring (1) Reading Recognition, (2) Reading Comprehension, and (3) Math ability. The Reading Recognition test was designed to measure word recognition and pronunciation ability. The Reading Comprehension test was designed to measure the child's ability to derive meaning from sentences that are read silently. The Math test was designed to measure the child's attainment in mathematics as taught in mainstream education. All three PIAT tests have been shown to have high reliability and validity and have been used extensively in previous research (CHRR 2006b:104-111). In the empirical analysis I use as my dependent variables the percentile scores for each PIAT test which are normed by children's age.

Cultural Capital

I use six items from the NLSY-CYA Mother Supplement to measure cultural capital. Following previous research on cultural capital, my items pertain to children's participation in cultural activities (e.g., DiMaggio 1982; Roscigno and Ainsworth-Darnell 1999), reading habits (e.g., De Graaf, de Graaf, and Kraaykamp 2000; Sullivan 2001), and participation in extracurricular activities (e.g., Kaufman and Gabler 2004; Lareau 2003). All information on children's cultural capital was provided by mothers in each survey wave and for each child in the family.

My measures of children's *cultural participation* include two items which measure how often in the last year a family member has taken the child to (1) any type of museum or (2) to any type of musical or theatrical performance (both variables have response categories: 1 = never; 2 = once or twice; 3 = several times; 4 = about once a month; 5 = about once a week or more often). I include these items as indicators of participation in legitimate culture.

My measures of children's *reading habits* include two items which measure (3) 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) and (4) how often the child reads for enjoyment (with response categories: 1 = never; 2 = several times a year; 3 = several times a month; 4 = several times a week; 5 = every day). These items are intended as indicators of the "supply" of a reading climate in the child's home (number of books provided by parents) and the child's "demand" for a reading climate (how much the child reads).

Finally, my measures of *extracurricular activities* include two dummy variables which measure whether the child (5) gets special lessons or belong to any organization that encourages activities such as sport, art, dance, drama etc. and (6) whether the child is encouraged to start and keep doing hobbies (both with response categories: 1 = yes; 0 = no). These items are included as indicators of "concerted cultivation"; i.e., parents' efforts to foster children's talents through organized leisure time activities (e.g., Cheadle 2008; Lareau 2003)

There is quite a lot of variation in the cultural capital variables both within families and within individuals. After adjusting for differences in siblings' age, the mean within-family correlations in the six cultural capital variables range from .26 to .43. The mean within-individual (i.e., over-time) correlations in cultural capital range from .31 to .52. Consequently, there is little evidence that parents tend to provide the same amount of cultural capital to all children in a family and the same amount to each child over time.

Control Variables

In addition to the cultural capital variables, I also include a set of demographic and socioeconomic control variables. These variables include (1) child's age in years at the time of the interview, (2) child's sex (with a dummy variable for girls), (3) mother and father (or mother's male partner's) education measured in years of completed schooling, (4) mother's score on the Armed Forces Qualification Test (AFQT; a measure of cognitive ability, see CHRR 2006a), (5) family income measured in thousands of US dollars and recoded into quintiles, (6) a dummy variable measuring whether the child's biological father is present in the household, (7) family size (number of biological, adopted, and step children in the household of the mother), and (9) race (with dummy variables for White, Black, Hispanic, and other). I also calculate dummy variables to indicate missing values on parents' education, family income, biological father present in the household, and family size.

Empirical Strategy

The objective of the empirical analysis is to estimate the causal effect of the six cultural capital variables on children's academic achievement. The main identification problem is that the cultural capital variables are likely to be correlated with unobserved characteristics of families and individuals which also affect children's academic achievement. Consequently, in a cross-sectional design it is likely that I get (upwardly) biased estimates of the effect of the cultural capital variables because these variables also pick up the effect of unobserved family- and individual-specific characteristics.

The NLSY-CYA includes more information than the data typically used in previous research because, first, in addition to between-individual (i.e., cross-sectional) variation, I also

observe academic achievement for multiple siblings from the same family (i.e., within-family variation) and, second, I observe academic achievement for the same individual at several points in time (i.e., within-individual variation). My baseline model specification is the following linear model:

$$y_{ijt} = \alpha + c_{ijt}\beta_1 + x_{it}\beta_2 + d_{ij}\beta_3 + k_i\beta_4 + \varepsilon_{ijt}, \quad (1)$$

where y_{ijt} measures academic achievement (PIAT test score) for child *i* (*i = 1*,…, *N*) in family *j* (*j* = 1,…,*J*) at time *t* (*t = 1*,…,*T*). There are four types of explanatory variables in this model. The vector *c* contains the cultural capital variables which have subscript *ijt* because they vary both over individuals (different children have different values, thus index *i*), within families (different siblings have different values, thus index *j*) and within individuals over time (children have different values at different points in time, thus index *t*). The *x* variables have subscript *it* because they vary over individuals and time but not within families (the *x* variables are: family income, no biological father present in the child's household, and family size). The *d* variables have subscript *ij* because they vary over individuals and within families but not over time (the *d* variables are: child's sex and age). The *k* variables have subscript *i* because they vary over individuals but not within families or within individuals (the *k* variables are: father and mother's education, mother's AFQT score, and race). Finally, ε_{ijt} is a normally-distributed error term which summarizes the effect of all unobserved variables which also affect academic achievement.

The inferential challenge I face is to estimate the causal effect of the cultural capital variables on academic achievement, i.e. β_1. The main threat to a causal interpretation of β_1 is that, after including the *x*, *d*, and *k* variables, I have not conditioned on all the relevant characteristics of families and individuals which affect academic achievement and which are correlated with cultural

capital. Any potential inability to control for relevant explanatory variables manifests in a correlation between the *c* variables and ε_{ijt} which summarizes the effect of these relevant but unobserved variables. This is the problem of omitted variable bias (e.g., Angrist and Pischke 2009; Halaby 2004).

It is almost always unrealistic to assume that I control for all relevant explanatory variables. Imagine, for example, that I observe family income but not parents' education which is known to be correlated with possession of cultural capital. In this scenario an observed indicator of cultural capital, for example how many books parents have, picks up both the causal effect of how many books parents have (the cultural capital effect) but also, via its correlation with ε_{ijt} which summarizes omitted variables such as parents' education, the effect of other family background characteristics which are different from cultural capital. Since the factors in ε_{ijt} are intrinsically unobserved (I do not know what they are), and the correlation between the cultural capital variable *c* and ε_{ijt} is unknown, all I know is that the estimate of β_1 is biased and does not represent a true causal effect.

However, the model in Equation (1) is more comprehensive than those estimated in previous research because, in addition to between-individual variation (subscript *i*), it also includes within-family and within-individual variation (subscripts *j* and *t*). These extra sources of variation allow me to address the problem of omitted variable bias. Conceptually, one may think of ε_{ijt} as capturing unobserved effects specific to *families* and to *individuals*. If I could condition on these effect in Equation (1) I would be able to obtain unbiased estimates of the causal effect of cultural capital on academic achievement. Because the NLSY-CYA includes variation in academic achievement both within families and within individuals, I can decompose the error term ε_{ijt} in the following way: $\varepsilon_{ijt} = f_j + u_i + \xi_{ijt}$. Now, ε_{ijt} summarizes three types of unobserved effects: time-

invariant (i.e., fixed) effects specific to families, f_j, time-invariant effects specific to individuals, u_i, and random factors ξ_{ijt} which vary over individuals, families, and over time. Substituting into Equation (1) I get

$$y_{ijt} = \alpha + c_{ijt}\beta_1 + x_{it}\beta_2 + d_{ij}\beta_3 + k_i\beta_4 + f_j + u_i + \xi_{ijt} \text{ . (2)}$$

Equation (2) now explicitly controls for fixed, unobserved effects specific to families (f_j) and to individuals (u_i). These effects are not identified with cross-sectional data because there is insufficient variation in this type of data to distinguish between f_j, u_i, and ξ_{ijt}.

Following conventions in econometrics, I can specify f_j and u_i in Equation (2) as either random effects (RE) or fixed effects (FE) (e.g., Halaby 2004; Wooldridge 2002). In the RE specification I assume that, first, f_j and u_i are normally distributed random variables with mean zero and variances σ_f^2 and σ_u^2 and, second, f_j and u_i are uncorrelated with the all the explanatory variables in the *c*, *x*, *d*, and *k* vectors and with ξ_{ijt}. The RE specification may be thought of as a multilevel level with observations of academic achievement nested within individuals and individuals nested within families. However, although useful the assumption in the RE model that the random effects which summarize unobserved family- and individual-specific effects are uncorrelated with the observed explanatory variables is highly unrealistic. Using the hypothetical scenario presented above in which I observe family income but not parents' education, this assumption entails that the observed cultural capital variable (how many books parents have) is completely unrelated to the random effect capturing unobserved family-specific effects (and also the effect of parents' education).

The FE specification provides a more credible approach. In this specification I transform the data to eliminate (rather than estimate) f_j and u_i. I am principally concerned with family-specific unobserved effect f_j, i.e., the possibility that factors specific to families are correlated with both how much cultural capital families possess and with children's academic achievement. Under the assumption that f_j is fixed over time (which also applies in the RE), I can rearrange Equation (2) into a within-family regression by subtracting the within-family mean of all variables which vary within families

$$(y_{ijt} - \bar{y}_j) = (c_{ijt} - \bar{c}_j)\beta_1 + x_{it}\beta_2 + (d_{ij} - \bar{d}_j)\beta_3 + (f_j - f_j) + u_i + (\xi_{ijt} - \bar{\xi}_j), \quad (3)$$

leaving

$$(y_{ijt} - \bar{y}_j) = (c_{ijt} - \bar{c}_t)\beta_1 + d_i\beta_3 + u_i + (\xi_{ijt} - \bar{\xi}_j), \quad (4)$$

which can be expressed more compactly using a difference operator as

$$\Delta^j y_{it} = \Delta^j c_{it}\beta_1 + \Delta^j d_i\beta_3 + u_i + \Delta^j \xi_{it}. \quad (5)$$

In Equation (5) Δ^j refers to transformed variables in which the family-specific mean has been subtracted for each observation, thus eliminating subscript *j*. Equation (5) is a *within-family* FE regression model in which all family-specific unobserved factors are washed out by design. It also follows from Equation (5) that the effect of variables which do not vary within families, here *x* and *k* (but not *d*), are subsumed into the family fixed effect and cannot be determined. The within-

family model in Equation (5) is important because, first, it controls for family-specific unobserved effects and, second, it yields unbiased estimates of the effect of the cultural capital variables on academic achievement *even if* the unobserved family-specific effects are correlated with the cultural capital and the *d* variables. The latter quality of the FE arises because the fixed effects are "washed out" by design instead of "conditioned on" (as in the RE).

Unfortunately, Equation (5) still includes the individual-specific effect u_i which may bias my estimates of β_1. Suppose, for example, that within a family an academically gifted sibling receives more books from her parents than a less gifted sibling, and furthermore that the gifted sibling is also more likely to perform well on the PIAT tests. Since I do not observe each sibling's innate academic ability, I would likely overestimate the effect of how many books the child has on academic achievement because provision of books is positively correlated with the child's innate ability. Fortunately, I can deal with the individual-specific effect because the NLSY-CYA also includes repeated measures of academic achievement and cultural capital for each child; i.e., data in dimension *t*. To eliminate u_i I can further rearrange Equation (5) by subtracting within-individual means for each observation

$$(\Delta^j y_{it} - \overline{y}_i) = (\Delta^j c_{it} - \overline{c}_i)\beta_1 + (\Delta^j d_i - \overline{d}_i)\beta_3 + (u_i - u_i) + (\Delta^j \xi_{it} - \xi_i), \quad (6)$$

which can be expressed more compactly as

$$\Delta^{ji} y_t = \Delta^{ji} c_t \beta_1 + \Delta^{ji} \xi_t . \quad (7)$$

Equation (7) is a "within-family, within-individual" or difference-in-difference (DID) regression model which has differenced out all fixed, unobserved effects specific to families and to individuals

(e.g., Angrist and Pischke 2009; Morgan and Winship 2007). Conceptually, the DID model can be thought of as a regression model which includes an intercept for each family and an intercept for each child. In this DID model the only variables whose effects on academic achievement I can identify are the cultural capital variables *c* because these variables vary both within families *and* within individuals. Fortunately, I am only interested in the effects of the cultural capital variables. It should be kept in mind that while the effect of the *x*, *d*, and *k* variables are indistinguishable from the family- and individual-specific effects, this is not a problem because, first, I have no substantive interest in the *x*, *d*, and *k* variables (they are controls) and, second, the DID model automatically controls for *all* factors specific to families and individuals which affect academic achievement (and not only the variables which happen to be observed in *x*, *d*, and *k*). This quality makes the DID specification particularly robust to omitted variable bias.[2]

In the empirical analysis I estimate DID models using only NLSY families with at least two children (otherwise there is no within-family variation) and children with at least two observations on the outcome variables (otherwise there is no within-individual variation). All analyses were carried out using Stata.

-- TABLE 3 HERE –

Results

This section presents result from the empirical analysis. I run regressions of academic achievement, as measured by the PIAT reading recognition, reading comprehension and math percentile scores on the cultural capital variables (and controls). My analytical strategy is to first estimate baseline Ordinary Least Squares (OLS) regression models which include the cultural capital and the control variables. These baseline models are conceptually similar to the ones estimated in most previous

research. I then proceed to estimate DID models which control for unobserved family- and individual-specific effects. Finally, I estimate DID models in different sub groups defined by parental SES to assess heterogeneity in the effect of cultural capital on academic success.

Table 3 summarizes results from the baseline OLS and DID models for all three outcome variables. The first column shows the estimated effects of the six cultural capital variables on academic achievement from the baseline OLS specification (the table omits the effects of the control variables, results available upon request). Numbers in brackets are fully standardized regression coefficients which are comparable to those from previous studies shown in Table 1. The second column shows results from the DID models.

Results from the baseline OLS models, which also include the other child and family background characteristics shown in Table 2, suggest that cultural capital has a statistically significant effect on PIAT reading recognition, reading comprehension, and math percentile scores. In particular, my indicators of children's reading climate and reading habits: number of books and the extent to which children read for enjoyment, are highly significant predictors of both reading and math achievement. The fully standardized effects of these variables range from .09 to .15 and are similar to those found in previous studies (see Table 1). This result fits cultural reproduction theory arguing that children benefit from parents' investments in promoting children's cultural and cognitive endowments. The indicators measuring cultural participation tend not to predict academic achievement (and in the model for reading recognition there is a negative relationship between the frequency of museum attendance and test scores in the OLS model). These results accords with De Graaf et al. (2000) who found that reading climate in the home (captured by parents' reading behavior in their study) was more strongly associated with children's educational success than parents' participation in highbrow cultural activities (see also Cheung and Andersen 2003; Sullivan 2001), and with Lareau et al. (2004) who argued that highbrow culture is only a sub component in

Bourdieu's concept of cultural capital. Finally, the baseline models also consistently show that participation in extracurricular activities (but not whether the child is encouraged to take on hobbies) has a positive effect on academic achievement (e.g., Cheadle 2008; Covay and Carbonaro 2010; Lareau 2003).

The second column of Table 3 shows results from the DID models. These models rely exclusively on variation within families *and* within individuals (i.e., variation from each child's deviations from his/her over-time mean on the cultural capital and academic achievement variables and the deviation of this deviation from the mean cultural capital and academic achievement level in the child's family), and they control for fixed, unobserved characteristics of families and individuals.

The DID models suggest that, first, even after controlling for family- and individual-specific unobserved effects there is clear evidence of a causal effect of cultural capital on academic achievement. Second, my results show that the effect of cultural capital is considerably weaker than suggested in the initial analysis. The reading climate variables remain highly significant predictors of reading recognition and comprehension test scores and, in the case of the extent to which the child reads for enjoyment, also of math test scores. However, in most cases the fully standardized effects are less than half of those in the baseline models (.03-.07 compared to .09-.15). The exception to this trend is the effect of the number of books the child has on reading comprehension which is found to be larger in the DID models than in the baseline models (fully standardized effect .133). Together, results from the DID models support cultural reproduction theory arguing that exposure to a literary climate in the home and internalization of literary interests has a positive effect on children's academic achievement (De Graaf, de Graaf, and Kraaykamp 2000). My analysis also shows that cultural participation, measured by frequency of going to museums and to concerts, is mostly unrelated to academic success.

In addition to these results, I also find that the estimated effects of extracurricular activities and whether the child is encouraged to take hobbies differ dramatically between the DID and the baseline OLS models. In the OLS models participation in extracurricular activities was found to have a highly significant positive effect on all three measures of academic achievement. These results follow expectations from cultural reproduction theory and results from previous research (e.g., Covay and Carbonaro 2010; Kaufman and Gabler 2004; Lareau 2003). In the DID models, however, I find that participation in extracurricular activities has a highly significant *negative* effect on reading comprehension test scores, a positive effect on math test scores and no effect on reading recognition test scores. The most likely explanation of the negative effect on reading comprehension test scores is that parents who are advantaged in terms of socioeconomic and cultural resources, but who have academically weak children use extracurricular activities as a means of improving children's academic performance. Thus, rather than extracurricular activities acting as a form of concerted cultivation which benefit children's academic achievement, my results suggest that children who participate in extracurricular activities tend to be academic low-performers.[3] I qualify this conclusion below by showing that there are important socioeconomic gradients in the effect of extracurricular activities on academic achievement.

-- TABLE 4 HERE --

So far the analysis shows that cultural capital has a causal effect on educational achievement even after I control for unmeasured characteristics of families and individuals. This is an important result. The next step in the analysis is to examine effect heterogeneity. Unfortunately, while the DID approach is very powerful in terms of controlling for unobserved effects its main limitation is that the effect of socioeconomic and demographic control variables which do not vary

both within families and within individuals are indistinguishable from the family and individual fixed effects. Consequently, when using the DID approach I cannot directly compare the effects of the socioeconomic variables with the effects of the cultural capital variables. However, I can assess socioeconomic heterogeneity in the effects of the cultural capital variables on academic achievement by estimating separate DID models in different sub groups in the data. This type of analysis allows me to analyze if cultural capital works in different ways across the distribution of SES, which has been suggested by previous research (e.g., Covay and Carbonaro 2010; DiMaggio 1982; Dumais 2006).

Table 4 shows fully standardized effects of the cultural capital variables from DID models estimated in sub groups defined by father's education (two groups), family income (three groups), and mother's AFQT score (three groups).[4] Further disaggregation was not possible due to low numbers of observations. The sub group analysis reveals five interesting patterns.

First, cultural participation (going to museums or concerts) has a statistically significant and positive effect on academic achievement in high-SES environments (defined by higher values on father's education, family income, and mother's AFQT score) but no effect in low-SES environments. This result suggests that legitimate culture is only rewarded in high-SES environments in which parents, peers, and gatekeepers possess and recognize this type of cultural capital. Furthermore, children who live in high-SES environment are likely to attend schools in which teachers and peers value highbrow cultural capital, which might also help to explain this effect. By contrast, familiarity with legitimate culture is not rewarded in low-SES environments, possibly because there is only little of this type of cultural capital in these environments and it does not carry any symbolic weight.

Second, in the DID models for reading achievement I find that the effect of how much children read for enjoyment is consistently (and statistically significantly) stronger in high-SES

environments than in low-SES environments. A possible explanation of this finding might relate to the differential supply of literary cultural capital in low- and high-SES environments and to differences among children with respect to their ability to internalize this capital (e.g., Cheung and Andersen 2003; Jæger 2009). The supply of literary cultural capital is generally higher in high-SES environments than in low-SES environments. Assuming that children's innate ability to internalize cultural capital is the same in the two environments, there will on average be less variation in children's literary cultural capital (captured by how much they read) in low-SES environments than in high-SES environments because there is less of this type of cultural capital for children in low-SES environments to internalize. Consequently, the reason why the effect of children's reading behavior is particularly strong in high-SES environments might be that children in these environments differ more in terms of how much of the available cultural capital they are able to internalize compared to children in low-SES environments (thus leading to more internal differentiation and stronger effects).

Third, I find a complementary pattern of results regarding the effect of the child's number of books. In the models for reading recognition test scores there is clear evidence that number of books has a stronger effect on test scores in low- and medium-SES environments than in high-SES environments (number of books is not significant in any of the groups which identify a high-SES environment). Interestingly, in high-SES environments the supply of a reading climate (captured by number of books) does not affect children's reading recognition test scores. However, as shown above children's ability to internalize the literary cultural climate in their home (captured by how much they read) has a strong effect in high-SES environments. In low-SES environments I observe the opposite effect: The supply of a reading climate (number of books) is relatively more important than children's ability to internalize this type of cultural capital (measured by how much they read). These results suggest that in low-SES environments children benefit from being exposed

to a literary climate (having books) but the extent to which they are able to internalize this climate (how much they read) is of lesser importance. By contrast, in high-SES families the supply of a literary climate is not very important in itself (possibly because most high-SES families provide an adequate literary climate), but the extent to which children are able to internalize and exploit this cultural capital (a child-specific attribute) is important.

Fourth, the effect of participating in extracurricular activities on academic achievement is more complex than initially assumed. In the DID models for reading recognition test scores I find some evidence of negative effects (or evidence of reverse causality) in low-SES environments but no effects in high-SES environments. Furthermore, in the models for reading comprehension I find that the negative relationship between participating in extracurricular activities and achievement appears to be stronger in low-SES environments than in high-SES environments. Finally, in the models for math performance I find a positive effect of extracurricular activities in high-SES environments but no effects in low-SES environments. Together, these patterns suggest that, at least with respect to reading achievement, low-SES parents are more prone to using extracurricular activities (or special lessons) to help academically poor performing children compared to high-SES parents who may use other activities to improve children's academic achievement. Alternatively, it may be that low-SES parents provide low-quality extracurricular activities to their poorly performing children (perhaps due to financial constraints), which explains the observed negative association between extracurricular activities and reading performance. (Unfortunately, the NLSY-CYA does not include information on which extracurricular activities children attend and, consequently, I cannot provide strong conclusions in this regard) My results for math ability suggest that children in high-SES environments benefit from extracurricular activities, whereas children in low-SES environments do not. It may be that high-SES parents are better able than low-SES parents to pick out extracurricular activities which are beneficial to children's math

achievement. Alternatively, it may be that because math achievement is more strongly related to "hard" skills (knowing a fixed curriculum, little room for interpretation, etc.) than to "soft" skills such as those transmitted via a literary climate, high-SES parents use extracurricular activities strategically as a means of compensating their "soft" cultural capital inputs.

Fifth, encouraging children to take on hobbies has a positive effect on reading comprehension and math achievement in low- and medium-SES environments but no effect in high-SES environments. A possible explanation of this finding might be that parental encouragement to take on hobbies is a better indicator of parental investments in children's cultural capital in low-SES/low cultural capital environments than in high-SES environments in which other types of cultural capital are more important (knowledge of legitimate culture, internalization of a literary climate, etc.).

Discussion

This paper provides new evidence on an old issue: does cultural capital affect educational success? Cultural reproduction theory argues that cultural capital should have a direct causal effect on educational success because those who possess cultural capital are positively discriminated against in the educational system and, as a consequence, they develop better skills and fare better in life.

While there is widespread *prima facie* support for cultural reproduction theory, existing quantitative research has been limited in its ability to adequately test the core causal claims in cultural reproduction theory. The main reason for this limitation is that the effect of cultural capital variables found in existing studies cannot be attributed *exclusively* to cultural capital because these effects most likely also capture the effect of omitted family and individual characteristics which are correlated with, but substantively different from, cultural capital. As a consequence, existing research has most likely overstated the effect of cultural capital on educational success.

In this paper I use data from the NLSY-CYA survey to estimate difference-in-difference (DID) models which control for fixed, unobserved characteristics of families and individuals. This research design provides a much stronger basis than previous research for testing whether cultural capital actually affects academic achievement.

I find that, first, children's cultural capital, captured by six indicators measuring cultural participation, reading habits, and participation in extracurricular activities, has (mostly) positive effects on children's reading recognition, reading comprehension, and math test scores. Consequently, my results support the core hypothesis in cultural reproduction theory that cultural capital matters. Second, I find that the effect of cultural capital on academic achievement is generally smaller than previously suggested. Consequently, while cultural capital has a statistically significant effect on academic achievement, its substantive impact in terms of explaining educational inequalities is modest. Third, I find that the effects of the different dimensions of cultural capital vary systematically across the distribution of SES. These results point to heterogeneity in the effect of cultural capital on academic achievement which should be explored in future research. Participation in legitimate culture affects academic achievement in high-SES environments only; i.e., in environments which recognize this type of cultural capital. This "local" effect of highbrow cultural capital presents an interesting extension of previous research which tends to find no effect of highbrow cultural capital (e.g., De Graaf, de Graaf, and Kraaykamp 2000). I also find that the provision of a reading climate (measured by the number of books a child has) matters more in low-SES environments than in high-SES environments, while the extent to which children internalize this literary climate (measured by how much the child reads) matters more in high-SES environments. This result extends existing research by pointing out that the effect of a family's reading climate on children's educational success has two dimensions: the extent to which parents provide a reading climate (a quantity dimension) and the extent to which children

internalize this climate (a quality dimension), and furthermore that the relative significance of each dimension varies across SES environments. Future research should explore why providing books is enough to generate a positive effect on academic achievement in low-SES environments, while this is not a sufficient condition in high-SES environments.

Finally, several limitations in the present analysis should be highlighted. First, the main contribution of this paper is to provide more credible estimates of the direct effect of cultural capital on academic achievement than those reported in previous research. However, my analysis does not identify the substantive mechanisms which generate this direct effect. Identifying the mechanisms through which cultural capital operates, for example via teachers' perceptions of children (e.g., Dumais 2006) or parents' educational strategies (e.g., Lareau 2003), is a crucial task for future research. Second, while my methodological approach controls for fixed, unobserved characteristics of families and individuals it does not account for *time-varying* unobserved characteristics which affect academic success. Suppose, for example, that a child's academic ability becomes gradually apparent to parents, and parents adjust their inputs in the child accordingly. Such a mechanism would entail that the process of cultural capital accumulation is dynamic and not static. Existing quantitative research is inherently static in that (at varying levels of sophistication) it counts the amount of cultural capital in the home of origin and relates this measure to some measure of subsequent educational success. This type of approach does not capture the dynamics of how parents invest cultural capital in children during childhood, how children accrue cultural capital, and how these processes jointly generate educational success. Qualitative research on cultural capital, on the other hand, is much better able to describe these dynamics but lacks the ability to generalize results. Future quantitative research should draw on insights from qualitative research on mechanisms (e.g., Lareau 2003) combined with recently developed dynamic models of parental

investments (e.g., Cunha and Heckman 2008; Todd and Wolpin 2007) to study the process of cultural reproduction.

Table 1. Summary of Fully Standardized Effects of Cultural Capital on Educational Success in Previous Studies

Study	Fully standardized effect of cultural capital measure(s)	Cultural capital measure(s)	Fully standardized effect of family background measure	Country
	Outcome: GPA/Test Scores			
DiMaggio (1982)	.018^{m}/.020^{w} [Overall GPA]	H	.005^{m,ns}/.004^{w,ns} [FED]	US
	.142^{m}/.217^{w} [English Grades]	H	.055^{m,ns}/.104^{w,ns} [FED]	
	.124^{m}/.158^{w} [History Grades]	H	.010^{m,ns}/.009^{w,ns} [FED]	
Downey (1995)	.077/.103/.086	E/H/H	.045 [MSC]	US
Roscigno and Ainsworth-Darnell (1999)	.067/.071/.053 [MRCT]	H/H/E	.272 [FSES]	US
	.012/.050/.043 [Overall GPA]	H/H/E	.193 [FSES]	
Dumais (2002)	.033^{m}/.075^{w}	H	.167^{m}/.102^{w} [FSES]	US
Eitle and Eitle (2002)	.506/-.126^{ns}/.421 [MRCT]	H/H/E	.758 [FSES]	US
	.042^{ns}/.014^{ns}/-.056^{ns} [Overall GPA]	H/H/E	.028^{ns} [FSES]	
Jæger (2009)	.051/.022^{ns}/.259/-.059	H/E/C/C	.098 [FED]	Den-mark
Flere et al. (2010)	.349	H	-.019 [FES]	Slovenia
	Outcome: Educational Attainment			
DiMaggio and Mohr (1985)	.186^{m}/.190^{w}	H	.087^{m}/.128^{w} [FED]	US
De Graaf (1986)	.177/.313	R/H	.153 [FES]	The Nether-lands
Teachman (1987)	.017^{m,ns}/.030^{w}	E	.104^{m}/.062^{w} [FED]	US
Graetz (1988)	.077^{ch1}/.112^{ch2}/.052^{ch3}	H	.105^{ch1}/.076^{ch2}/.030^{ch3} [FED]	Aus-tralia
Kalmijn and Kraaykamp (1996)	.081	H,R	.042 [FED]	US
De Graaf et al. (2000)	.062/.012^{ns}/.053	H/H/R	.828 [FED]	The Nether-lands
Georg (2004)	.225	H,R	.638 [FED]	Ger-many

Note: All effects significant at $p < .05$ unless otherwise stated. Abbreviations: ^{m} estimate is for men, ^{w} estimate is for women, ^{ch1} estimate is for cohort born before 1949, ^{ch2} estimate is for cohort born 1950-69, ^{ch2} estimate is for cohort born 1970 or later, ^{ns} estimate is not significant at $p < .05$. Type of cultural capital measure: H = Highbrow culture, E = Educational resources/objects, C = Cultural communication/interaction, R = reading behavior/climate. MRCT = Math-reading composite test score, GPA = Grade Point Average. Family background measure used: FED = Father's/parents' education, FSES = Family SES, MSC = Money saved for college, FES = Subjective family economic status.

Table 2. Descriptive Statistics in NLSY-CYA Sample

	Mean	Standard Deviation	*N*
PIAT Percentile Scores:			
Reading Recognition	57.35	28.60	29,987
Reading Comprehension	52.01	27.81	25,633
Math	50.74	27.82	30,109
Cultural Capital:			
Taken to museums	2.22	.95	24,532
Taken to concerts	1.89	.89	24,522
Number of books	3.60	.73	24,562
Reads for enjoyment	3.82	1.11	24,346
Extracurricular activities	.59	.49	24,523
Encouraged to take hobbies	.91	.29	24,537
Control Variables:			
Child's age	11.94	6.97	78,664
Child's sex	.49	.50	114,690
Father's education	13.04	2.73	59,262
Mother's education	12.50	2.56	89,937
Mother's AFQT score	34.32	28.07	114,690
Family income in quintiles	5.29	2.92	75,540
Biological father not present in household	.41	.49	64,083
Family size	2.14	1.36	90,156
Race:			
White	.43	.50	114,690
Black	.27	.44	114,690
Hispanic	.17	.38	114,690
Other	.13	.33	114,690
Missing data, father's education	.48	.50	114,690
Missing data, mother's education	.22	.41	114,690
Missing data, family income	.34	.47	114,690
Missing data, father not present	.44	.50	114,690

Note: *N* is total child-by-year (1986-2006) observations. *N* is high for some control variables (for example, child's sex, *N* = 114,690) because all children have valid observations in all years. *N* is lower for the dependent variables because only some children are eligible for taking the PIAT tests in the different years.

Table 3. Summary of Regression Results. Unstandardized Regression Coefficients and Fully Standardized Regression Coefficients in Brackets

	Reading Recognition		*Reading Comprehension*		*Math*	
	OLS	DID	OLS	DID	OLS	DID
Taken to museums	-.738**	-.139	-.384	.513*	-.218	.145
	(.264)	(.171)	(.250)	(.223)	(.251)	(.200)
	[-.025]	[-.005]	[-.013]	[.018]	[-.007]	[.005]
Taken to concerts	-.393	.197	-.441	-.244	-.122	.307
	(.288)	(.183)	(.265)	(.221)	(.257)	(.200)
	[-.013]	[.007]	[-.015]	[-.008]	[-.004]	[.007]
Number of books	3.296***	1.022***	2.638***	3.880***	2.748***	.111
	(.418)	(.253)	(.373)	(.315)	(.351)	(.278)
	[.109]	[.034]	[.090]	[.133]	[.094]	[.004]
Reads for enjoyment	4.542***	1.461***	4.259***	1.962***	2.755***	.721***
	(.218)	(.162)	(.209)	(.196)	(.194)	(.159)
	[.151]	[.049]	[.145]	[.067]	[.094]	[.025]
Extracurricular activities	2.711***	-.299	1.966***	-1.063***	3.922***	.520**
	(.520)	(.172)	(.476)	(.191)	(.487)	(.181)
	[.090]	[-.010]	[.067]	[-.036]	[.134]	[.018]
Encouraged to take hobbies	-.441	-.190	-.059	.621***	.279	.275*
	(.770)	(.130)	(.743)	(.136)	(.734)	(.131)
	[-.015]	[-.006]	[-.002]	[.021]	[.010]	[.009]
N	21,445	21,445	19,721	19,721	21,510	21,510

Note: * $p < .05$ ** $p < .01$ *** $p < .001$. All models adjust for within-extended-family (first cousin) clustering. Baseline OLS models include all control variables in Table 2.

Table 4. Fully Standardized Effects of Cultural Capital on Academic Achievement from DID Models in Different Sub Groups

	Father's Education		Family Income			Mother's AFQT Scores		
Reading Recognition:	12 years or less	12+ years	Quintile 1-3	Quintile 4-7	Quintile 8-10	First Tercile	Second Tercile	Third Tercile
Taken to museums	.006	-.014	-.002	-.007	-.014	.002	-.013	.000
Taken to concerts	-.006	.029**	.002	.008	.012	-.004	.020*	.003
Number of books	.025*	-.010	.035***	.036**	-.010	.035***	.030**	-.007
Reads for enjoyment	.043***	.091***	.052***	.053***	.075***	.030**	.052***	.099***
Extracurricular activities	-.003	-.004	-.012[a]	-.002	-.003	-.012*	-.004	.001
Encouraged to take hobbies	.000	-.005	.002	-.004	-.003	.000	-.003	-.004
N	8,703	6,101	5,998	7,023	5,309	6,849	7,415	7,181
Reading Comprehension:								
Taken to museums	.008	.028*	.013	.011	.042**	-.005	.029*	.034*
Taken to concerts	-.009	-.016	.002	-.013	-.016	-.001	-.006	-.015
Number of books	.094***	.099***	.112***	.104***	.106***	.100***	.104***	.111***
Reads for enjoyment	.067***	.114***	.061***	.067***	.111***	.033**	.090***	.120***
Extracurricular activities	-.025***	-.014*	-.021**	-.028***	-.016*	-.023***	-.025***	-.009
Encouraged to take hobbies	.012***	.004	.008**	.008**	.009*	.008**	.008**	.003
N	7,971	5,695	5,435	6,486	4,952	6,145	6,854	6,722
Math:								
Taken to museums	.012	-.010	.002	.016	-.003	.013	.009	-.013
Taken to concerts	.011	.024[b]	-.008	.007	.035**	.005	.017	.005
Number of books	.003	-.013	.018	-.002	-.014	.016	-.001	-.030
Reads for enjoyment	.033**	.030*	.020*	.023*	.052***	.015	.031**	.045***
Extracurricular activities	.003	.016*	.008	.008	.015[c]	.005	.007	.016**
Encouraged to take hobbies	.007**	-.002	.004	.003	.000	.004*	.004	-.001
N	8,742	6,106	6,021	7,056	5,314	6,885	7,442	7,183

Note: * $p < .05$ ** $p < .01$ *** $p < .001$. All models adjust for within-extended-family (first cousin) clustering, [a] $p = .053$, [b] $p = .056$, [c] $p = .059$.

References

Angrist, Joshua D. and Jörn-Steffen Pischke. 2009. *Mostly Harmless Econometrics. An Empiricist's Companion*. Princeton, NJ: Princeton University Press.

Aschaffenburg, Karen and Ineke Maas. 1997. "Cultural and Educational Careers: The Dynamics of Social Reproduction." *American Sociological Review* 62:573-587.

Bourdieu, Pierre. 1977. *Reproduction in Education, Society, Culture*. Beverly Hills, CA: Sage.

—. 1984. *Distinction. A Social Critique of the Judgement of Taste*. Cambridge, Mass.: Harvard University Press.

—. 1986. "The Forms of Capital." Pp. 241-258 in *Handbook of Theory and Research in the Sociology of Education*, edited by J. G. Richardson. New York: Greenwood Press.

Bourdieu, Pierre and Jean-Claude Passeron. 1990. *Reproduction in Education, Society and Culture*. London: Sage.

Cheadle, Jacob E. 2008. "Educational Investment, Family Context, and Children's Math and Reading Growth from Kindergarten Through the Third Grade." *Sociology of Education* 81:1-31.

Cheung, Sin Yi and Robert Andersen. 2003. "Time to Read: Family Resources and Educational Outcomes in Britain." *Journal of Comparative Family Studies* 34:413-433.

CHRR (Center for Human Resource Research). 2006a. *NLSY79 User's Guide*. Columbus, OH: Center for Human Resource Research, Ohio State University.

—. 2006b. *NLSY79 Child and Young Adult Data Users Guide*. Columbus, OH: Center for Human Resource Research, The Ohio State University.

Covay, Elizabeth and Willian Carbonaro. 2010. "After the Bell: Participation in Extracurricular Activities, Classroom Behavior, and Academic Achievement." *Sociology of Education* 83:20-45.

Crook, Christopher J. 1997. *Cultural Practices and Socioeconomic Attainment: The Australian Experience*. Westport, CN: Greenwood Press.

Cunha, Flavio and James J. Heckman. 2008. “Formulating, Identifying and Estimating the Technology of Cognitive and Noncogitive Skill Formation.” *Journal of Human Resources* 43:738-782.

De Graaf, Nan Dirk, Paul M. de Graaf, and Gerbert Kraaykamp. 2000. “Parental Cultural Capital and Educational Attainment in the Netherlands: A Refinement of the Cultural Capital Perspective.” *Sociology of Education* 73:92-111.

DiMaggio, Paul. 1982. “Cultural Capital and School Success: The Impact of Status Culture Participation on the Grade of U.S. High School Students.” *American Sociological Review* 47:189-201.

DiMaggio, Paul and John Mohr. 1985. “Cultural Capital, Educational Attainment, and Marital Selection.” *American Journal of Sociology* 90:1231-1261.

Downey, Douglas B. 1995. “When bigger is not better: Family size, parental resources, and children’s educational performance.” *American Sociological Review* 60:746-761.

Dumais, Susan A. 2002. “Cultural Capital, Gender, and School Success: The Role of Habitus.” *Sociology of Education* 75:44-68.

—. 2006. “Early childhood cultural capital, parental habitus, and teachers’ perceptions.” *Poetics* 34:83.

Farkas, George, Robert P. Grobe, Daniel Sheehan, and Yuan Shuan. 1990. “Cultural resources and school success: Gender, ethnicity, and poverty groups within an urban school district.” *American Sociological Review* 55:127-142.

Flere, Sergej, Marina T. Krajnc, Rudi Klanjsek, Nojan Musil, and Andrej Kirbis. 2010. "Cultural Capital and Intellectual Ability as Predictors of Scholastic Achievement: A Study of Slovenian Secondary School Students." *British Journal of Sociology of Education* 31:47-58.

Georg, Werner. 2004. "Cultural Capital and Social Inequality in the Life Course." *European Sociological Review* 20:333-344.

Halaby, Charles N. 2004. "Panel Models in Sociological Research: Theory into Practice." *Annual Review of Sociology* 30:507-544.

Hauser, Robert M. and Raymond Sin-Kwok Wong. 1989. "Sibling Resemblance and Intersibling Effects in Educational Attainment." *Sociology of Education* 62:149-171.

Jæger, Mads Meier. 2009. "Equal Access but Unequal Outcomes: Cultural Capital and Educational Choice in a Meritocratic Society." *Social Forces* 87:1943-1971.

Kalmijn, Matthijs and Gerbert Kraaykamp. 1996. "Race, Cultural Capital, and Schooling: An Analysis of Trends in the United States." *Sociology of Education* 69:22-34.

Katsillis, John and Richard Rubinson. 1990. "Cultural Capital, Student Achievement, and Educational Reproduction: The Case of Greece." *American Sociological Review* 55:270-279.

Kaufman, Jason and Jay Gabler. 2004. "Cultural capital and the extracurricular activities of girls and boys in the college attainment process." *Poetics* 32:145-168.

Kingston, Paul M. 2001. "The Unfulfilled Promise of Cultural Capital Theory." *Sociology of Education* 74:88-99.

Lamont, Michele and Annette Lareau. 1988. "Cultural Capital: Allusions, Gaps and Glissandos in Recent Theoretical Developments." *Sociological Theory* 6:153-168.

Lareau, Annette. 2003. *Unequal Childhoods. Class, Race, and Family Life*. Berkeley: University of California Press.

Lareau, Annette and Erin McNamara Horvat. 1999. “Moments of Social Inclusion and Exclusion. Race, Class, and Cultural Capital on Family-School Relationships.” *Sociology of Education* 72:37-53.

Lareau, Annette, Elliot B. Weininger, David L. Swartz, and Vera L. Zolberg. 2004. “Cultural capital in educational research: A critical assessment.” Pp. 105-144 in *After Bourdieu. Influence, Critique, Elaboration*. Dordrecht: Kluwer Academic Publishers.

Morgan, Stephen L. and Christopher Winship. 2007. *Counterfactuals and Causal Inference: Methods and Principles for Social Research*. Cambridge: Cambridge University Press.

Robinson, Robert V. and Maurice A. Garnier. 1985. “Class Reproduction among Men and Women in France: Reproduction Theory on Its Home Ground.” *American Journal of Sociology* 91:250-280.

Roscigno, Vincent J. and James W. Ainsworth-Darnell. 1999. “Race, Cultural Capital, and Educational Resources: Persistent Inequalities and Achievement Returns.” *Sociology of Education* 72:158-178.

Sandefur, Gary and Thomas Wells. 1999. “Does Family Structure Really Influence Educational Attainment?” *Social Science Research* 28:331-357.

Sieben, Inge, Johannes Huinink, and Paul M. de Graaf. 2001. “Family Background and Sibling Resemblance in Educational Attainment. Trends in the Former FRG, the Former GDR, and the Netherlands.” *European Sociological Review* 17:401-430.

Sullivan, Alice. 2001. “Cultural Capital and Educational Attainment.” *Sociology* 35:893-912.

—. 2002. “Bourdieu and Education: How Useful is Bourdieu's Theory for Researchers?” *The Netherlands' Journal of Social Sciences* 38:144-166.

Swartz, David. 1997. *Culture and Power: The Sociology of Pierre Bourdieu*. Chicago: University of Chicago Press.

Teachman, Jay D. 1987. “Family Background, Educational Resources, and Educational Attainment.” *American Sociological Review* 52:548-557.

Todd, Petra E. and Kenneth I. Wolpin. 2007. “The Production of Cognitive Achievement in Children: Home, School and Racial Test Score Gaps.” *Journal of Human Capital* 1:91-136.

van de Werfhorst, Herman G. and Saskia Hofstede. 2007. “Cultural Capital or Relative Risk Aversion? Two Mechanisms for Educational Inequality Compared.” *British Journal of Sociology* 58:391-415.

Wildhagen, Tina. 2009. “Why Does Cultural Capital Matter for High School Performance? An Empirical Assessment of Teacher-Selection and Self-Selection Mechanisms as Explanations of the Cultural Capital Effect.” *The Sociological Quarterly* 50:173-200.

Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross-Section and Panel Data*. Cambridge, MA: MIT Press.

Notes

[1] The relatively high estimates of the effect of cultural capital on final educational attainment in de Graaf (1986) and Georg (2004) may be due to the fact that both studies use multiple indicators to construct latent variables which measure cultural capital. Latent variables reduce attenuation bias from random measurement error in single indicators and would be expected to lead to higher estimates of the effect of cultural capital.

[2] The NLSY-CYA also includes respondents who are first cousins (related through maternal siblings). In order to keep the analysis feasible, I do not consider extended family relationships in this paper. I have, however, experimented with triple-differenced models which, in addition to family and individual fixed effects, also difference out extended-family fixed effects. Results from these models are very similar to those obtained using the DID models and are available upon request. All my empirical analyses using DID models adjust for clustering of respondents within extended families.

[3] The item which measures extracurricular activities pertains both to children receiving special lessons (perhaps due to poor academic performance) and to regular extracurricular activities (sport, art, dance, etc.). Consequently, it may be that in some cases the variable identifies children who receive special lessons.

[4] I have also run the DID models in sub groups defined by child's sex and race, but these analyses did not produce any clear patterns. Results are available upon request.

CSER
CENTRE FOR STRATEGIC RESEARCH IN EDUCATION