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Capital at Home and at School: Effects on Student Achievement*

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Abstract

We investigate the effects of both family and school capital on student math and reading achievement. We use the National Longitudinal Survey of Youth (NLSY) merged Child-Mother Data for 1992 and 1994, to which indicators of capital in the children's schools for 1993-94 and 1994-95 have recently been added. We study children who attended first through eighth grades in both 1992 and 1994, with samples of 2034 for math achievement and 2203 for reading recognition. Findings suggest that school capital effects are modest in size while family capital effects are stronger; combinations of school and family capital boost or modify additive findings. We sketch directions for future research and discuss the usefulness of analyzing school and family capital as parallel concepts.

There is widespread agreement that schooling is a fundamental basis for success in meritocratic societies. Youths who succeed in school have strong advantages in occupational placement and earnings attainment (see Ganzeboom, Treiman & Ultee 1991; Kerckhoff 1995). There is considerable debate, however, regarding how school achievement can be enhanced. Do financial resources invested in schools produce improvements in student outcomes? Are not family resources critical to promoting student success?

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In this article we investigate the effects of both family and school capital — social, human, and financial — on math and reading test scores for a sample of elementary and middle-school age children.¹ We take a particular interest in social capital, and following Coleman (1988, 1990) distinguish social capital at home from the human capital, such as education and ability, that workers bring to the labor market; we distinguish each of these from the financial capital that families or firms use to invest (see also Portes 1998:2-3, for distinctions among these forms of capital). We also draw analogies among these forms of capital and argue that each operates at home and at school in potentially parallel ways. We then construct a test of the effects of these forms of capital on student achievement and derive inferences regarding in which sphere, home or school, *and* under what conditions, investments in children are likely to have the greatest payoffs for academic success.

These questions are classic topics in social science. Sociologists have examined the effects of school characteristics on educational outcomes (see Hallinan 1988 and Entwisle & Alexander 1993 for useful reviews), as well as the effects of family background on status attainment in adulthood (Blau & Duncan 1967; Featherman & Hauser 1978; Hauser & Featherman 1977; Jencks et al. 1972, 1979; Sewell & Hauser 1975; Sewell, Hauser & Wolf 1980). Although findings have suggested that family background is an important determinant of educational outcomes, and that school characteristics have minimal effects, debate continues regarding the relative importance of family and school inputs. Such discussions are fueled by increases in the numbers of single-parent households, a family form linked to lower student achievement (McLanahan & Sandefur 1994), as well as pressure from citizens for both school accountability and improved student performance.

Capital at Home

FAMILY SOCIAL CAPITAL

Coleman's (1988, 1990) arguments regarding the importance of social capital in facilitating child socialization provide a useful starting point for discussion. By social capital we understand resources that inhere in the relationships between and among actors and that facilitate a range of social outcomes (see Coleman 1990). Social capital is contained in relationships between and among individuals, as well as between and among corporate actors. We focus on family social capital, which refers here to the bonds between parents and children that are useful in promoting child socialization. Social capital reflects the time and attention parents spend in interaction with children, in monitoring their activities, and in promoting child well-being, including educational achievement (Coleman 1990). As such it refers to parental resources used in the socialization process. Social capital in families is greater when the family system is characterized by time-closure; when the parents'

commitment to each other is long term, children benefit from the stability of the union. In addition, children benefit from continued exposure to the social connections both parents have with others outside the family group, such as neighbors, school personnel or work colleagues. These arguments imply that two-parent families provide benefits in child rearing that are absent from other family forms. Coleman also worries that increased maternal labor force participation will weaken the bonds within communities that mothers who stay home with their children have time to form with neighbors; he sees these bonds as helpful in protecting and socializing children.

There is empirical support for some of these ideas. Parcel & Menaghan (1994a, 1994b) have demonstrated that several forms of family social capital can influence child outcomes. Children's home environments reflect parental investment in child well-being. These environments are a function of material resources, but after a certain level of basic expenditure, home environments reflect parental orientation to providing the types of interpersonal resources that favor child development. Parental investments in age-appropriate cognitive stimulation, an affectively warm style of interacting with children, and in general cleanliness and safety of the home environment combine to promote positive child outcomes. Stronger children's home environments are associated with greater verbal facility (Parcel & Menaghan 1990, 1994a, 1994b), both reading and math achievement (Parcel & Menaghan 1994b), and lower levels of child behavior problems (Parcel & Menaghan 1993). Intact family status also speaks to the amount of social capital children can access. We know that children from intact families have advantages in both educational attainment and social well-being (McLanahan & Sandefur 1994) as well as in better occupational placement and earnings attainment (Powell & Parcel 1997). Coleman's worries regarding maternal labor force participation receive less support (Parcel & Menaghan 1994a, 1994b), although these studies do find that persistent overtime work hours for both mothers and fathers predict increased behavior problems and lower levels of verbal facility. This underscores the importance of considering fathers' roles in the socialization process as well as mothers' (Coltrane 1997).

HUMAN AND FINANCIAL CAPITAL AT HOME

We distinguish social capital from parental financial capital such as family financial resources, and from human capital such as parental years of schooling. Clearly, sufficient material support is important for family well-being; parental earnings typically provide the foundation for family financial support. Studies regarding the effects of poverty on child outcomes establish that material deprivation is inimical to favorable child development (Huston 1991; Duncan, Brooks-Gunn & Klebanov 1994; Garrett, Ng'andu & Ferron 1994; Duncan & Brooks-Gunn 1997). Economists have traditionally argued that investments in human capital, such as education, increase worker productivity and thus worker earnings; therefore, higher

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levels of human capital facilitate family financial capital. In addition, however, higher levels of parental human capital provide assets upon which children can draw at home during socialization. These parental assets facilitate achievement throughout childhood and adolescence. Some of this effect may be due to more educated parents having high expectations for children's performance and communicating these expectations to their children. Some also may be due to such parents having the means to keep children in school longer or facilitating greater school success through in-home socialization that matches the middle class expectations of the schools and their teachers. These arguments suggest that several forms of capital at home can influence child academic achievement.

DIFFUSION OF CAPITAL AT HOME

Several studies have demonstrated that increased numbers of children within the family lead to less favorable child outcomes, presumably through the mechanism of resource dilution (see Blake 1989, for a classic statement). Resource dilution speaks to the quantity of time and material resources that parents are able to invest in their children; when there are more children in a family, parental time and resources are necessarily divided more finely. Under these conditions, all forms of family capital—financial, human and social—are more finely spread across children (see Downey 1995). Again, empirical evidence supports these claims. Children from larger families have lower levels of verbal facility (Parcel & Menaghan 1990, 1994a, 1994b), and less favorable home environments (Menaghan & Parcel 1991). In addition, children from larger families have lower levels of math and reading achievement (Parcel & Menaghan 1994b), higher levels of behavior problems (Parcel & Menaghan 1993), and lower levels of educational achievement (Downey 1995).

Capital at School

SCHOOL SOCIAL CAPITAL

Given that social, human, and financial capital in families affect child outcomes, are there analogous processes in schools? Social capital associated with schools most directly refers to bonds between parents and schools that can facilitate educational outcomes. These bonds can reflect community ties, a concept also intertwined with the role of school social capital in promoting child well-being. These bonds can also reflect the relationships that parents and children form with school teachers. Arguments regarding the superiority of Catholic schools are based on the notion that the community ties associated with a common religion for many attendees, their families and their teachers promote common norms useful in supporting

educational attainment, such as valuing learning and appropriate social behavior. Attending a Catholic school may promote the formation of social capital through social closure; parents of students may be more likely to have relationships outside of school, in this case through church attendance, with parents of other students. Several studies have shown positive effects of attending Catholic schools (Coleman, Hoffer & Kilgore 1982; Jensen 1986) while others suggest that these effects are modest when appropriate background controls are introduced (Wilms 1985; Alexander and Pallas 1985; Raudenbush and Bryk 1986). Studying differences between public schools and private schools more generally, Gibbens and Bickel (1991) suggest that *schooling* characteristics do promote achievement. Graetz' (1990) study, however, suggests that while private schools create some advantage for children because of the education they provide, some of these differences are attributable to student social background and ability. Taken together, these findings suggest that whatever combinations of social capital these schools represent, such factors may function to promote educational achievement. However, these effects may be small.

Recently other scholars have invoked the concept of social capital to test whether and why schools influence educational outcomes (e.g., Booth & Dunn 1996; Teachman 1996; Teachman et al. 1996; Schneider & Coleman 1993). In most of these analyses, however, researchers do not investigate the effects of *school* social capital, even though the student outcomes are measured in terms of educational achievement or aspirations. Studies often measure the effect of family type (Downey 1995; Entwistle & Alexander 1996), family residential mobility (Hagan et al. 1996; Teachman et al. 1996), or family interpersonal resources or processes (Astone & McLanahan 1991; Menaghan 1996). These concepts tap family and/or community social capital, although residential mobility might involve loss of social ties from school settings (Pribesh & Downey 1999). In partial contrast, Lee studies the effects of school social organization on educational outcomes (Lee et al. 1997), but does not interpret these organizational characteristics as forms of social capital. Our analyses study the effects of school social capital directly. Just as home environment is a form of social capital that can enhance children's learning, school environments reflect the social ties and interactive styles embedded in the schools, also enhancing learning. Similarly, just as family size is a reflection of the access children have to one-on-one interactions with their parents, the ratio of teachers to students acts as a proxy to tap the potential for social interactions between students and key adults in their lives — their teachers.

SCHOOL HUMAN AND FINANCIAL CAPITAL: RESOURCE DILUTION IN SCHOOLS

We also consider the effects of school analogs of family human and financial capital. Students can draw on teachers' stores of human capital at school in the same way that they can draw on parental human capital at home. Teachers with

greater knowledge or more experience may do a better job in the classroom, thus facilitating student achievement. Therefore, schools with a higher proportion of teachers who have masters' degrees or greater skills may have a stronger base of human capital upon which children can draw. Similarly, schools with greater financial capital may provide a better learning environment than poor schools, in the same way that families with higher as opposed to lower earnings may better promote child achievement. At school, more financial capital may translate into better science laboratories, more books or more computers. In addition, financial capital may beget human capital in the form of paying higher teacher salaries, thus attracting better teachers.

Numerous studies have looked for "school effects" on student outcomes. In initial studies (e.g., Coleman et al. 1966; Hallinan 1988), key indicators largely reflected resource arguments related most closely to school financial capital. For example, higher teacher salaries would attract better teacher with more human capital to share with children. More resources would also permit lower student-teacher ratios. Analogous to smaller family size, better student-teacher ratios should also reduce resource dilution effects in the classroom in terms of teacher attention to students. These studies, however, failed to support the notion that characteristics of schools themselves are important predictors of educational achievement. Coleman et al. (1966) argued that school effects did exist, but their models lacked appropriate controls at the individual level to rule out spuriousness. Later studies suggested that school effects might be stronger among younger children than among high school-aged children, largely because high schools were, on average, more heterogeneous than elementary schools, thus leading to school-level indicators being averages of very disparate subgroups of school characteristics (Alexander, McPartland & Cook 1981). Additional work also suggested that lowering the level of conceptualization and measurement even further to the track within a school or to the classroom did show "schooling" to have effects on educational outcomes even when "schools" did not (Bidwell and Kasarda 1980; Gamoran 1987). Recent research continues to debate whether school financial resources promote achievement (e.g., Elliott 1998; Hanushek 1989, 1994; Greenwald, Hedges & Laine 1996; Hedges, Laine & Greenwald 1994). We also evaluate this idea, and interpret indicators of financial and human resources in schools as reflecting financial and human capital operative in that context.

Parallelism in Resources at Home and at School

These arguments suggest parallelism in the resources that families and schools provide to children in the socialization process. Social capital exists both at home and in schools. Both the home environments that parents construct for children and the environments within schools that children experience can be characterized by their safety, their levels of intellectual stimulation, and the extent to which they

promote appropriate social behavior. Larger family sizes and greater numbers of pupils per teacher or counselor both invoke the concept of resource dilution. Children who attend private schools may experience greater social closure in that there is greater commonality in norms, including those related to achievement, than children in public schools. Such social closure is analogous to the social closure of parents who have a great deal of knowledge about children's whereabouts, activities, and friends. Children who are tied to key institutions such as churches should have similar advantages.

Human capital also exists both at home and at school. Parents may be more or less educated or have higher or lower levels of mental abilities. Similarly, teachers vary in levels of qualifications. Finally, both families and schools have varying amounts of financial capital with which to promote child outcomes.

Hypotheses

Several hypotheses guide our investigation. First, we expect that higher levels of family social capital will have positive effects on child academic achievement. In particular, lower numbers of children within the family, stronger home environments, and intact family status should be associated with better cognitive achievement for children. We also have the opportunity to critically evaluate the role of both maternal and paternal work hours in hindering or promoting reading and mathematics achievement. We also expect that school social capital will have positive effects on academic outcomes. We expect that children who attend private (including Catholic) schools will show stronger achievement than those attending public schools, and that greater parental involvement in school activities will also facilitate attainment. We expect that stronger school environments will promote learning. Those schools characterized by social problems such as absenteeism and crime, as well as those where students engage in risky behaviors, should promote lower levels of achievement than schools with more favorable learning environments, especially if school personnel must devote time and resources to addressing multiple school problems and cannot devote those resources to building useful social capital with students or students' parents. At the same time, family human capital such as parental education and mental abilities, parental financial capital, and human capital characteristics of teachers and financial resources used by schools to promote learning should also be positively associated with student achievement.

We also investigate how these several forms of capital may interact to promote child achievement. Coleman (1988, 1990) argues that parental human capital, no matter how high, will not automatically result in improved child outcomes unless there is sufficient family social capital present to allow the child access to parental personal resources. For example, higher levels of maternal education may be

helpful to children only if mothers work less than full time, thus allowing them more time at home (a form of social capital) in support of child achievement. In this case, parental human and social capital combine to boost child achievement. Teachman, Paasch, and Carver (1997) provide supportive evidence to show that social, financial and human capital in families interact to deter children from dropping out of school. Similarly, we evaluate whether school and family institutions work together to promote child achievement. Following Coleman, we believe that children who experience favorable conditions both at home and at school may achieve more. We call these effects “resource boosters.” Alternatively, Greenwald, Hedges and Laine (1996) argue that as family social capital declines, school resources become more important to promoting student achievement. In this case, a deficit in resources at home can be at least partially compensated by supportive resources at school. We call these “compensating effects,” because more favorable conditions in one sphere may compensate for less favorable conditions in the other. Finally, effects that in an additive model might suggest either a boost or a hindrance to achievement may, when interacting, reach a threshold in their effects. Maternal mental ability and children’s home environments may both promote child achievement, but in combination have more modest effects than one would expect if both of these factors had positive effects in strictly additive models. We call these “threshold effects.” In addition, we will assess whether the processes we study differ by sex of child, race of the mothers, and for younger as opposed to older school age children.

Sample, Methods, and Analytic Strategy

To test these hypotheses, we use the National Longitudinal Survey of Youth (NLSY) compiled by the Center for Human Resource Research (CHRR). The NLSY79 is an ongoing panel study that interviewed 12,686 youths between the ages of 14 and 21 in 1979. The original design oversampled Blacks and Hispanics. Until 1997 when interviews began in alternate years, respondents were re-interviewed annually; beginning in 1986, children of female respondents are evaluated in alternate years (*NLS Handbook 1997*). In 1996, the NLSY surveyed the schools these children attended and asked for information about the individual children and about their schools for the 1993-94 and 1994-95 school years; we merged these data to NLSY Child-Mother files, thus linking information about maternal background and occupational conditions, family conditions, child attributes, and child cognitive outcomes with information on school resources and experiences. Previous work (Parcel & Menaghan 1994a, 1994b) has demonstrated that the Child-Mother data are very useful for studying the relationships between family social capital and child outcomes. Adding the School Data makes these data unique in their ability to match richly detailed longitudinal maternal *and* child information to data about

children's schools, thus allowing comparisons of family and school capital. By contrast, the National Educational Longitudinal Study (NELS) and the High School and Beyond Study (HS&B), while providing detailed information on children's schools and schooling, are not able to provide detailed family background information, while other surveys such as the National Survey of Families and Households (NSFH), which provide detailed family information, contain no information about school experiences.

We use information from the Merged Child-Mother Data for 1992 and 1994 and from the 1993-94 and 1994-95 School Data. Because our measures of cognitive outcomes are not assessed either for high school students or those younger than five, we restrict our sample to children who attended the first through the eighth grades in *both* 1992 and 1994.²

Initial analyses suggested that missing data, particularly on some of the new school variables, was of non-trivial proportions. Because many commonly-used methods of dealing with missing data produce substantial distortion in variables' distributions and unrealistic variances, we follow Little and Rubin (1987, 1990) in using interpolation and imputation to deal with cases that have missing data. If a variable was missing data on fewer than 15% of cases, we used linear interpolation to replace missing values. This method consists of using the last valid value before and the first valid value after the missing value to interpolate a value for the missing value. If the first or last case in the series has a missing value, the missing value is not replaced. If a variable was missing data on more than 15% of cases, we interpolated scores on that variable through regression imputation (Little & Rubin 1990). We created a regression equation to predict the variable that has missing data; we could then use the coefficients generated by that equation to create unique new values for each case based on other characteristics of that case.³ Both of these methods have the advantage of producing less distortion of the variable's distribution and realistic variance than, for example, mean substitution or available case analysis (Jinn & Sedransk 1989; Little & Rubin 1987, 1990).

Table 1 describes the variables used in the analyses; here we highlight key aspects of our measurement decisions. We measure math achievement with the *1994 Peabody Individual Achievement Test (PIAT) for Mathematics*. This portion of the PIAT assessments tests mathematics knowledge from recognition of numerals to advanced trigonometry concepts. *Reading recognition PIAT assessment* tests children's age-appropriate word recognition and pronunciation skills. The PIAT assessments are useful indicators of cognitive development because of high test-retest reliability and validity (Baker et al. 1993). Our sample selection provides us with samples of 2034 children when examining math achievement, and 2203 when looking at reading recognition. We use weighted data to correct for oversampling of racial minorities and respondents from lower socioeconomic backgrounds.

To tap social capital, we measure the *home environment* parents provide for their children by creating a 28-item scale that taps the physical environment of the home,

the cognitive stimulation present in the home, and mother's affect and disciplinary styles. Social capital may also be embedded in the resources parents and children draw from their communities. We include measures of the *number of child's close friends mother knows by sight and name* (0 = none to 5 = all of them), *how often mother knows child's location when not at home* (0 = only rarely to 4 = all the time), and the *frequency of child's church attendance* (0 = never to 4 = at least once a month). We also include *number of children in family*, mother's *marital status* (1 = married; 0 = not married), and both *maternal and paternal work hours*.

Children may also benefit from the social capital created by their schools' environment and resources. We examine school type by differentiating *private schools* (including Catholic, private religious, non-Catholic, and private nonreligious = 1) from public schools and by creating scales that reflect school environment. In keeping with arguments about the resource dilution of social capital, we also include the *ratio of teachers to students* and of *counselors to students*.

School social problems is a twenty-two-item scale that reports the degree to which principals believe physical conflicts among students, gang activity, robbery or theft, vandalism, weapons, physical and verbal abuse of teachers, racial conflicts, tardiness, absenteeism, class-cutting, legal and illegal drug use, sexual behavior, inadequate nutrition and clothing, insufficient rest, lack of parental supervision, and substance abuse by students' family members are problematic at the child's school. The scale is constructed so that high scores indicate more problems. The *school physical environment* is measured by a four-item scale that taps the extent to which traffic, noise, neighborhood crime, and loitering are present near the school. High scores reflect safer environments. *Communication* reflects parent-teacher communication, while *teachers care* reflects maternal perceptions of how much teachers care about their students. We include a measure of *school-wide parental involvement in school activities*. This 14-item scale, reported by school principals, measures the degree to which parents in the child's school are involved in meetings of parent-teacher associations and parent advisory organizations, parent-teacher conferences, informal parent-teacher contacts, advising on program design, participating in policy decisions, evaluating instructional programs, monitoring teachers, volunteering in classroom and school programs, fundraising, homework, and working as paid aides.

In addition, we examine parental and child human capital and school human capital. We include measures of *maternal and paternal education*, *maternal cognitive skills* (AFQT 1989), whether *the mother lived in a two-parent family at 14*, *maternal grandmother's education*, and *child health, birthweight and age*. To tap the school's human capital we include *the ratio of teachers with Master's degrees* to all teachers and maternal ratings of *teacher skill*. We also distinguish between parental financial capital and school financial capital. We measure *maternal and paternal wages* to tap family financial capital. To examine school financial capital, we add the *total school learning resources* (measured as number of books, videos, and compact discs

the school owns) and the *per pupil expenditures* of the school district in which the student resides. We also control for child *race* (white, black, Mexican Hispanic, other Hispanic; white is the reference category) and *sex* (male = 1).

Regarding data limitations, the NLSY79 data set is probably weakest in terms of its measures of school human and financial capital; we did additional analyses involving alternative measures of these concepts, but failed to improve upon the findings we report with the measures we use here. In addition, the data set does not include direct measure of teacher-student interaction. However, parental perceptions of teacher caring and school safety likely reflect individual child experience, not global characteristics of the school. Some may argue that it is difficult to disentangle social capital at home from social capital at school because parental involvement at school, for example, could reflect capital in either location or both. We cannot completely resolve this issue. However, except for maternal perceptions of teachers' caring, all measures in our category of school social capital rely on principal perceptions; thus we classify these measures as reflecting school social capital. Despite these challenges, the data set we use is unique in terms of its capacity to tap both family and school capital (social, human and financial), and thus makes our comparisons possible. We report means and standard deviations for all variables in Appendix A.

Our analytic strategy involves using ordinary least squares regressions to test the effects of sets of variables on child educational outcomes.⁴ All models will control for a measure of the dependent variable in 1992 in order to rule out the effects of unmeasured background characteristics, and these findings are presented in model 1 of Tables 2 and 3; thus, in the subsequent models we are actually estimating the effects of our independent variables on the change in reading recognition and mathematics achievement between 1992 and 1994. This is a very conservative strategy, and thus variables that are statistically significant over and above the effect of the 1992 measure have faced a very demanding test. In preliminary analyses we entered school and family variables in various combinations into models predicting achievement. The results did not vary across these specifications, so we present a limited subset here. Specifically, because we are especially interested in the role of social capital, we entered family social capital measures in model 2, and school social capital in model 3. These models suggest how family social capital influences achievement, and then how family and school social capital work together. Model 4 introduces controls for human and financial capital from both families and schools. Model 4 thus becomes the basis for the most conservative inference because it captures the net effects of all the forms of capital we are studying, and the most suitable basis for tests of statistical interaction.⁵ We performed two types of interactive tests. First, we wanted to evaluate whether the significant coefficients we identified from the multivariate analyses operated similarly for male and female children, for children of white and nonwhite mothers, and for children of elementary school age (6-11 years) versus older

children (12-14 years). Multiplicative terms were added one at a time to the additive models and then in groups. We also wanted to assess whether combinations of family capital and school capital would appreciably add to child test scores, and followed the same strategy of adding one term at a time to the additive models.⁶ We table only those additive and interactive effects that are statistically significant. The table footnotes indicate those variables that were controlled but not significant in respective models.

Findings

When examining changes in math achievement, we find that family social capital is important. Better home environments are related to increases in achievement, as is living with a mother who was married at the time of the assessment (Table 2, model 2). By contrast, higher maternal working hours are negatively associated with math achievement. These effects remain significant when school social capital variables enter the equation in model 3. Attending a private school is associated with increases in math scores, as is attending a school with a better physical environment. Attending a troubled school, however, has a negative effect. These results suggest that the stores of social capital children have from *both* their families *and* their schools are important predictors of changes in math achievement.

Several of these social capital effects remain significant even when variables for human capital, financial capital, and additional controls are added (Table 2, model 4). A positive home environment still encourages gains in math achievement; however, the school physical environment is no longer important. The negative effects of the lack of social capital suggested by high maternal work hours and school social problems persist as well, although the protective effect of a married mother is attenuated. Additional analyses (not shown) suggest that family human capital drives the changes in model 4. Mother's AFQT has a strong effect on changes in math achievement, as do characteristics of the maternal family of origin. Weaker but positive effects of mother living in a two-parent family at age 14 and grandmother's education suggest an intergenerational transfer of human capital. In addition, children suffering from health problems that interfere with schoolwork see a drop in their math achievement. Interestingly, once we control for family human capital, the effect of parental involvement in school activities becomes significant, improving child math achievement. School financial capital has a positive effect, with children who attend schools with higher per pupil expenditures enjoying increases in math achievement. By contrast, attending a school where a greater percentage of teachers hold master's degrees has a negative effect on changes in math achievement. This counterintuitive finding may be due to requirements in larger school districts for greater certification; these same schools

may face more challenges in terms of resources and student capabilities than others, and in ways that we cannot measure here.

Several key additive findings become refined once we perform interactive tests; we detect evidence for boosting, threshold and compensating effects. Students receive an extra boost in math achievement when they have both high AFQT mothers and caring teachers. Also, the improvement in math achievement maternal AFQT fosters is even more important when children attend schools with problematic social environments. In contrast, AFQT reaches a threshold in its positive effect on math gains when there are both skillful teachers and when children are male. In addition, the positive effects of a good school physical environment and higher levels of per pupil expenditures also reach a threshold in their effects on improvements in math achievement. Perhaps under these circumstances money that might otherwise go to instructional enrichment is being invested in the school physical plant. Regarding compensating effects, maternal AFQT compensates for child placement in schools that require more teacher human capital, while better school environments compensate for homes in which maternal work hours are longer.

In Table 3 we see that changes in reading recognition are also affected by the several forms of capital we are studying. In model 2, after controlling for previous achievement, having a mother who is married and who more often knows her child's location is associated with gains in reading recognition. By contrast, dilution of available family social capital through having more siblings or higher maternal work hours have negative effects. Higher work hours for the mother's spouse are related to gains in achievement. Family social capital effects persist as school social capital variables are introduced into the equation (model 3). Attending a private school increases reading recognition, as does attending a school with a better physical environment.

As was the case when examining math achievement, when variables tapping other forms of capital and additional controls are introduced, some of the social capital variables are no longer significant. As model 4 demonstrates, the effects of having a mother who is married or who works longer hours are attenuated, as are the effects of attending a private school or one with a better physical environment. Family human capital variables, particularly the positive effect of maternal mental ability, are responsible for the decrease in size of previously significant family social capital variables, as well as for the decrease in the effect of attending a private school. Controlling for child sex attenuates the effect of attending a school with a positive environment. In a counterintuitive finding, greater per pupil expenditures have a negative effect on gains in reading recognition, suggesting that perhaps resources are being devoted to schools where more of the students have reading problems.⁷ As was the case for math achievement, health problems that affect schoolwork interfere with reading achievement. After family human capital is controlled, school communication with parents becomes significant, increasing gains in reading recognition.

TABLE 1: List of Concepts and Variables

Concepts/Variables	Description
<i>Dependent variables</i>	
Math PIAT	Measured in 1992 and 1994. Taps age-appropriate math achievement from recognizing numerals to trigonometry concepts.
Reading Recognition PIAT	Measured in 1992 and 1994. Examines reading using age-appropriate measures of reading recognition and pronunciation ability from preschool to high school levels.
<i>Key concepts and independent variables</i>	
<i>Family social capital</i>	
Home environment	Measured in 1994. Includes items about home physical environment, affect, and cognitive stimulation ($\alpha = .87$).
Mother's knowledge of child's friends and location	Two variables asking mothers how many of their child's friends they can name (0 = none to 5 = all of them) and how often they know their children's location when not at home (0 = only rarely to 4 = all the time).
Child's church attendance	Frequency of child's church attendance in 1994 (0 = never to 4 = at least once a month).
Number of children	Measured in 1994 as the number of children the mother had in addition to the focal child.
Married	1 = mothers were married in 1994; 0 = otherwise.
Working hours	Measured per week in 1994 for mothers and 1993 for spouses.
<i>School social capital</i>	
Private school	1 = private school; 0 = otherwise.
Teacher/student and counselor/student ratios	A pair of variables tapping the ratio of teachers to students and of counselors to students.

TABLE 1: List of Concepts and Variables (Continued)

Concepts/Variables	Description
School environment variables	<i>School social problems</i> includes 22 items that tap principal ratings of criminal activity, attendance problems, high-risk activities, and school-level parental investment in student health and well-being. Higher scores = more problems. <i>Physical environment</i> includes 4 items that tap principal's rating of school's safety and location. Higher scores = better environment. <i>Communication</i> includes 2 items on how well the school and the parents share information. <i>Teachers care</i> is a single item that reflects mothers' ratings of how much teachers care about students. Higher scores = more communication and caring. Alpha levels for all multi-item scales exceed .72.
Parental involvement in school activities	A scale of 14 items measuring principal's rating of parental involvement in school activities, including PTA, fundraising, classroom volunteering, and other volunteer work. $\alpha = .74$.
<i>Family human capital</i> Parental education	Measured in 1994 for mother and spouse. Education is measured by number of years.
Maternal AFQT 1989	Measured by the mother's percentile score on the Armed Forces Forces Qualifying Test (AFQT) given in 1989. This test measures paragraph comprehension, word knowledge, arithmetic ability, and numeric operational skills.
Mother lived in two-parent family at 14	1 = mother lived in a two-parent family when she was 14; 0 = otherwise.
Grandmother's education	The child's maternal grandmother's years of schooling.
<i>Child human capital</i> Child health problem variables	Measured in 1994. A set of variables tapping the extent to which child health problems infringe on normal activities.
Low birthweight	1 = birthweight was below 5.5 pounds; 0 = otherwise.
Child age	Measured in months.

TABLE 1: List of Concepts and Variables (Continued)

Concept/Variables	Description
<i>School human capital</i>	
Ratio of teachers with MA's	Ratio of teachers with Master's degrees to all teachers.
Teacher skill	Maternal rating of teacher skill (0-5).
<i>Family financial capital</i>	
Wages	Measured as average hourly wage in 1994 for mothers and 1993 for spouses. For spouses, this measure was constructed by dividing average annual earnings by average hours worked.
<i>School financial capital</i>	
Total learning resources	Total number of school's books, compact discs, and videos/100.
Per pupil expenditures	District-level instructional dollars spent per pupil. Range coded so that 1 = under \$10, 2 = \$10-\$49, 3 = \$50-\$199, 4 = \$200-\$299, 5 = 300-\$499, 6 = \$500-\$599, 7 = \$600-\$699, 8 = 700-\$1,499, 9 = \$1,500+.
<i>Other controls</i>	
Race variables	Set of dummy variables: white, black, Mexican Hispanic, other Hispanic. White is the omitted category.
Male	1 = child is male; 0 = child is female.

Model 5 allows us to evaluate interactive arguments regarding whether capital at home and at school work together to benefit children; we find fewer interactive effects for reading than for math, and here effects are either boosting or threshold effects. Male children have the weakest gains in reading achievement when they attend schools with more social problems, as do older children. In addition, the negative effects of maternal work hours and school social problems reach a threshold in their joint effects suggesting that in combination, the effects are less negative than the additive model would imply.

Summary and Discussion

Our purpose in this article has been to evaluate the effects of several forms of capital on student academic outcomes. Previous work examining school effects has produced mixed evidence as to the influence schools exert over students' lives; few

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TABLE 2: Effects of Family Capital, School Capital, and Family Background Characteristics on 1994 PIAT Math

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Math PIAT 1992	.583*** (.596)	.552*** (.565)	.540*** (.553)	.482** (.493)	.485** (.497)
Sample selection bias correction	-1.009* (-.044)	-.942* (-.041)	-.979* (-.043)	-.737+ (-.032)	-.785* (-.030)
<i>Family social capital</i>					
Home environment		8.645*** (.091)	8.700*** (.092)	7.168*** (.076)	6.647*** (.070)
Married		2.804** (.050)	2.116* (.038)	-.467 (-.008)	-.432 (-.008)
Maternal working hours		-.139*** (-.070)	-.131*** (-.065)	-.091* (-.046)	-.059 (-.030)
<i>School social capital</i>					
Private school			6.316** (.058)	5.376* (.049)	5.495* (.051)
School social problems			-3.658** (-.054)	-2.454+ (-.036)	-8.680*** (-.128)
School physical environment			7.300* (.040)	.276 (.002)	28.068* (.156)
Teachers care			1.257 (.031)	.432 (.011)	-1.982 (-.049)
Parental involvement in school activities			1.677 (.023)	2.886* (.039)	2.713* (.037)
<i>Family and school human capital; family and school financial capital; additional controls</i>					
<i>Family human capital</i>					
Maternal AFQT 1989				1.342*** (.133)	.154 (.015)
Mother lived in two-parent family at				2.258+ 14(.035)	2.210+ (.035)

TABLE 2: Effects of Family Capital, School Capital, and Family Background Characteristics on 1994 PIAT Math (Continued)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Grandmother's education				.364+ (.037)	.340+ (.035)
Child health problem that interferes with schoolwork				-14.542*** (-.081)	-15.513*** (-.086)
<i>School human capital</i>					
Ratio of teachers with MA's				-1.932* (-.041)	2.852 (.060)
Teacher skill				1.008 (.022)	3.786* (.083)
<i>School financial capital</i>					
Per pupil expenditures				.440+ (.033)	.669* (.050)
<i>Other controls</i>					
Male				1.212 (.024)	5.264** (.102)
<i>Multiplicative effects</i>					
<i>Boosting effects</i>					
AFQT * teachers care					.626* (.204)
AFQT * school social problems					1.533** (.254)
<i>Threshold effects</i>					
AFQT * teacher skill					-.747* (-.232)
AFQT * male					-.945** (-.102)
School physical environment * per pupil expenditures					-3.399* (-.120)

TABLE 2: Effects of Family Capital, School Capital, and Family Background Characteristics on 1994 PIAT Math (Continued)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
<i>Compensating effects</i>					
AFQT * ratio of teachers with MA's					-1.024** (-.131)
School physical environment* maternal work hours					-.306† (-.057)
Constant	25.295	20.918	20.889	11.954	15.620
R ²	.357	.373	.383	.413	.423
(N = 2,034)					

Note: Standardized coefficients in parentheses. In model 2 and subsequent models we also control for number of children, spouse working hours, how many of the child's close friends the mother knows by name, how often the mother knows the child's location, how often the child attends church services. In model 3 and subsequent models, we also control for school communication, ratios of teachers to students and counselors to students. In model 4 and subsequent models we also control for maternal and spouse's education, child's health problems that require medication or affect physical activities or school attendance, duration of health problems, child's birthweight, child age, maternal and spouse wages, total school learning resources, and race.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

of these studies, however, have addressed whether school social capital affects child outcomes. We have also developed the notion of capital at home and at school, potentially operating in parallel ways, and provided an empirical test of their relative effects on student achievement.

Across the two dependent variables we have studied, parental and child human capital are persistent and important determinants of improvements in reading and math achievement. Higher AFQT mothers have children who make greater gains in both reading and math achievement; health problems that interfere with school work are detrimental to both types of achievement. In addition, male children are less likely than female children to gain in reading, while grandmother's education and having the mother come from an intact family promotes gains in children's math achievement. In addition, however, family social capital is also helpful to child achievement. Stronger home environments promote math achievement, while parental knowledge of child location helps reading. In addition, we observe resource

TABLE 3: Effects of Family Capital, School Capital, and Family Background Characteristics on 1994 PIAT Reading Recognition

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
<i>Reading</i>					
Recognition PIAT 1992	.726*** (.699)	.696*** (.669)	.690*** (.664)	.641** (.616)	.640** (.616)
Sample selection bias correction	.756† (.030)	.862* (.034)	.837* (.033)	.973* (.034)	.951* (.037)
<i>Family social capital</i>					
Mother knows child's location		1.886* (.032)	2.142* (.036)	2.079* (.035)	2.255* (.038)
Number of children		-1.895*** (-.074)	-1.754*** (-.069)	-1.576*** (-.062)	-1.510*** (-.059)
Married		2.350* (.038)	1.759† (.028)	.434 (.007)	.585 (.009)
Maternal working hours		-.075* (-.034)	-.074* (-.034)	-.051 (-.023)	.069 (.031)
Mother's spouse's working hours		.094** (.047)	.089** (.044)	.064* (.032)	.060† (.030)
<i>School social capital</i>					
Private school			6.277** (.050)	1.965 (.016)	1.912 (.015)
School social problems			-.274 (-.004)	.502 (.007)	-2.272 (-.031)
School physical environment			10.470** (.053)	5.346 (.027)	4.559 (.023)
School communication			1.033 (.024)	1.698* (.040)	1.723* (.041)
<i>Family and school human capital; Family and school financial capital; additional controls</i>					
<i>Family human capital</i>					
Maternal AFQT 1989				1.267*** (.113)	1.355*** (.121)

TABLE 3: Effects of Family Capital, School Capital, and Family Back ground Characteristics on 1994 PIAT Reading Recognition (Continued)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Child health problem that interferes with schoolwork				-11.120** (-.054)	-10.933*** (-.053)
Child age				.001 (.001)	.075** (.082)
<i>School financial capital</i>					
Per pupil expenditures				-.751** (-.050)	-.731** (-.048)
<i>Other controls</i>					
Male				-2.130* (-.037)	-14.121*** (-.248)
<i>Multiplicative effects</i>					
<i>Boosting effects</i>					
Male * school social problems					7.332** (.224)
Child age* school social problems					3.332*** (.091)
<i>Threshold effects</i>					
Maternal work hours* school social problems					-.084* (-.072)
Constant	14.944	6.056	5.515	10.385	2.674
R ²	.486	.498	.502	.518	.523
(N = 2,203)					

Note: Standardized coefficients in parentheses. In model 2 and subsequent models we also control for home environment, how many of the child's close friends the mother knows by name, and how often the child attends church services. In model 3 and subsequent models we also control for teachers care, parental involvement in school activities, ratios of teachers to students and counselors to students. In model 4 and subsequent models we also control for maternal and spouse's education, mother lived in two-parent family at 14, grandmother's education, child's health problems that require medication or affect physical activities or school attendance, duration of health problems, child's birthweight, ratio of teachers with MA's, teacher skill, maternal and spouse wages, school physical resources, and race.

† p < .10 * p < .05 ** p < .01 *** p < .001

diffusion effects on reading associated with greater family size, although we do not observe these same effects on math achievement. These findings suggest that family social capital can play an important part in supporting child achievement.

These findings provide support for investment in the family as a key institution supporting child achievement, but not every hypothesis related to family capital investment receives support. Worries that possible reductions in social capital owing to maternal work hours may hinder children receive some support for math achievement, but not for reading. At the same time, high levels of paternal work hours actually promote reading recognition, although the effect is weak. Other aspects of family social capital reflected in intact family systems, both in mother's families of orientation and of procreation, are also important. Resource diffusion in the family appears relevant; interactive models highlight circumstances under which such effects may be more detrimental. But school social capital effects, although relatively less influential, are still present. Children's reading recognition benefits from their attending private schools as well as schools with greater parental involvement in school activities. However, children's math learning is harmed if they attend schools where the social environment is hampered by numerous social problems. Children's reading recognition is enhanced in schools with better communication with parents. Schools with more challenges, i.e., those requiring greater stores of teacher human capital, find it more difficult to promote improvement in math.

These findings are refined, however, by considering how combinations of family and school capital jointly enhance or hinder student achievement. Capital at home and at school can work together for good or for ill. For example, mothers with greater human capital in the form of higher mental abilities enhance the positive effects on math achievement of school social capital in the form of going to a school where teachers care, while protecting their children from the negative effects of attending schools with more social problems. Similarly, having access to school social capital by attending a safe school buffers some of the negative effect high maternal working hours have on math achievement. We produce no evidence to suggest that family social capital is essential to translating family human capital into child achievement; were that the case, we would see interactions between variables such as maternal AFQT and children's home environments, or maternal education and maternal work hours. Thus, although Coleman's ideas on this point are intriguing ones, our findings point more frequently to interactive effects involving human capital at home (e.g., maternal AFQT) and social capital at school (e.g., school social problems or teachers caring) working together to boost/threaten achievement, or modify additive effects via thresholds.

These findings suggest that we cannot provide a strictly competitive test as to whether capital should be invested at home *or* at school. Rather, we need to consider how the two institutions work together to promote child achievement. The presence of several interactions composed of terms representing both family human capital

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and school social capital provides significant support for the idea that while capital investment at home is important for child achievement, combinations of investment at school and at home are also influential. Future research should evaluate additional hypotheses regarding how these two institutions' joint effects may be more important than their additive effects alone.

In addition, this strategy should be useful in investigations regarding other institutions' effects on individual outcomes. Here we have been concerned with the effects of school and family on child academic achievement. Parcel and Dufur (forthcoming) demonstrate that this model is also useful for studying the effects of school and family on child social adjustment. Analyses of the effects of school and community characteristics on college attendance, and investigations of both firms' characteristics and local economic conditions on employment prospects also involve the joint effects of major institutions on individual outcomes. It is important that we conceptualize individual outcomes as affected by multiple institutions. Our research provides support for this idea, as well as a strategy that may be useful in analogous investigations.

Notes

1. Although the idea of cultural capital (Bourdieu 1977; Farkas 1996) flows logically from this conceptualization, a full consideration of cultural capital is beyond the scope of this paper. This is an important topic for future work.
2. The issue of sample selection bias arises because we choose samples by determining which children have PIAT scores in 1992 and 1994 and also have at least a minimum of information — a score on type of school attended — from the schools. Following Berk (1983), we test for sample selection bias by constructing an inverse Mills statistic for inclusion in regression analysis. We create this statistic by running probit analyses to predict whether a child fell into or out of our sample. Independent variables included measures not used in the main analyses, but those that we expect might influence whether principals responded to the survey. We therefore included other aspects of family and school socioeconomic resources, and demographic controls (Dubin & Rivers 1990). This test was significant in our predictions of reading recognition and math, thus suggesting that family SES and school economic resources were associated with principal questionnaire completion.
3. We regressed the problematic variables on two sets of predictors: first, we included independent variables from our explanatory model of interest (predicting reading and math scores) on which there was very little missing data. These included maternal AFQT, self-esteem, race, region, religion, 1994 maternal education, marital status, home environment, number of children, and child's age and school type. The second set of variables we used to impute scores for missing data consisted of additional variables that were not included in the original explanatory model tapping family, school and neighborhood socioeconomic status, plus demographic controls. For variables where we could explain ten percent or more of the variance, we used the regression coefficients

APPENDIX A: Means, Standard Deviations, Correlations with Reading Recognition 1994, and Percentage of Missing Data

Variable	Mean	Std. Dev.	Correlation with Math 1994	Percentage of Missing Data
Math PIAT 1994 ^a	49.72	26.32	—	0
Math PIAT 1992 ^a	47.82	26.62	.610***	0
Reading Recognition PIAT 1994 ^a	54.23	29.04	.559***	0
Reading Recognition PIAT 1992 ^a	55.04	27.92	.521***	0
<i>Family social capital</i>				
Home environment ^b	.536	.324	.144***	1
Mother knows child's friends ^b	5.053	.921	.112***	1
Mother knows child's location ^b	3.638	.531	.079***	1
Child's church attendance ^b	2.939	.995	.028	1
Number of children ^b	2.736	1.201	-.135***	1
Married ^b	.614	.487	.188***	1
Maternal working hours ^c	36.175	11.667	-.104***	21
Spouse working hours ^c	42.566	12.909	.140***	30
<i>School social capital</i>				
Private school ^a	.054	.191	.100***	0
Public school ^a	.946	.446	.002	0
Teacher/students ^b ratio	.065	.173	-.010	14
Counselor/students ^b ratio	.003	.011	-.002	14
School social problems ^c	1.688	.364	-.123***	15
School physical environment ^c	3.177	.542	.175***	15
School communication ^c	3.930	.959	-.023	32
Teachers care ^c	4.090	.900	.072***	31
Parental involvement in school activities ^b	1.092	.342	-.048***	1

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APPENDIX A: Means, Standard Deviations, Correlations with Reading Recognition 1994, and Percentage of Missing Data (Continued)

Variable	Mean	Std. Dev.	Correlation with Math 1994	Percentage of Missing Data
<i>Family human capital</i>				
Mother's education ^b	12.492	1.878	.274***	1
Spouse education ^b	12.618	2.154	.223***	1
Maternal AFQT 1989 ^b	4.084	2.512	.424***	1
Mother lived in two-parent family at 14 ^b	.787	.410	.125***	1
Grandmother's education ^b	10.864	2.612	.245***	1
<i>Child human capital</i>				
Child health problems that require medication ^a	.078	.256	-.014	0
Child health problems that limit physical activities ^a	.036	.178	-.078***	0
Child health problems that limit school attendance ^a	.016	.118	-.083***	0
Child health problems that interfere with schoolwork ^a	.021	.138	-.162***	0
Duration of health problems in months ^a	26.236	12.754	-.176***	0
Low birthweight ^a	.038	.191	.058***	0
Child age ^a	132.688	31.212	-.092***	0
<i>School human capital</i>				
Ratio of teachers with MA's ^b	.506	.509	.013	14
Teachers' skill ^c	4.160	.810	.078***	32
<i>Family financial capital</i>				
Maternal wages ^b	9.046	6.673	.095***	1
Spouse wages ^b	15.612	5.873	.151***	1

APPENDIX A: Means, Standard Deviations, Correlations with Reading Recognition 1994, and Percentage of Missing Data (Continued)

Variable	Mean	Std. Dev.	Correlation with Math 1994	Percentage of Missing Data
<i>School financial capital</i>				
Total learning resources ^b	2.709	4.426	-.014	1
Per pupil expenditures ^b	5.68	4.426	-.062***	2
<i>Other controls</i>				
White ^a	.528	.499	.309**	0
Black ^a	.282	.450	-.237**	0
Mexican Hispanic ^a	.120	.325	-.109**	0
Other Hispanic ^a	.070	.254	-.033*	0
Male ^a	.513	.500	.004	0

Note: Means, standard deviations, and correlations varied little for the samples used to examine reading and mathematical achievement, so we report here only the results for the sample with the largest N (reading). Results for the math sample are available from the authors on request.

Types of missing data replacement:

^a No missing data

^b Missing data replaced through linear interpolation; the last valid value before and first valid value after the missing value are used to interpolate a value for the missing case.

^c Missing data replaced through regression imputation. We created a regression equation for each variable for which we used this method and then used the coefficients produced by that equation to create unique new values for each case that has missing data on that variable (see Endnote 3).

* $p < .05$ ** $p < .01$ *** $p < .001$

to compute unique replacement values. If a regression equation using these variables did not explain at least ten percent of the variance of one of our problem variables, we did not use the regression coefficients to perform regression imputation replacement of missing data for that variable. For these variables (child's church attendance, mother's knowledge of friends and location, mother's opinion of school, parental involvement in school, and both measures of school financial capital), we instead used the linear interpolation method described within the text. Superscripts in Appendix A indicate which of these strategies was used for which variables.

4. Some studies of school effects use multilevel modeling to evaluate the role of school characteristics on student outcomes (Bryk & Raudenbush 1992; Raudenbush & Bryk

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1986). However, this technique requires data where students are clustered by school so that there are sufficient cases with which to estimate the within-school regressions, which in turn form the foundation for the estimates of the school effects themselves. A ratio of five cases per independent variable is considered an acceptable number of cases for models run within each school. NLSY data were produced with a stratified area sample of youths ages 14-21 in 1979, but even the schools of these youths, who are now the parents of our target children, were more dispersed than this one-to-five ratio of cases to variables would suggest. By 1994, those young parents were obviously no longer living in those same geographical clusters. Therefore, their children will not be sufficiently clustered in schools to allow within-group estimations using multilevel modeling. Although the NLSY design thus sacrifices efficient estimation of aggregate-level effects given this geographic dispersion, variation in aggregate-level indicators increases, thus potentially strengthening key zero-order relationships.

5. We examined zero-order correlations among all of our independent variables to determine whether these associations might be introducing problems into our multivariate equations. As suggested by Coleman's (1988) assertion that human capital can be transferred through social capital, correlations do exist among some of our indicators of capital. For example, we find a significant correlation between maternal education (human capital) and home environments (social capital) ($r = .22$). Similarly, higher wages (financial capital) for both the mother ($r = .09$) and spouse ($r = .08$) are associated with better home environments (social capital). Further, correlations between variables within types of capital are often significant but are generally very small. For example, the correlation between home environment and maternal knowledge of child's friends, both family social capital indicators, is positive and significant, but is rather small ($r = .068$). The correlation between home environment and maternal work hours is also significant and in the expected direction, but is smaller yet ($r = -.032$). Similarly, the correlation between school social problems and parental-school communication, both indicators of school social capital, are significant but not large enough to suggest that the two variables are tapping exactly the same concept ($r = -.046$). These examples are representative of the correlations between indicators of capital in our model; fewer than five of the more than 2209 correlations (47 variables) among our indicators of capital were above .25. Inspection of multicollinearity diagnostics such as variance inflation factors indicated no cause for concern that these relationships bring into question findings from the multivariate analyses.

6. Again, we inspected collinearity diagnostics including tolerance coefficients and variance inflation factors and found no evidence that the final model specification suffered from multicollinearity that would challenge the findings.

7. Higher levels of per pupil expenditures are helpful in math achievement, although negative in affecting reading. It is interesting to note that the zero order correlation with math is negative; the positive effect is derived from our controls. The negative zero order effect with reading does not change when other variables are entered in the model.

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