The effects of schooling on parental time in education production[*]

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Abstract

This study uses recently released American Time Use Survey (ATUS) data to examine whether parents with greater educational attainment allocate more time towards the educational activities of their children. This question is inherently empirical because theoretical predictions about the direction of the relationship are ambiguous: net of correlations with preferences, opportunity costs, and resource availability, human capital and efficiency effects of schooling act in opposite directions. Regression results show that after controlling for a wide array of demographic and geographic characteristics including a variety of family structure and budget constraint measures, an additional year of schooling is associated with increases in time spent with children of 12 percent on reading, four percent on homework and two percent overall. However, the nature of the relationship differs across activity categories. For reading, virtually the entire relationship occurs on the extensive margin (i.e. spending any time with children) rather than the intensive margin (i.e. time spent conditional on allocating any time). The schooling gradient is large and significant for parents of both pre-school and school age children, married parents regardless of work status, both mothers and fathers, and both the school year and summer, and is larger at higher levels of schooling. For homework, effects are equally divided between the extensive and intensive margins but are marginally insignificant in each case, and are strongest among parents of school-age children, married parents who work, single parents, and mothers, and during school year weekdays. For overall time, the impact is primarily on the intensive margin, but is significant for both margins. The variation in importance across demographic groups is similar to that for homework time, but the relationship is driven by time spent during weekends, holidays and summer. Our failure to reject the hypothesis that schooling coefficients are equivalent for degree and non-degree years suggests that they at least partially reflect a human capital effect rather than unobserved heterogeneity with determinants of graduating from various levels.

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1. Introduction

This paper examines the amount of time parents spend in educational production at home using recently released data from the American Time Use Survey (ATUS). In particular, we investigate the association between years of schooling and parental time spent reading with their children, helping them with homework and in any activity with them.

It is well-established that family background is an important predictor of student achievement. Hoxby (2001), for example, finds that family variables account for 90–93 percent of the variation across individuals in income, educational attainment, and 12th grade math scores. More educated parents clearly raise more educated children.

This relationship appears to be both genetic and causal. There is weak, but growing, evidence that increasing parental education causally improves educational outcomes of their children. Behrman and Rosenzweig (2002) difference out monozygotic twins' genetics and find that children of better educated mothers attain less schooling. However, Antonovics and Goldberger (2003) show that these results are sensitive to data coding. Moreover, Plug (2004) finds no significant effect of mother's schooling on that of her adopted child, although children adopted by higher educated fathers attain more schooling.

Other studies use compulsory schooling laws to estimate causal effects of parental education on children's education, obtaining mixed results. Chevalier (2004) finds a positive effect of maternal educational attainment, but no effect of paternal attainment, on child schooling. Oreopoulous et al. (2003) estimate that increasing the education level of either parent reduces the likelihood that a child is held back in school. Using Norwegian data, Black et al. (2005) find that increasing maternal schooling raises child schooling.

Little is known, however, about the mechanisms through which additional parental schooling improves the educational outcomes of their children. This paper investigates one such mechanism: we consider whether more educated parents spend more time in educational production. Because economic theory does not unambiguously predict the direction of this relationship, our question is inherently an empirical one.

There are at least three reasons to expect a positive relationship between parental schooling and time in home education production. First, additional schooling might transmit an understanding that the marginal benefit of additional educational time with a child is larger than would otherwise have been assumed. Second, schooling could directly increase the marginal benefit of additional educational time at any time allocation amount. Third, higher educational attainment almost certainly reflects stronger preferences for educational activity that will also be manifested in spending more time in child educational production. An important distinction between these explanations is that the first two reflect causal impacts of schooling on time in educational production, while the third is symptomatic of a spurious correlation between schooling and child educational time through preferences regarding educational activity.

Results from some of the previous related literature are consistent with these theoretical arguments. In early time-use studies focusing on maternal time use in two-parent families, Hill and Russell (1974 and 1980) find that mothers with greater educational attainment spend more time with their children. Leibowitz (1977) suggests that more highly educated mothers participate in activities, such as reading, that improve child verbal abilities. Datcher-Loury (1988) estimates that schooling increases the effectiveness of maternal child care time in increasing child educational attainment.

Evidence on whether education increases productivity in home production is mixed. Michael (1973) and Gronau (1980) find that more educated women have higher productivity at home, while Graham and Green (1984) and Sharp et al. (2004), who summarize the other three papers, obtain the opposite result. Of these four papers, all but Michael (1973) focus on housework activities such as cooking and cleaning. Productivity in home production of education more clearly relates to a person's own education. In a developing country setting, Behrman et al. (1999) show that home production of education is more efficient among literate mothers.

There are also several reasons for which to expect the opposite, a negative, relationship between parental schooling and time in educational production. Additional schooling increases both the likelihood of maternal employment (Mulligan and Rubinstein 2005) and the wage rate. The former reduces the time available to spend with children, while the latter creates both substitution and income effects that raise the likelihood of purchasing educational inputs to offset less home production.[1] Flyer and Rosen (1997) show that increases in female labor supply lead to higher demand for school inputs. Michael (1973) estimates a positive elasticity of demand for education items with respect to household educational attainment, although Murnane et al. (1981) find that having more educational items in the home does not improve child achievement. Hill and Russell (1980) note that the time use of married fathers, who traditionally worked while their spouses stayed home to care for their children, changes little with the presence of children. Consistent with this, Leibowitz (1977) finds that paternal education does not affect child ability.

Other reasons that home education production time might decline with increased parental schooling are more subtle. Educational ability is both positively correlated with educational

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[1] In contrast to this argument, Bonesronning (2004) suggests that parental effort and school inputs are complementary. However, Houtenville and Smith-Conway (2005) convincingly argue that school inputs and parental effort are substitutes in educational production.

attainment and likely to be genetically transmitted to offspring. This means that children of highly educated parents will on average have higher ability and be more efficient in performing educational activities. Similarly, the greater productive efficiency among better educated parents documented earlier implies that additional schooling will decrease the amount of time parents need to complete a given educational task (e.g. homework assignment) with their children.

Our goal is to characterize the relationship between parental educational attainment and home education production time. We estimate regressions of time spent in reading, homework, and any activity with one's children on years of parental schooling that control for various indirect pathways through which parental schooling might impact educational time with their children. Specifically, holding constant a large set of covariates, including proxies for opportunity costs of parental time, constraints on parental time and income, and preferences regarding education, we estimate positive associations between home education production time and schooling. Effects on reading time are large, robust to a variety of sample permutations and concentrated on the extensive margins, i.e. whether any time is spent reading with a child. Effects on homework and overall time are smaller and hold only for certain samples, but are spread more evenly across the extensive and intensive margins, i.e. how much time is spent by those who spend any time in the given activity.

Because our controls for educational preferences are imperfect, we cannot make definitive statements about causality. However, using regression specifications similar to those in the "sheepskin" effects literature, we show that the marginal effect of an additional year of schooling is the same for degree and non-degree years, i.e. effects are not concentrated in the 12th and 16th year of schooling that correspond with graduating from high school and college. If educational preferences are more highly correlated with finishing high school and college than

with additional years of schooling between degree levels, this evidence is consistent with the premise that at least some of the observed association between educational attainment and home production is related to direct human capital effects.

2. Data and Empirical Strategy

This analysis uses the newly released American Time Use Survey (ATUS) from the Bureau of Labor Statistics. ATUS randomly samples survey households from the Current Population Survey (CPS) to complete a time use diary for a single day. One member of the household reports each primary activity as well as who is in the room with them. We focus on time spent with household children, particularly in activities related to the children's education.

The ATUS sampled 20,720 individuals in 2003 and 13,973 individuals in 2004. The ATUS provides weights to generate a nationally representative sample for the pooled 2003 and 2004 data; all of the analysis employs these weights. We observe one respondent in each household and restrict our sample to the 12,199 respondents who are parents of children under 18 that live in the same household and who report at least nine years of schooling. The latter constraint, which eliminates 458 respondents, is imposed for two reasons. One is that the lower tail of the schooling distribution has minimal policy relevance, given that current compulsory education laws severely limit the possibility of obtaining less than a ninth grade education. The other is that for these respondents we know only the education category, with a two or three year interval width, rather than the exact years of schooling.

We focus on three categories of time use: reading with own household children, helping own household children with homework, and any activity with own household children.[2] This

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[2] We omit other activities with children categorized as educational by the ATUS. Attending parent-teacher conferences is excluded because most of this time is presumably without children present, home schooling is

third, more inclusive category, which allows for more flexibility in the home production process of education, does not include time spent in secondary childcare during which the respondent is responsible for a child but is not interacting with him or her.

Table 1 summarizes, by five educational attainment groups, time spent with children in these three categories. On average, parents with more schooling spend more educational time, but not more time overall, with their children. However, the positive relationship between educational attainment and reading and homework time appears to be explained almost entirely by differences in the likelihood of spending time with children on reading and homework, as minutes conditional on spending any time in these activities are relatively constant across schooling categories. Parents spend more than five hours per day with their children, though just over eight percent of parents are not with their children at all on the diary day. Less than one percent of time with children involves reading with the child; 1.7 percent of time with children is in help with homework. One-twelfth of parents read with their children, spending on average a half-hour doing so. Ten percent provide homework assistance, spending just under an hour on average.

Table 2 provides an overview of the three categories of parental time with children for various subgroups. The propensity to engage in activities with children is higher for mothers, parents with multiple and pre-school children and married parents who do not work. Homework assistance is most likely to be provided to primary school age children and on weekdays during the school year. Parents of high school age children and who are not married are least likely to spend time with their children. Patterns for amounts of time devoted by parents who spend time

excluded because it substitutes for formal schooling, and a residual ATUS category for such time not elsewhere classified is excluded because it is unclear what this involves. These three categories compose less than 14 percent of total education time when they are included. We do not consider activities such as playing with children, teaching children how to tie their shoes or other non-school related activities that may be educational, which is consistent with the ATUS categorization of these activities as separate from educational activities with children.

with their children are similar, though less so for educational than overall time. Child time

allocations are largest on weekends and holidays.

The three categories of parental time with children summarized in table 1 constitute the

response variables for our empirical analysis. We test whether additional parental schooling is

associated with more educational and overall time with children. For parent i, we estimate the

regression equation

$$Time_i = \beta_0 + \beta_1 education_i + X\beta_2 + u_i.$$

Our variable of primary interest is *education*, with β_1 representing the relationship between

parental schooling and time spent with the child. The vector X contains the parent and child

characteristics listed in table 3, along with indicators for state of residence, month, day of the

week, whether the day was a holiday, 14 family income categories, 20 non-educational

occupational categories and seven teaching-related occupational categories.

One feature of the data of econometric importance, as noted above, is that many parents

do not spend time in educational activities with their children. To address this issue, for each

time category we separately estimate two equations, one for the decision of whether to spend

time with the child and another for the log of minutes spent with children, which is defined only

for those who spent some time with their children. This provides a way to disentangle effects on

the extensive and intensive margins. Both equations are estimated by OLS.

Table 3 lists the explanatory variables and shows summary statistics from the full sample.

On average, parents have attained two years of college education. Most are residents of

metropolitan areas, native U.S. citizens who were born in the U.S., white, employed, and have

spouses who are also employed. The average age is 38, but the sample includes the extremes

observed in the overall ATUS sample, as limited at the young end by the sampling strategy and

at the high end by top coding. About 56 percent are mothers. Seven percent are enrolled in

school, mostly in college, but less than half are full time students. Almost half of all respondent

children are age 6–13, with the rest relatively equally divided among ages 0–2, 3–5 and 14–17.

Employed respondents with non-varying labor supply work almost 42 weekly hours on average,

with an analogous average of 33 weekly hours for employed spouses.

3. Results

a. Full sample

Table 4 present results for each of the three time categories (pairs of columns) for four model

specifications (panels a–d). Each specification is estimated first for participation in the

corresponding category of time use (odd-numbered columns) and then, for those who participate,

the number of minutes spent in that activity (even-numbered columns). Moving down the table,

each subsequent panel represents a specification that includes an additional set of explanatory

factors, as indicated by the panel headings, that control for several indirect pathways through

which schooling might be related to time use.

The models in panel (a) control only for covariates that are plausibly exogenous to

parental schooling decisions: age and age squared, along with indicators for state, metropolitan

area, year, month, day of week, holiday, citizenship, gender and race. Educational attainment is

significantly positively related to participating in reading and any time with children. An

additional year of attainment increases the probability of reading with children by 16 percent and

total child time by 0.8 percent, but is unrelated to the probability of providing homework

assistance. Among those who spend time with their children, an additional year of schooling

increase minutes spent by two percent (i.e. seven minutes per day) but has no effect on time spent reading or helping with homework.

Panel (b) adds as controls a number of family structure variables: the number of children ages 0–2, 3–5, 6–13 and 14–17, the age of the youngest child, and indicators for being married and having an unmarried partner. Attainment is still significantly related to spending reading and overall time, but the magnitudes of the coefficients fall by 37 and 54 percent, respectively. Moreover, the schooling coefficient in the conditional overall minutes equation is reduced to one-eighth of its previous size and becomes insignificant. In these specifications, a large proportion of the schooling effects that were observed in panel (a) are in fact attributable to family structure differences that are correlated with both higher educational attainment and greater home education production. Schooling coefficients in other models remain insignificant.

Panel (c) adds several variables related to opportunity costs of time potentially devoted to children and constraints on the income and time available to spend on children, including logged weekly work hours for the respondent and spouse (or unmarried partner) along with indicators for whether weekly work hours vary (in which case the corresponding hours variable is set to zero because hours information is unreported), employment status of the respondent and spouse/partner, school enrollment, and 14 family income categories. In addition, occupation indicators – for 20 non-education occupations and seven teaching-related occupations – crudely control for both the possibility that more educated workers have jobs that involve more hours flexibility and preferences towards educational activity. These specifications are preferred to those in the first two panels because their schooling coefficients are purged of many of the aforementioned indirect pathways through which schooling and home education time might be correlated. Specifically, because schooling increases employment rates and wages, thus

increasing the opportunity cost of leisure and monetary resources to spend on educational inputs while reducing available leisure time, the coefficients in (c) are expected to be larger (more positive) than those in (b).

Indeed, this conjecture is uniformly confirmed, though coefficients that were significant in (a) remain smaller in magnitude than in the original specification. An additional year of schooling increases the probability of time with children by 11 percent for reading, two percent for homework (though this is insignificant) and 0.5 percent overall. The analogous effect on conditional minutes rises to 1.3 percent and regains significance for overall time, and increases to 0.9 percent for reading time and 1.8 percent for homework time but remains insignificant.

In sum, educational attainment is associated with increases in home education production. The relationship is stronger, both statistically and practically, for reading than for homework assistance. Almost the entire net effect of an additional year of schooling on reading time, 12 percent, operates through the extensive margin. In contrast, roughly half of the analogous effect for homework, four percent, occurs on the intensive margin. Attaining one more year of education also raises total time with children by slightly less than two percent, about three-quarters of which arises because of additional time allocated by parents who allocate any time.[3]

Although some indirect pathways through which schooling and educational time with children are held constant, the coefficients in panel (c) are not necessarily causal, i.e. attributable solely to human capital increases gained from additional schooling, because other sources of spurious correlation might remain. In particular, the extent to which higher attainment is

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[3] In evaluating the comparatively small size of the relationship for overall time, despite statistical significance on both the extensive and intensive margins, it should be kept in mind that most parents spend large amounts of time with their children (table 1), leaving little scope for a quantitatively large impact of schooling.

correlated with stronger preferences for educational activity, even after controlling for employment in teaching related occupations, is unclear.

One further source of heterogeneity that can be investigated is the possible correlation between the two dependent variable time categories. Given that educational attainment is positively related to both educational time and overall time with children, it seems likely that time in home educational and overall production are related. Panel (d) thus replicates panel (c), but adds the log of total minutes with children as a regressor. Because this variable is defined only for parents who spend any time with their children, the panel (d) samples include only these respondents, which reduces the sample sizes drastically for the two education-related time categories but only slightly for the overall time category. Evidently, schooling-related changes in overall child time do not drive schooling-related changes in educational time: the panel (d) estimates are only slightly different than those in panel (c). Subsequent tables thus show schooling coefficients from specifications that correspond to that shown in panel (c).

Table 5 presents the estimates for the most relevant remaining coefficients from these regressions. Most coefficients have the expected sign. Mothers are more likely than fathers to spend time with their children in each of the three categories and spend more total time conditional on spending any time. Infants are more time intensive. Parents are more likely to read to pre-school children and to help school-aged children with their homework. Those who work more hours spend less time with their children but, conditional on spending time, more time in homework help. The logged total minutes coefficient, the only one in the table that comes from the panel (d) regression in table 4, shows that, at the mean educational activity participation rate, a 10 percent increase in total child time raises reading and homework time by

only 4.3 and 6.2 percent, respectively, which is somewhat remarkable considering that these activities comprise such a small proportion of total time with children.

b. Subsamples

Table 6 replicates the specifications from panel (c) of table 4 for subsamples based on whether parents have pre-school (0–5 years old) and school-age (6–17 years old) children. Reading would be expected to occur more with pre-school than school-age children, while the opposite is true for homework help. The latter is reflected in the table 6 estimates. The top two panels show that homework time effects are close to zero for pre-school children; in fact, the sample of parents with only pre-school children who provide homework help is of insufficient size to estimate the conditional minutes regression. However, an additional year of schooling is associated with a statistically significant, 4–5 percent increase in the probability of providing homework help to school age children. Reading time effects are indeed significant, on the extensive margin, among parents of pre-school age children, but are also significant and even larger, in percentage terms, for parents of school age children. On both the extensive and intensive margins, effects of schooling on total time are larger for parents of school age than pre-school children, possibly because time allocations to pre-school children are large regardless of education level.

Table 7 shows coefficients for subsamples based on whether the respondent has a spouse or partner present and whether that spouse or partner works. On the extensive margin, schooling coefficients are larger for married/partnered parents, particularly among parents in dual-income households with respect to homework and total time. Educational attainment has no effect on activity participation for single parents. In contrast, on the intensive margin, schooling

coefficients are small and insignificant for married/partnered parents, but are positive and large for single parents, albeit significant only for homework time. Conditional on helping with homework, single parents with an additional year of schooling spend 15 percent more time in homework help. Even the analogous effect of nearly seven percent for reading time, though statistically insignificant, is large relative to the negligible intensive margin reading time effect in the full sample. Clearly, having no other parent available to spend time with the child on a regular basis affects home education production decisions. It could be that single parents have limited scope to alter the frequency of educational interactions, but those that are more educated find more time for the interactions that do occur.

Table 8 estimates the parental time equations separately for mothers and fathers. As reviewed earlier, previous time use studies from the 1970s focus on mothers and find little impact of children on the time allocation decisions of fathers. However, we might expect that participation by fathers in their children's lives has increased during the intervening period. In fact, results for reading time are similar across genders: an additional year of schooling raises participation by about 10 percent and is unrelated to conditional minutes spent reading. For homework help, though, educational attainment is unrelated to time allocation by fathers, but has a large positive effect (albeit statistically insignificant for participation) for mothers, for whom a year of schooling raises time allocated by seven percent. These results are consistent with those of Black et al. (2005) and Chevalier (2004), who find effects of maternal education, but not paternal education, on children's schooling. Total time coefficients for mothers are similar to those for the full sample; the extensive margin effect is nearly identical for fathers, but there is no accompanying intensive margin effect.

Table 9 separates the sample into school days, weekends and holidays during the school year, and summer days. For reading and homework participation, schooling coefficients are larger for school nights than other nights, though the reading semi-elasticity is still significant and sizable for other days, while for conditional time spent the effects are insignificant and small other than for reading on weekends and holidays during the school year. Homework help participation effects appear to be driven by school nights, consistent with the notion that much homework assistance is for assignments that are imminently due. Total time participation coefficients are quite similar across subsamples, but the amount of parental time allocated to children is positively related to time available, assuming that parental time constraints are less binding on weekends regardless of the time of year.

c. Within degree level effects

To reemphasize a point made when discussing the main results from table 4, one potentially important type of heterogeneity that prevents us from interpreting the schooling coefficients as causal effects is the likely correlation of schooling with attitudes regarding the importance of education. The top panel of table 10 takes one approach, though indirect and incomplete, at investigating this issue, based on previous literature addressing "sheepskin" effects of high school and college degrees. These studies (e.g. Hungerford and Solon 1987, Jaeger and Page 1996) find large wage jumps in the 12th and 16th year of schooling relative to other years, which presumably imply that the signaling value of finishing high school and college play some role in the positive effect of schooling on wages. Analogous jumps in home education production at these years of schooling would suggest that the same characteristics or preferences that determine whether an individual finishes the last year of high school and

college, and are evidently valued by employers, are also correlated with the decision by more highly educated parents to allocate additional educational time to their children.

In panel (a) of table 10, indicators of graduating from high school (exactly 12 years of schooling), college (exactly 16 years) and obtaining a professional or doctoral degree (20 years) are added to the models from panel (c) of table 4. In conjunction, a new schooling measure is created which measures years of schooling after eighth grade (for high school dropouts), high school (for high school graduates who did not obtain a bachelor's degree) and college (for bachelor's recipients who did not receive a professional or doctoral degree). If preferences associated with finishing degrees matter, we would expect the graduation coefficients to be much more than four times larger than the years of schooling coefficients. However, this is only true for a subset of the degree coefficients across models, and many of these have large associated standard errors. The bottom row of panel (a) shows that the null hypothesis corresponding to the absence of degree effects cannot be rejected in any of the six models, with p values never below 0.5.

Panel (b) estimates whether the marginal effect of a year of schooling is the same for schooling that occurs in high school, college and graduate school.[4] For any reading time, the impact of schooling is larger at higher education levels: an additional year has a mildly negative impact for high school, but increases the propensity to spend time reading with children by about nine percent for college and 24 percent for graduate school. The penultimate row shows that the hypothesis of equivalent schooling effects at each level is rejected at any conventional significance level. Similar conclusions, albeit at lower confidence levels, are reached for total child time on both the extensive and intensive margins.

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[4] Conclusions from the more sophisticated model that combines the two specifications from table 10 are identical to those in panel (a).

4. Conclusion

This study uses recently released American Time Use Survey (ATUS) data to examine whether parents with greater educational attainment allocate more time towards the educational activities of their children. This question is inherently empirical because theoretical predictions about the direction of the relationship are ambiguous: net of correlations with preferences, opportunity costs, and resource availability, human capital and efficiency effects of schooling act in opposite directions. Regression results show that after controlling for a wide array of demographic and geographic characteristics including a variety of family structure and budget constraint measures, an additional year of schooling is associated with increases in time spent with children of 12 percent on reading, four percent on homework and two percent overall.

The nature of the relationship differs across activity categories. For reading, virtually the entire relationship occurs on the extensive margin (i.e. spending any time with children) rather than the intensive margin (i.e. time spent conditional on allocating any time). The schooling gradient is large and significant for parents of both pre-school and school age children, married parents regardless of work status, both mothers and fathers, and both the school year and summer, and is larger at higher levels of schooling. For homework, effects are equally divided between the extensive and intensive margins but are marginally insignificant in each case, and are strongest among parents of school-age children, married parents who work, single parents, and mothers, and during school year weekdays. For overall time, the impact is primarily on the intensive margin, but is significant for both margins. The variation in importance across demographic groups is similar to that for homework time, but the relationship is driven by time spent during weekends, holidays and summer.

A possible reason for the relative sizes of the extensive and intensive margin effects in the reading and homework time categories, as well as the combined effect in these categories, is the impact of improved educational time efficiency, on the part of either the parents or their children, associated with higher education levels. Presumably this will not affect the decision to read with children, but could reduce the amount of time spent reading in a given session. It also seems likely that more educated parents help their children with homework less often, or for shorter amounts of time, because they are more efficient at transmitting assistance or their children require less assistance because they have higher ability in educational tasks. This scenario would predict a large relationship between schooling and reading time on the extensive margin and comparatively smaller effects on the intensive margin and for homework assistance.

Our failure to reject the hypothesis that schooling coefficients are equivalent for degree and non-degree years suggests that they at least partially reflect a human capital effect rather than unobserved heterogeneity with determinants of graduating from various levels. The existence of a direct human capital effect would imply that policies that promote educational attainment among youth, beyond being beneficial for a wide variety of well-understood reasons, might also provide the additional benefit of increased educational attainment among the future children of those youth. Such an effect would be bolstered if programs that increase educational attainment also change the attitudes of the affected youth towards the importance of education for their future children.

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Table 1: Time in education-related activities, by years of schooling

Years of schooling	≥ 9 < 12	12	≥ 13 < 16	16	> 16	Total
Number of respondents	805	3,833	3,203	2,851	1,507	12,199
Avg. number of children	1.97	1.84	1.87	1.87	1.82	1.87
Minutes spent:						
Reading	1.05	1.70	2.54	3.78	3.96	2.54
Helping with homework	5.17	5.36	4.96	5.82	5.97	5.41
Any activity	336	316	319	330	318	322
Spent any time with child						
Reading	.032	.051	.086	.124	.133	.083
Helping with homework	.102	.093	.098	.106	.113	.100
Any activity	.891	.905	.920	.933	.931	.916
Minutes conditional on any:						
Reading	32.5	32.9	29.7	30.4	29.7	30.7
Helping with homework	50.7	57.6	50.6	54.7	52.7	54.1
Any activity	377	350	346	354	341	351

Statistics other than number of respondents are calculated using sample weights.

Table 2: Time in education-related activities: various subgroups

Group	N	Any child time Read.	HW	Any	Conditional minutes Read.	HW	Any
Mother	7,216	.108	.131	.951	31.1	51.5	395
Father	4,983	.051	.061	.873	29.6	61.0	291
Has 1 child	4,938	.062	.065	.884	32.7	54.4	312
Has 2 children	4,858	.101	.111	.932	29.5	52.6	356
Has 3+ children	2,403	.090	.151	.951	30.6	56.0	415
Has any children age 0–2	3,203	.126	.057	.960	29.7	54.2	447
Has only children age 0–2	1,342	.098	.002	.963	31.0	30.0	427
Has any children age 3–5	3,569	.161	.097	.952	30.2	50.5	417
Has only children age 3–5	887	.170	.042	.936	31.6	50.4	384
Has any children age 6–13	7,449	.077	.151	.928	31.2	54.9	347
Has only children age 6–13	3,571	.063	.163	.906	33.3	58.0	305
Has any children age 14–17	3,366	.022	.084	.871	30.2	53.8	284
Has only children age 14–17	1,602	0	.041	.806		50.4	222
Has spouse or partner & job	7,829	.076	.082	.910	27.8	53.1	311
Has spouse or partner & no job	1,997	.125	.154	.967	33.6	56.0	490
Has no spouse or partner	2,373	.063	.119	.886	39.3	54.3	361
September–May	9,195	.086	.122	.922	31.0	53.9	347
June–August	3,004	.072	.034	.899	29.6	56.0	365
Weekday & not holiday	5,881	.088	.130	.914	28.7	53.1	299
Weekend or holiday	6,318	.070	.030	.921	36.7	63.8	471

Statistics other than number of respondents are calculated using sample weights.

Table 3: Summary statistics for explanatory variables in full sample (*N* = 12,199)

Variable	Mean	Standard deviation	Min.	Max.
Years of schooling	13.92	2.472	9	20
Year 2004	.5103		0	1
Lives in non-metropolitan area	.1893		0	1
Metropolitan area status not identified	.0015		0	1
Native U.S. citizen born in U.S. outlying area	.0059		0	1
Native U.S. citizen born abroad	.0102		0	1
Naturalized foreign-born U.S. citizen	.0461		0	1
Foreign born & not U.S. citizen	.0938		0	1
Age	37.71	8.441	15	80
Female	.5568		0	1
White	.8160		0	1
Black	.1249		0	1
Hispanic	.1448		0	1
Married	.8090		0	1
Has non-spouse partner	.0360		0	1
Number of children age 0–2	.3133	.5447	0	4
Number of children age 3–5	.3221	.5409	0	3
Number of children age 6–13	.8561	.9030	0	7
Number of children age 14–17	.3740	.5977	0	4
Age of youngest child	6.847	5.244	0	17
Enrolled in school	.0701		0	1
Enrolled full-time	.0298		0	1
Enrolled in college	.0667		0	1
Employed but absent from work	.0327		0	1
Unemployed on layoff	.0072		0	1
Unemployed & looking for work	.0442		0	1
Not in labor force	.1632		0	1
Weekly hours worked	31.60	21.22	0	160
Work hours vary	.0266		0	1
Spouse does not work	.1784		0	1
Spouse weekly hours worked	26.34	22.15	0	99
Spouse work hours vary	.0253		0	1

Statistics are calculated using sample weights. Standard deviations are shown only for non-indicator variables. Regressions also control for indicators for state, month, day of week, holiday, 14 family income categories, 20 non-educational occupation categories and seven teaching occupation categories.

Table 4: Effects of years of schooling on time with children

Time category:	Reading		Homework		Total	
Dependent variable:	Any time	Log (min.)	Any time	Log (min.)	Any time	Log (min.)
Regressors included	(1)	(2)	(3)	(4)	(5)	(6)
a: Baseline	.0135	−.0036	.0002	−.0006	.0074	.0217
	(.0014)	(.0103)	(.0015)	(.0114)	(.0015)	(.0048)
	.1633		*.0020*		*.0081*	
b: (a) plus family structure	.0085	−.0041	.0016	.0002	.0034	.0028
	(.0013)	(.0110)	(.0016)	(.0114)	(.0016)	(.0045)
	.1028		*.0160*		*.0037*	
c: (b) plus budget constraint	.0092	.0090	.0021	.0177	.0043	.0125
	(.0017)	(.0112)	(.0019)	(.0135)	(.0019)	(.0055)
	.1113		*.0210*		*.0047*	
d: (c) plus log(min. w/ child)	.0092	.0079	.0016	.0178		
	(.0019)	(.0111)	(.0021)	(.0131)		
	.1113		*.0160*			
Sample size	12,199	1,099	12,199	1,048	12,199	11,252

Estimates are from OLS regressions that use sample weights. Standard errors robust to arbitrary forms of heteroskedasticity are in parentheses. Semi-elasticities at the weighted dependent variable means are in italics. All models include age and age squared along with indicators for state, metropolitan area status, year, month, day of week, holiday, citizenship, gender, and race. Family structure variables include number of children ages 0–2, 3–5, 6–13 and 14–17, age of the youngest child, and marital status indicators. Budget constraint variables include logged work hours for respondent and spouse/partner and indicators for 14 family income categories, 20 non-educational occupation categories, seven teaching occupation categories, school enrollment, labor force status, whether work hours for respondent and spouse/partner are variable, and whether spouse/partner works. Linear probability models that include logged minutes with children (model (d), odd-numbered columns) omit 947 respondents who report spending no time with their children.

Table 5: Additional regression coefficients

Time category:	Reading		Homework		Total	
Dependent variable:	Any time	Log (min.)	Any time	Log (min.)	Any time	Log (min.)
Regressor	(1)	(2)	(3)	(4)	(5)	(6)
Female	.0435	−.0789	.0459	−.1160	.0803	.2603
	(.0073)	(.0643)	(.0095)	(.0749)	(.0113)	(.0305)
Married	−.0528	.2849	−.0390	.3545	.0619	−.1517
	(.0305)	(.2480)	(.0354)	(.3916)	(.0409)	(.1385)
Has non-spouse partner	−.0805	.0231	−.0759	.7435	.0212	−.1489
	(.0324)	(.2828)	(.0376)	(.4178)	(.0445)	(.1428)
Number of children age 0–2	−.0072	−.0577	−.0205	.1087	.0014	.0748
	(.0104)	(.0598)	(.0117)	(.0821)	(.0099)	(.0293)
Number of children age 3–5	.0516	.0055	.0063	−.0140	.0018	.0927
	(.0081)	(.0450)	(.0092)	(.0597)	(.0071)	(.0215)
Number of children age 6–13	−.0132	−.0372	.0555	.0780	.0133	.0630
	(.0040)	(.0312)	(.0049)	(.0356)	(.0046)	(.0132)
Number of children age 14–17	−.0248	−.1540	−.0102	-.1056	.0010	.0459
	(.0049)	(.0677)	(.0080)	(.0667)	(.0073)	(.0250)
Age of youngest child	−.0078	.0064	.0009	.0045	−.0096	−.0477
	(.0010)	(.0141)	(.0016)	(.0114)	(.0017)	(.0045)
Employed, absent from work	−.0010	.1935	.0014	−.2179	.0108	.4167
	(.0181)	(.1261)	(.0154)	(.1823)	(.0140)	(.0679)
Unemployed on layoff	−.0720	−.6138	−.0289	.9955	−.0188	−.6391
	(.0479)	(.3948)	(.0601)	(.4271)	(.0394)	(.1680)
Unemployed, looking for work	−.0852	−.1695	.0144	.6033	−.0803	−.3936
	(.0376)	(.2530)	(.0466)	(.2749)	(.0361)	(.1205)
Not in labor force	−.0418	−.0474	−.0332	.5353	−.0454	−.2951
	(.0365)	(.2164)	(.0405)	(.2635)	(.0314)	(.1122)
Log(weekly hours worked)	−.0211	−.1204	−.0163	.1057	−.0194	−.2167
	(.0091)	(.0544)	(.0103)	(.0645)	(.0082)	(.0293)
Work hours vary	−.0584	−.3059	−.0323	.4048	−.0631	−.7215
	(.0383)	(.2077)	(.0424)	(.2710)	(.0334)	(.1209)
Spouse does not work	.0419	−.3063	.0164	−.6587	−.0281	.0615
	(.0283)	(.2389)	(.0324)	(.3856)	(.0384)	(.1327)
Log(spouse wk. hours worked)	.0142	−.1094	.0516	−.4165	−.0057	.0301
	(.0079)	(.0644)	(.0446)	(.4485)	(.0104)	(.0367)
Spouse work hours vary	.0816	−.4837	.0124	−.1427	−.0221	1047
	(.0353)	(.2720)	(.0090)	(.1034)	(.0419)	(.1449)
Log(minutes with child)	.0258	.1232	.0322	.2996		
	(.0027)	(.0404)	(.0034)	(.0457)		
Sample size	12,199	1,099	12,199	1,048	12,199	11,252

Estimates are from OLS regressions that use sample weights. Standard errors robust to arbitrary forms of heteroskedasticity are in parentheses. All models include age and age squared, indicators for state, metropolitan area status, year, month, day of week, holiday, citizenship, gender, and race, and the family structure and budget constraint variables listed in the footnote to table 4. The log(minutes with child) coefficients are from specifications corresponding to row (d) of table 4 that omit respondents who report spending no time with their children.

Table 6: Schooling effects in pre-school and school-aged samples

Time category:	Reading		Homework		Total	
Dependent variable:	Any time	Log (min.)	Any time	Log (min.)	Any time	Log (min.)
Sample	(1)	(2)	(3)	(4)	(5)	(6)
At least one child age ≤ 5	.0125	.0077	.0009	.0165	.0036	−.0007
	(.0030)	(.0132)	(.0024)	(.0242)	(.0019)	(.0066)
	.0916		*.0117*		*.0038*	
Sample size	5,583	826	5,583	357	5,583	5,357
No children age ≥ 6	.0117	−.0131	.0005		.0007	.0055
	(.0043)	(.0166)	(.0018)		(.0026)	(.0092)
	.0808		*.0208*		*.0007*	
Sample size	3,057	499	3,057	53	3,057	2,935
At least one child age ≥ 6	.0074	.0278	.0054	.0150	.0054	.0141
	(.0018)	(.0136)	(.0024)	(.0142)	(.0024)	(.0066)
	.1215		*.0426*		*.0060*	
Sample size	9,142	600	9,142	995	9,142	8,317
No children age ≤ 5	.0044	−.0454	.0057	.0219	.0054	.0197
	(.0018)	(.0234)	(.0028)	(.0176)	(.0030)	(.0084)
	.1195		*.0476*		*.0061*	
Sample size	6,616	273	6,616	691	6,616	5,895

Estimates are from OLS regressions that use sample weights. Standard errors robust to arbitrary forms of heteroskedasticity are in parentheses. Semi-elasticities at the weighted dependent variable means are in italics. All models include age and age squared, indicators for state, metropolitan area status, year, month, day of week, holiday, citizenship, gender, and race, and the family structure and budget constraint variables listed in the footnote to table 4.

Table 7: Schooling effects by marital & work status

Time category:	Reading		Homework		Total	
Dependent variable:	Any time	Log (min.)	Any time	Log (min.)	Any time	Log (min.)
Sample	(1)	(2)	(3)	(4)	(5)	(6)
Has spouse or partner & works	.0093 (.0019) *.1221*	.0152 (.0147)	.0039 (.0021) *.0478*	−.0037 (.0185)	.0066 (.0025) *.0073*	.0101 (.0069)
Sample size	7,829	656	7,829	577	7,829	7,222
Has spouse or partner & does not work	.0125 (.0045) *.0998*	−.0097 (.0240)	−.0010 (.0046) *−.0065*	.0316 (.0280)	−.0018 (.0021) *−.0019*	.0107 (.0102)
Sample size	1,997	276	1,997	248	1,997	1,939
Unmarried & no partner	−.0011 (.0041) *−.0174*	.0675 (.0585)	.0026 (.0056) *.0218*	.1462 (.0556)	.0000 (.0055) *.0000*	.0236 (.0162)
Sample size	2,373	167	2,373	223	2,373	2,091

Estimates are from OLS regressions that use sample weights. Standard errors robust to arbitrary forms of heteroskedasticity are in parentheses. Semi-elasticities at the weighted dependent variable means are in italics. All models include age and age squared, indicators for state, metropolitan area status, year, month, day of week, holiday, citizenship, gender, and race, and the family structure and budget constraint variables listed in the footnote to table 4.

Table 8: Schooling effects by gender

Time category:	Reading		Homework		Total	
Dependent variable:	Any time	Log (min.)	Any time	Log (min.)	Any time	Log (min.)
Sample	(1)	(2)	(3)	(4)	(5)	(6)
Mothers	.0114	.0041	.0036	.0429	.0051	.0151
	(.0027)	(.0131)	(.0029)	(.0154)	(.0021)	(.0066)
	.1053		*.0274*		*.0054*	
Sample size	7,216	814	7,216	784	7,216	6,837
Fathers	.0050	−.0062	.0005	−.0401	.0054	.0031
	(.0019)	(.0261)	(.0023)	(.0396)	(.0034)	(.0093)
	.0989		*.0082*		*.0062*	
Sample size	4,983	285	4,983	264	4,983	4,415

Estimates are from OLS regressions that use sample weights. Standard errors robust to arbitrary forms of heteroskedasticity are in parentheses. Semi-elasticities at the weighted dependent variable means are in italics. All models include age and age squared, indicators for state, metropolitan area status, year, month, day of week, holiday, citizenship, gender, and race, and the family structure and budget constraint variables listed in the footnote to table 4.

Table 9: Schooling effects by day of week & time of year

Time category:	Reading		Homework		Total	
Dependent variable:	Any time	Log (min.)	Any time	Log (min.)	Any time	Log (min.)
Sample	(1)	(2)	(3)	(4)	(5)	(6)
Monday–Thursday during school year (September–May)	.0119 (.0031) *.1188*	.0030 (.0186)	.0062 (.0039) *.0333*	.0121 (.0171)	.0047 (.0031) *.0051*	.0070 (.0092)
Sample size	3,538	403	3,538	718	3,538	3,307
Friday–Sunday or holiday during school year (Sept.–May)	.0064 (.0023) *.0925*	.0288 (.0183)	−.0001 (.0021) *−.0023*	.0174 (.0361)	.0039 (.0026) *.0042*	.0192 (.0080)
Sample size	5,657	463	5,657	254	5,657	5,243
Summer (June–August)	.0073 (.0032) *.1019*	.0091 (.0283)	−.0004 (.0023) *−.0118*		.0044 (.0042) *.0049*	.0149 (.0108)
Sample size	3,004	233	3,004	76	3,004	2,702

Estimates are from OLS regressions that use sample weights.   Standard errors robust to arbitrary forms of heteroskedasticity are in parentheses. Semi-elasticities at the weighted dependent variable means are in italics. All models include age and age squared, indicators for state, metropolitan area status, year, month, day of week, holiday, citizenship, gender, and race, and the family structure and budget constraint variables listed in the footnote to table 4.

Table 10: Effects of schooling within degree categories

Time category:	Reading		Homework		Total	
Dependent variable:	Any time	Log (min.)	Any time	Log (min.)	Any time	Log (min.)
Variable	(1)	(2)	(3)	(4)	(5)	(6)
a) Different effects for degree years						
Years of schooling	.0077	.0062	–.0009	.0122	.0047	.0069
	(.0030)	(.0212)	(.0033)	(.0275)	(.0033)	(.0107)
High school graduate	.0219	.0964	–.0005	.0557	.0310	.0775
	(.0110)	(.1645)	(.0163)	(.1188)	(.0185)	(.0546)
College graduate	.0439	.0330	.0167	.0615	.0123	.0451
	(.0092)	(.0538)	(.0099)	(.0699)	(.0091)	(.0269)
Ph.D. or professional school graduate	.0301	.0170	–.0089	.1629	.0190	.0472
	(.0206)	(.1069)	(.0215)	(.1366)	(.0184)	(.0586)
F statistic for test of joint significance	7.43 [.000]	.19 [.944]	.82 [.511]	.65 [.628]	1.40 [.232]	1.39 [.236]
F statistic for test that $4\beta_{years} = \beta_{HS} = \beta_{Col} = \beta_{PhD}$	.90 [.442]	.07 [.977]	.76 [.516]	.17 [.913]	.32 [.810]	.24 [.866]
b) Different slopes within degree categories						
Years of schooling during high school	-.0020	-.0074	-.0022	.0403	.0004	-.0058
	(.0028)	(.0215)	(.0033)	(.0249)	(.0031)	(.0098)
Years of schooling during college	.0076	.0201	-.0004	.0613	.0046	.0116
	(.0038)	(.0224)	(.0041)	(.0285)	(.0038)	(.0115)
Years of schooling during graduate school	.0199	.0007	.0013	.0894	.0090	.0185
	(.0055)	(.0328)	(.0059)	(.0415)	(.0055)	(.0171)
F statistic for test of joint significance	9.30 [.000]	1.21 [.304]	.39 [.758]	1.81 [.144]	1.37 [.251]	1.96 [.118]
F statistic for test that $\beta_{year(HS)} = \beta_{year(Col)} = \beta_{year(PhD)}$	13.39 [.000]	1.76 [.173]	.35 [.703]	1.12 [.328]	2.03 [.132]	2.87 [.057]
Sample size	12,199	1,099	12,199	1,048	12,199	11,252

Estimates are from OLS regressions that use sample weights. Years of schooling is measured in increments between degrees, starting with zero at eight, 12, 16 years and 20 years. In specification a), indicators for graduating from high school, college and a doctoral or professional (beyond masters level) graduate program are included separately. In b), years of schooling is coded as four for 12, 16 and 20 total years, and is interacted with an indicator for whether the year takes place in high school, college or graduate school. Standard errors robust to arbitrary forms of heteroskedasticity are in parentheses. Square brackets beneath F statistics contain p-values. All models include age and age squared, indicators for state, metropolitan area status, year, month, day of week, holiday, citizenship, gender, and race, and the family structure and budget constraint variables listed in the footnote to table 4.