Non-Cognitive Skills and Educational Attainment

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Abstract

This paper relies on data from the NLSY97 (n= 3,459) to explore the role of cognitive and non-cognitive skills in educational attainment. Our sample consists of children initially observed in 1997 at ages 12-14, when measures of their cognitive abilities, family backgrounds, non-cognitive skills, and home environments are collected. Educational attainment is measured in 2007, when youth are between the ages of 22 and 24. We also employ the Blinder Oaxaca decomposition approach to analyzing educational outcomes between subgroups defined by parental education levels. Our results also show that a one standard deviation improvement in children's cognitive test scores relate to a .32 sd increase in net educational attainment. Nevertheless, controlling for all of these variables and a wide set of background characteristics (including parental self-efficacy), the role of children's non-cognitive skills in predicting educational attainment is as strong as the role of cognitive skills; positive expectations about the future figure prominently in these associations. A test of the interaction between cognitive and non-cognitive skills reveals that for children with low cognitive test scores, self-efficacy is a highly significant predictor of educational attainment (years of education and college attendance), whereas self-efficacy is insignificant for those children with average and high cognitive skill levels. More specifically, for children with low cognitive skills, increasing self-efficacy by one standard deviation can improve their outcomes to a level where they exceed the outcome for children with average cognitive skills. Finally, our decomposition analysis indicates that a significant proportion of the difference in children's educational attainment by parental education is attributable to differences in the level of our predictors, especially cognitive test scores.

1. Introduction

Economists and other social scientists have long been interested in the determinants of human capital formation and in the role that human capital policies can play in ameliorating disadvantage. Until recently, questions in this field focused exclusively on cognitive skills (Heckman & Krueger, 2003). More recent work suggests that both cognitive and non-cognitive factors predict future success in education and employment (Cunha & Heckman, 2007; Heckman, 2007; Heckman, Stixrud, & Urzua, 2006). Identifying the importance of these factors, alone or in combination, can provide insights into the policy levers that can be pushed to improve educational success. This is important because education plays a key role in economic mobility and attainment in America. Although there are important differences by race and gender, on average educational attainment not only improves the likelihood of earning greater income than one's parents, but also increases the probability that children born into low-income households will move out of poverty as adults. It also, to an even greater degree, ensures that children born into wealthy families will maintain that status as adults.

Children resemble their parents in many ways. The elasticity of educational attainment in the US is relatively high -- roughly 0.36 (Grawe 2007). Most researchers would agree that this represents a high degree of persistence. In contrast, in countries where family background is not as strong a determinant of future attainment, in part due to the presence of strong welfare states (e.g., the Nordic countries), the corresponding correlation coefficient is closer to .20 (Black et al., 2005).

Some have argued, controversially, that the correlation across generations in educational attainment is due largely to the genetic transmission of IQ (Herrnstein & Murray, 1994). If this were the case, there would seemingly be little role for public policy to intervene. Others have argued that this correlation represents constraints on economic resources within families. The human capital model of earnings and intergenerational transmission of economic status (Becker-Tomes) argues that the level of human capital investment in children is driven not only by their returns to education, which is determined by their level of abilities, but also credit constraints on parents, in the absence of fluid credit markets. Carneiro and Heckman (2002) find a strong correlation between parental income and college attendance while Ellwood and Kane (2000) and Haveman and Speeding (2006) find that this correlation is increasing with time. However, Carneiro and Heckman (2003) find that after controlling for cognitive skills and family characteristics only 4.2% of children are financially constrained and they are spread equally across the first three income quartiles. Hence, the literature is divided on the relative impact of abilities, family background and income on education, though there is evidence for the absolute impact of each.

In studies of the intergenerational transmission of economic status, it is well accepted that over fifty percent of the transmission of earnings is unaccounted for by cognitive skills and educational attainment (Osborne, 2002). Researchers have thus turned their attention to factors inside the household; i.e., the behaviors and attitudes that parents might teach or strive to foster in their children that affect educational attainment independent of their cognitive abilities. Most recently, there has been increasing evidence for the impact of non-cognitive skills such as motivation and self-esteem, on educational outcomes and on economic success (Osborne, 2000; Heckman, 1999 and 2011 and Goldsmith et. al., 1997). Mason (2006) employs the PSID to estimate the impact of motivation on educational attainment and finds that achievement orientation impacts educational outcome positively. He also finds a larger role for family behaviors and home environment (e.g. having reading material at home) in determining children's education as opposed to their earnings.

This paper assesses the role of cognitive and non-cognitive skills and also economic and non-economic measures of the home environment (including parents' non-cognitive skills) to predict children's educational attainment. The strength of our data (the NLSY97) includes that it is a large representative sample of young adults (ages 22-24), who provided detailed information 10 years earlier about their cognitive skills, their families' SES, and their attitudes, expectations, and personality. This allows us to distinguish among the potentially different effects of this range of factors and hence determine whether and in what aspects policy can serve to decrease intergenerational persistence in education, and hence minimize inequalities in educational opportunities.

We borrow from the literature on the determinants of earnings in adults to analyze to what extent predictors of earnings such as cognitive skills, resource constraints, personality and motivation all account for educational outcomes as well, to focus on education and child policy intervention in these aspects prior to entry into the workforce. This is an extension to traditional explanations focusing on the transmission of IQ in explaining the high degree of familial similarity in education in the United States.

Related studies

The present paper fits into a broader body of work focused on the role of "non-cognitive skills" in human capital investments, labor market outcomes, and social behavior (Andrisani, 1977; Coleman & DeLeire, 2003; Cuhna & Heckman, 2007; Duckworth & Seligman, 2005; Duncan & Dunifon, 1998; Goldsmith, Veum, & Darity, 1997; Heckman, Stixrud, & Urzua, 2006; Kalil & Kunz, 1999; Menaghan, 1990; Wang, Kick, Fraser, & Burns, 1999). Although there is far from universal consensus on what constitutes a "non-cognitive skill," many such studies focus on locus of control and related measures of self-efficacy. Locus of control refers to the degree to which persons expect that a reinforcement or an outcome of their behavior is contingent on their own behavior (internal control) versus the degree to which persons expect that the reinforcement or outcome is a function of chance, luck, or fate, is under the control of powerful others, or is simply unpredictable (Rotter, 1990). Studies in psychology, sociology and, increasingly, economics, conclude that such factors play a substantively important role in men's and women's physical health, psychological well-being, and human capital development and, importantly, that these skills are distinct from measures of ability or other cognitive skills (Bandura, 1989; Benabou & Tirole, 2002; Gecas, 1989; Haidt & Rodin, 1999; Heckman et al., 2006; Wang et al., 1999). Such empirical findings support a theoretical argument that individuals who believe that labor market success depends little on their schooling investments and more on luck, fate, or powerful others would be less likely to invest and succeed in school (Coleman & DeLeire, 2003). Self-beliefs of efficacy or control may shape behavior through their impact on motivation and perseverance in the face of difficulty, cognitive processes such as persistence or task orientation, or affective processes, such as the ability to manage stress and anxiety in taxing situations (Bandura, 1989). Of particular relevance for the present paper, non-cognitive abilities appear to play a more important role in schooling versus earnings (Heckman et al., 2006), and prior research has established the centrality of the locus of control concept in human capital investment decisions (Coleman & DeLeire, 2003; Heckman et al., 2006; Wang et al., 1999).

2. Model

In order to account for the relative impact of cognitive and non-cognitive factors on educational outcomes we construct a simple linear regression framework which relates net educational attainment of children to a battery of controls provided in the NLSY97 including parental education, grandparental socioeconomic status, parental socioeconomic status, child characteristics, parental non-cognitive skills and household environment variables:

$$Eci = a + b1*Epi + b2*SESpi + b3*SESci + b4*Ci + b5*NCpi + b6*HHci + ei \tag{1}$$

Here, Ec refers to children's outcomes; we employ both numbers of years of completed schooling, as well as college attendance, both gathered for the last round of the survey data. Ep is the number of years of parental education; SESpi is a vector of grandparental education and whether the parent resided in a single parent household when she was growing up; SESci is a vector for socioeconomic characteristics of the child's household, including current income, permanent income, single parent household, and size of household under 18 years; C is a vector of children's characteristics such as age, gender and race; NCp reflects parental non-cognitive skills in the form of parental efficacy, and HHc refers to education-related aspects of the child's home environment including access to a computer, dictionary and quiet environment for study; i refers to the family unit from which these parent-child pairs are drawn.

To account for the cognitive skills pathway that contributes to net educational attainment, we extend our model to:

$$Eci = a + b1*Epi + b2*SESpi + b3*SESci + b4*Ci + b5*NCpi + b6*HHci + b7*ASVABci + ei \tag{2}$$

where ASVABci measures the cognitive performance of children measured through ASVAB scores, controlling for all the aforementioned variables of parental, household and child characteristics.

Our non-cognitive skills model allows for a behavioral pathway to educational attainment whereby children's self-efficacy and educational expectations affect their years of schooling and their likelihood to attend college. We account separately for the impact of non-cognitive skills on educational outcomes, and for the joint impact of cognitive and non-cognitive skills on NCci, with equations 3 and 4 respectively:

$$Eci = a + b1*Epi + b2*SESpi + b3*SESci + b4*Ci + b5*NCpi + b6*HHci + b8*NCci + ei \quad (3)$$

$$Eci = a + b1*Epi + b2*SESpi + b3*SESci + b4*Ci + b5*NCpi + b6*HHci + b7*ASVABci + b8*NCci + ei \quad (4)$$

where NCci includes an index for self-efficacy; the inverse of an index of negative expectations of getting pregnant, not attending school, and getting drunk in the following year and in five years; an index of mental distress; and an index of "educationally-productive" time use, which includes the time spent on homework, lessons and reading minus the time spent watching television.

Consequently, the key coefficients of interest are b7 and b8, with the remaining coefficients constituting a battery of controls,.

To account for the possibilities of substitution or complementarities between cognitive and non-cognitive characteristics of children, we introduce interactions in the final permutation of our model:

$$E_{ci} = a + b_1 * E_{pi} + b_2 * SES_{pi} + b_3 * SES_{ci} + b_4 * C_i + b_5 * NC_{pi} + b_6 * HH_{ci} + b_7 * ASVAB_{ci} + b_8 * NC_{ci} + b_9 * ASVAB_{ci} * NC_{ci} + e_i \quad (5)$$

where ASVAB scores are interacted with each of our indices of non cognitive abilities. All of our non-binary variables are standardized to allow comparisons across the sample.

To allow for differences in the relative and absolute importance of these characteristics in sample sub groups which are characterized by large disparities in children's educational attainment, we explore the model separately in its application to children of parents with high school or less than high school education compared to those with parents who have some college education. We employ the Blinder-Oaxaca decomposition method to account for these subgroup differences, a method popularized by its application to measuring differences in labor market outcomes between race and sex groups. This method allows us to delineate the differences in group outcomes that can be attributed to 'explained' differences in endowment of characteristics, and 'unexplained' differences in how these endowments are converted into outcomes as indicated by the coefficients. While the 'unexplained' component is generally attributed to discrimination, it also contains the effect of unobservables in the model, the latter explanation being conceivably more relevant to our analysis.

Hence, given the two types of families with high parental education (h) and low parental education (l), our interest is in the contribution of our predictors to explaining the mean outcome difference between the two groups:

$$\text{Difference} = E(Ech) - E(Ecl) \qquad (6)$$

where (Ecj) denotes the expected value of the outcome for group j (h or l).

In a simple linear model of prediction,

$$Yj = Xj*bj + ej, \text{ where } E(ej)=0 \qquad (7)$$

Xj is a vector of predictors and bj the corresponding vector of slope coefficients, with ej as the normally distributed error term which is zero in expectation.

Expressing this difference in terms of a linear model of regressors:

$$\text{Difference} = E(Xch)*bh - E(Xcl)*bl \quad \text{given } E(ej)=0 \qquad (7)$$

Rearranging this equation (Jann, 2008), the difference can be expressed in a 'threefold' decomposition as follows:

$$\text{Difference} = [E(Xch)-E(Xcl)]*bl + E(Xcl)*(bh-bl) + [E(Xch)-E(Xcl)]*(bh-bl) \qquad (8)$$

The first component [E(Xch)-E(Xcl)]*bl is the endowment effect which results from differences in the level of predictors between the two groups. The second component E(Xcl)*(bh-bl) derives from differences in coefficients between the two groups and the final component is composed of the interaction between endowment differences and coefficient differences.

The decomposition in equation 8 is developed with reference to the second group, in our example the group of families with low education (l). Hence, the endowment effect is calculated against the coefficient ‘bl’ and quantifies the increase in the outcome that would be effected if the predictors of group ‘l’ were raised to the level of group ‘h’, holding the coefficients of the reference group constant. Similarly, the coefficient effect demonstrates the effect of changing group l’s coefficients to group h’s coefficients, holding group l’s endowments constant.

As we can see, the decomposition effect is contingent on our choice of reference group, the ‘index number problem’ (Oaxaca, 1973). From a policy point of view, because we are interested in changing the endowments of the disadvantaged group, we will use the low income group as our reference group, as expressed in equation 8.

Alternately, we can employ a twofold decomposition which accounts for the possibility that the coefficients of either group are biased due to discrimination and consequently seeks to employ a non-discriminatory vector of coefficients. We employ Neumark’s (1988) suggestion of using the coefficients from a pooled regression of both groups to analyze the decomposition. Fairlie (2005) allows for the application of this approach to binary choice models, which we employ to assess our college attendance outcome.

Data and Measures

All of the variables are drawn from the National Longitudinal Survey of Youth, 1997 (NLSY97) dataset. The NLSY97 is a nationally representative sample of 8984 American youth born between 1980 and 1984. Surveys are conducted annually, beginning in 1997 when the youth are between 12 and 18 years of age. The last publicly available round of survey data at the time this paper was written is from 2007 when the respondents were between 22 and 28 years of age. Because the original sample was selected so as to over-sample minorities, it is necessary to re-weight the data to make it representative of the US population. These weights also account for sample attrition through the use of inverse probability weighting conditioned on the race, sex, and census tract information of the respondents. Item non-response is dealt with by purging our final dataset of individuals who have any missing information for our variables of interest. Because the youth efficacy data is only collected for children between 12 and 14 years of age at the time of first survey, our potential sample size is restricted to 5417 youth.

The family background and parental characteristic variables are all collected in the first round of the survey. The parental education variable is constructed to reflect the highest grade achieved by either of the resident parents in the household; hence, it is the highest grade achieved by the most educated parent, when information on both parents is available, or the highest grade achieved of the resident parent in the household if information on both parents is not available. The self-efficacy index for both parents and youth is created from their response to each of the following four questions:

In uncertain times, I usually expect the best.

I rarely count on good things happening to me.

I'm always optimistic about my future.

I hardly ever expect things to go my way.

Though originally calibrated on a four-point scale, we have recalibrated the responses to agreement or disagreement, in line with Goldsmith, Veum and Darity's (1997) expectation that people will respond subjectively in terms of the intensity of their response. The first and third questions are aggregated positively and the second and fourth questions are aggregated negatively for a scale that takes on values between 0 and 4.

The youth expectation variables are collected from the fourth round of the survey when these questions are fielded to the entire sample of youth with no exception for age (these are the only predictors in our model, besides the measure of permanent income, that are not collected from the baseline interview). The youth are asked the percentage chance that they will: be in school the next year, in school and working for pay the next year, be pregnant or get someone pregnant by the next year, or get seriously drunk in the next year. The responses to these questions are recalibrated into agreement or disagreement if they are above and below 50% respectively.

The mental health index is generated from the self-reporting of the youth to the following questions from the Achenbach Youth Self Report, an instrument designed to measure the emotional and behavioral functioning of adolescents.

Female respondents:	You lie or cheat
	Your school work is poor
	You have trouble sleeping
	You are unhappy, sad or depressed
Male respondents:	You lie or cheat
	You don't get along with other kids

You have trouble concentrating or paying attention

You are unhappy, sad or depressed

We also include the youth reports from the first survey round regarding their home environment, such as whether they had a quiet place to study and whether there was a dictionary or a computer available at home. Information on time utilization by the youth over weekends is also included in the number of hours spent on homework, extra lessons, television and reading for pleasure.

In order to account for socioeconomic controls in our analysis, we also include a binary measure reflecting whether the respondent belongs to a single mother headed household. We measure current income as reflecting the combined income of the resident parent and their resident partner in the first survey round. However, since permanent income measures are more accurate as an indicator of the resource availability in a household, we also generate a five-year average of the combined parental incomes for the years 1997, 1999, 2000, 2001 and 2002. Owing to frequent non-response for the income variables from year to year, the permanent income measure is calculated over the years for which the income data is available for the parents, hence not all resulting measure reflect five year averages and many may reflect fewer years of data. Basic demographic controls include the age of the respondent, their gender, race and ethnicity and the number of respondents in the household who are under the age of 18.

As a measure of nascent cognitive ability of the youth, we also include results from the computer adapted Armed Services Vocational Aptitude Battery test (CAT-ASVAB) which was taken between 1997-98 by all willing youth from the original sample. Since the test results were topical, we only consider the percentile measure for math and verbal ability created by the NLS staff which is calculated for each age group over their scores in mathematical knowledge, arithmetic reasoning, word knowledge and paragraph comprehension.

Finally, our measure of the youth's educational attainment was taken from the final available round of the survey, when our restricted sample of youth were between 21 and 23 years of age and hence were likely to have taken their decision to either enter college or join the work force.

All non-categorical variables are employed in standardized form in our empirical analysis. Accounting for item non-responses in our regressors through list wise deletion, we are left with a regression sample of 3459 children who have complete information for our model specification, out of an original universe of 5417. Of those who are dropped due to missing data, 864 children are missing information on the outcome variable in the final round (822 of these children are a product of sample attrition; i.e. they have been reweighted in the final round to 0). 278 cases are dropped due to missing data on parental education and 244 are missing grandparental education. 183 cases are missing on the index of educational expectations, 64 are missing from the time use variables, 55 are missing for current income, 33 are missing from parental efficacy, 30 are missing from child efficacy, and 23 are missing from the permanent income measure. In addition, 181 parental surveys were completed by caregivers of the youth who were neither the mother nor father and were hence also removed from our sample.

Table 1 presents the descriptive statistics for the sample. Roughly 45% of the sample children have parents who have below high school education or a high school diploma (or GED); the remaining 55% of the sample consists of parents who have spent some time in college. The mean education for children in the sample, measured in number of years of education is 13.58 years, which is slightly lower than the mean grade completion of the parents which is 13.89

years. This is not to suggest that mean education has diminished between generations, because a number of the children in the sample are still enrolled in college. As we can see from columns 2 and 3, children's highest completed grade is significantly different between our subsamples of college educated parents and parents that did not attend college, as is the rate of college attendance. The average age in the sample is nearly 13 years, at the time of first survey. 49% of the sample is female, 13% is black and 11% is Hispanic. On average, the children in the sample belong to families that have over 2 members that are less than 18 years of age. Nearly 22% of the sample children belong to single mother households. As the breakdown indicates, children belonging to the subsample of lesser-educated parents are more likely to be black or Hispanic and to come from single mother households and households that have a larger number of young dependents. Consequently, these variables comprise important socioeconomic controls in our analysis.

On a scale from 0-4, the mean score on parental and child self-efficacy is roughly 2.8, and is significantly lower in the subsample of less-educated parents. Of the sample, only 1.6% expect to get pregnant the next year or make someone pregnant but over 80% expect to be in school the next year. In our subsample of less-educated parents, the expectations of getting pregnant and drunk are higher and of staying in school lower than amongst children of more educated parents. Nearly 96% of the households in the sample possess a dictionary, 61% own a computer, and 90% of the children in the sample report having a quiet place to study at home, with lesser educated household reporting a lesser probability of having each.

The large discrepancies between our two subsamples indicate the need to assess the dynamics of our controls and regressors independently within the subgroups, since they may be operating in a unique fashion for each type of family. We will consequently employ the Blinder

Oaxaca decomposition approach to analyzing educational outcomes between the subgroups, following our full sample analysis.

Regression results

Our regression estimates for the continuous measure of children's years of education are presented in Table 2. Column 1 presents the set of all exogenous controls that we anticipate may affect educational outcomes in children including parental and grandparental education, child age, race, and gender, home resource characteristics (including parental efficacy), and socioeconomic status (income and family structure variables). Female children in our sample have .26 standard deviations higher education than the mean, while Hispanic children have an advantage over the mean of .19 sds, controlling for other exogenous variables. Belonging to a single mother household correlates with lower educational attainment by .12 sds, which is comparable to the impact of permanent income where a one standard deviation decrease correlates with a decrease in educational attainment of .10 sds.

The coefficient on grandparental highest completed grade indicates that children whose grandparental education is one standard deviation above the mean have .07 standard deviations higher years of education than the sample mean. Similarly, if the parents of the children belonged to single-parent households while they were growing up, their years of education are .15 standard deviations below the mean. An increase in parental education of one standard deviation has a very large effect and corresponds with children's years of education being higher by .30 standard deviations. Parental efficacy is highly significantly correlated with children's educational attainment, but the magnitude of the effect is small with one standard deviation increase in parental efficacy rendering only a .05 sd increase in children's years of education.

The home resource variables, measured in 1997, have a very strong correlation with children's years of education, with the household possessing a computer contributing nearly .40 sds to the number of years of children's schooling. Similarly, having a dictionary at home correlates with .22 sds higher educational attainment, while having a quiet study environment at home contributes .26 sds of higher educational attainment in number of years of schooling in our full sample. In this descriptive analysis we obviously do not interpret these as causal impacts on children's educational attainment. Rather, these education-promoting aspects of the home environment likely serve as proxies for unmeasured characteristics or behaviors of parents or the home environments that promote educational success.

Controlling for these elements of parental education and socioeconomic status and resources, we introduce a scale of cognitive abilities in Column 2, as measured by the children's standardized ASVAB score. The r-squared on our model rises by nearly 30% as a result, showing that children's cognitive skills contribute significantly to explaining their net educational attainment, independently of parental education and household resources. The coefficient on ASVAB scores indicates that a standard deviation improvement in cognitive scores of children related to a .32 sd increase in net educational attainment. Adding a direct measure of cognitive skills reduces the coefficient on many of our other explanatory controls, suggesting that their impact is mediated by cognitive skills. Important amongst these variables, grandparental education loses significance as a factor explaining children's education, as does parental self-efficacy.

In Column 3 we introduce our measures for non cognitive skills which consist of children's efficacy, mental distress, an index of adverse expectations comprising expectations of pregnancy, getting drunk and not going to school in the following year, and an index of productive time use comprising time spent on homework, lessons and reading minus the time spent on television. The r-squared on our model, following the addition of these variables, rises by 35%, suggesting that their contribution to educational attainment, controlling for other exogenous variable, is slightly stronger than cognitive skills. Positive expectations regarding the coming year (or the absence of negative expectations) increase net educational attainment by .27 sds. Higher efficacy of one sd above the mean correlates with higher education by .04 sds, while mental distress reduces educational attainment by .11 sds. Our index of productive time use is also significantly related to educational outcomes, with a standard deviation improvement in the index rendering .07 sds increase in years of education.

Column 4 combines all our variables for cognitive and non-cognitive skills and exogenous controls. Together, these variables increase the r-squared of the original model by more than 50% suggesting that these variables are more significantly associated with children's educational outcomes than our entire set of parental, demographic and socioeconomic controls. In column 5 we add children's expectations for five years into the future. While the coefficient on expectations for 5 years into the future is little over half the coefficient for next years' expectations, it is still very large and significant, and the r-squared of the model does not suffer significantly.

Column 6 explores possible interactions between cognitive skills and non-cognitive skills. Here, the uninteracted coefficients reflect the partial effect of the variable at the mean. Hence, for people of average cognitive abilities, the impact of efficacy on educational attainment is now positive and significant, while the other variables do not see much change at the mean. However, as the interaction demonstrate, the higher the cognitive skills, the more negative the impact of efficacy and positive expectations on achievement outcomes; by extension, the lower the cognitive skills, the higher the impact of non-cognitive variables.

On the other hand, this interaction may also be interpreted as suggesting that the higher the non-cognitive skills, the lower the impact of cognitive skills on achievement, or conversely, the lower the non-cognitive skills, the greater the positive contribution of cognitive skills to educational outcomes. This interaction effect is important because it indicates that cognitive and non cognitive skills do not operate in a complementary manner. Instead, in the above or below average child, their impact can work in opposing directions.

In order to unpack the nature of this interaction between cognitive and non-cognitive skills, we analyze our sample along the axis of children with high ASVAB, defined as more than one standard deviation above the mean, and low ASVAB, which is constituted of children with scores less than a standard deviation below the mean. These indicators are independently interacted with our scales of self-efficacy, expectations for the future, and productive time use, with the uninteracted coefficients representing the 'average' children who lie within a standard deviation on either side of the mean. Table 3 depicts the results, with all other controls suppressed.

As the results indicate, for a child with average cognitive skills, the impact of self-efficacy on educational outcomes is insignificant, the impact of productive time use is weakly significant, whereas positive expectations for the future contribute a significant and large impact on years of education (.27 sd's). Two interactions are significant in this analysis. First, the results show that the impact of having positive expectations for the future is somewhat muted for children with higher cognitive skills because the interaction between high ASVAB and expectations is negative, though the size of the interaction coefficient is not large enough to reverse the relationship and the net relationship is still positive and substantial. The parallel interaction between expectations and ASVAB for low ASVAB children is insignificant, suggesting that the response of low ASVAB children to higher levels of expectations does not differ from the average child.

Second, the interaction between low ASVAB and self-efficacy is relatively large and statistically significant, whereas the effect of self-efficacy on years of education is insignificant for the child of average or high cognitive skills. The nature of these results suggests that relative to the child with average levels of cognitive skills, children with low cognitive test scores have significantly lower educational attainment, but low-ASVAB children with high efficacy have a higher level of attainment than the child with average cognitive skills. In other words, for a child with low cognitive skills, increasing self-efficacy by one standard deviation can increase their years of education to a significant amount over that of their counterparts with average levels of cognitive skills. These results are significant for public policy because they indicate that non-cognitive skill development may yield the largest returns amongst children with weaker cognitive skills and may assist in reversing the educational deficit amongst these children that arises from their weaker cognitive skills.

Table 4 extends our analysis to the model the impact of our regressors on college attendance. We employ a logit specification, and report odds ratios for ease of interpretation. Our controls operate in the anticipated direction, with grandparental education increasing the odds of college attendance by 18% and parents belonging to a single parent household reducing odds of college attendance by 30%. Females are 81% more likely to attend college than males, and blacks and Hispanics are 25% and 75% more likely, respectively, than whites to attend college in our sample (with income controlled in the model). Higher permanent income increases the odds of college attendance by 30% while a larger household of dependents reduces these odds by 10%. Similarly, having a dictionary, a computer and a quiet place to study at home are correlated with substantially higher odds of attending college of 98%, 122% and 93% respectively.

In column 2, we see that higher cognitive scores of one standard deviation above the mean translate into nearly 120% higher odds of college attendance. Positive expectations for the future increase these odds by 90%, and productive time use and efficacy are correlated with smaller improvements of 19% and 14% respectively. Mental distress is coincident with a reduction in the odds of college attendance by nearly 20%. Controlling for cognitive and non-cognitive measures simultaneously, in column 4, we find that the individual coefficients are not attenuated significantly, suggesting that the respective contributions of cognitive and non-cognitive skills operate independently of one another. Column 5 demonstrates that positive expectations regarding 5 years into the future are also strongly correlated with college attendance, improving those odds by 64%.

Our interactions in column 6 represent a similar pattern as our OLS models, with children's efficacy at the mean becoming more significant, with slightly improved odds of 12%. Here, the only significant interaction is between ASVAB and efficacy, and it diminishes the odds of college attendance by over 10%. Hence, our data once again suggests that amongst children of high cognitive abilities, higher self-efficacy is correlated with lower achievement in terms of college attendance, and vice versa for children of high efficacy.

To examine this interaction further, we once again separate the sample by high cognitive and low cognitive abilities in Table 5. We see, first, that having cognitive abilities (above one standard deviation from the mean) vastly improves the odds of college attendance by 266% over the mean category, whereas cognitive abilities lower than one standard deviation of the mean lower these odds by less than 30%. Moreover, we find that none of our non-cognitive measures produce any significant improvement in the odds of college attendance for children of high cognitive abilities, whereas high expectations for the future contribute to improved odds of college attendance at mean level of cognitive abilities and, as in the prior set of regressions, high efficacy correlates with a substantial improvement in odds of 45% amongst children of low cognitive abilities.

BLINDER-OAXACA Decomposition

Given the large differences in children's educational attainment by parental educational status, we explore the respective contributions of our explanatory variables in a Blinder-Oaxaca decomposition, which allows for the identification of outcome differentials between subgroups by the 'explained' component of differential endowments between the two groups, and an 'unexplained' component which subsumes all unobservables in the model as well as any features of discrimination or bias between the two groups which are not productivity based.

Hence we analyze our sample across the axis of children belonging to households where the most educated parent has a high school education or less than high school education, against children belonging to households where the most educated parent has some college education.

Columns 2-4 of Table 6 decompose the difference in highest grade achieved between the two subgroups using a threefold decomposition approach as suggested in Blinder (1973) and Oaxaca (1973), holding parents with high school education only as the reference subgroup. Our choice of reference group is primarily premised on the fact that policy will be directed towards improving endowments of the disadvantaged group, hence we would like to assess the impact of raising endowments of less educated families to the level of more educated families. However, acknowledging the 'index number problem' of the Blinder-Oaxaca method (Jann 2008), and the fact that either of the two sub group coefficients may be biased, we also report results from a two-fold decomposition of the model in columns 4 and 5, employing pooled coefficients from both groups as proposed in Neumark (1988) and Jann (2008).

Both approaches indicate that a significant proportion of the difference in children's educational attainment between the two subgroups is attributable to differences in the level of our predictors. In the threefold decomposition over half the difference in between the two groups can be explained by differences in endowments of the variables in our model. Of interest is the coefficient on ASVAB, which indicates that merely raising the endowment of cognitive abilities amongst our disadvantaged group will reduce the gap between the two groups by 30% and will explain nearly half of the total difference arising from difference in predictors between the two groups. Another endowment variable of mention is computer ownership, which if raised to a level comparable with the sub group of college educated parents will reduce the gap between the groups by 15% of the total difference and nearly 30% of the explained difference (although, as mentioned earlier, we view this as a proxy measure of some unobserved element of the home or parenting environment). Positive expectations also account for nearly 15% of the difference in children's educational outcomes between poorly and well educated families, and improvement in mental distress bridges this gap by a small but statistically significant amount.

Most significantly, however, we find that for all our measures of cognitive and non cognitive skills and time utilization, there is no significant contribution of the 'coefficient' to the differences between the two groups, indicating that with regard to these predictors, both types of children are equally equipped to convert their cognitive and non cognitive endowments into educational attainment.

These results are mirrored in the estimates with pooled coefficients in columns 5 and 6. Additionally we find significant contributions of our socioeconomic status variables to explaining the difference between the two groups, with family size under 18, single mother households and permanent income raising the net educational attainment of children in lesser educated families if their endowments are raised to the level of more educated families. Our index of efficacy also shows an endowment effect in this analysis, raising educational attainment if its level is raised to the mean of the sub group of college educated families. All interactions are, however, insignificant.

Fairlie (1999) and Fairlie (2005) allow for the extension of the Blinder-Oaxaca decomposition to allow for binary outcomes estimated using logit and probit models. We employ this Fairlie decomposition approach in Table 7 to analyze the contribution of our predictors to the differential college attendance characterized by our sub groups of high school (or lesser) educated parents and college educated parents.

As the first column of our estimation results indicates, over 60% of the differential probability of college enrollment amongst children from lesser and more educated families can be explained from differences in our predictors. In concordance with our earlier results, the strongest contributor to this difference in outcomes is cognitive abilities, which account for 40% of the explainable difference between the two groups. Non-cognitive measure combined also account for a significant 23% of the explained difference between the probability of college attendance amongst children in the two sub groups. Home environment and socioeconomic status variables account for the remainder of the difference that can be attributed to differences in predictors.

Conclusion

The best strategy for ensuring disadvantaged children's educational success remains subject to debate. Nevertheless, it is important to understand who among the population will benefit from interventions designed to improve human capital, and what form these interventions should take. Not surprisingly, our results underscore the important role of cognitive skills in improving educational attainment. At the same time, we show an equally important role for "non-cognitive skills" for educational attainment. For instance, for the child with average cognitive skills, having positive expectations for the future plays a large role in educational success. In addition, we show that non-cognitive skills are especially important in ensuring the academic success of those who are less-cognitively skilled. Here, one of our most important findings is that for a child with low cognitive skills, increasing self-efficacy by one standard deviation can increase their years of education (and their odds of college attendance) to a significant amount over that of their counterparts with average levels of cognitive skills. These results are significant for public policy because they indicate that non-cognitive skill development (in particular, self-efficacy) may yield the largest returns amongst children with weaker cognitive skills and may assist in reversing the educational deficit amongst these children that arises from their weaker cognitive skills.

How does self-efficacy develop and is it malleable? These are important questions for policy interventions that aim to increase human capital. Theoretically, a lack of self-efficacy develops from a history of observing that one's actions do not affect desired outcomes. Early life experiences, such as the nature of parent-child interactions, level of exposure to stressful events, and number of personal mastery experiences all play important roles in the development of locus of control (Gecas, 1989). Individuals exposed to frequent noncontingency and uncontrollability develop the self-view that there is little or no return to the relevant investment or behavior, a process termed "learned helplessness" (Haidt & Rodin, 1999). Dahl (2004), however, provides evidence that the prefrontal cortex (the region of the brain that governs emotion and self-regulation) is malleable into the early 20's, which suggests there may be a substantial opportunity for intervention.

The evidence presented here informs the policy question of whether education-focused interventions have a higher return for more able individuals than less able individuals. Previous discussions of this topic (e.g., Heckman & Krueger, 2003) focused exclusively on cognitive skills. We have shown here that adolescents with high levels of cognitive skills achieve the highest levels of education, and for these youth, non-cognitive skills (as we have measured them here) play little or no role. These results stand in contrast to other findings suggesting a synergy between certain types of cognitive and non-cognitive skills (see also Cunha & Heckman, 2007; Leininger & Kalil, 2008).

Our findings thus support an argument that interventions for disadvantaged youth should focus on the more cognitively able if the goal is to maximize educational attainment. Conversely, different types of interventions will be required to improve outcomes among the relatively more cognitively disadvantaged, and for these youth, interventions to improve non-cognitive skills (especially self-efficacy) may be fruitful. Nonetheless, a compelling argument exists that interventions in early childhood, when the course of development is theoretically the most malleable, will be the most cost-effective not only because they can substantially improve cognitive and non-cognitive skills but also because the returns to these skill improvements can be enjoyed over the entire lifecourse (Heckman, 2011).

Finally, these results are policy relevant insofar as they suggest that a large portion of the gap in educational attainment between children of different educational backgrounds can be narrowed by changing their endowments of cognitive and non-cognitive skills and their home environment. Effectively, the deficit between the two groups appears to be attributable to resources as opposed to abilities or other unobservable factors, and hence can be effectively tackled through targeted policy.

References (to be added)

Table 1 (Summary Statistics)	(1) **Full sample**	(2) **High school educated parents sample**	(3) **College educated parents sample**	(4) **Significance of (2)-(3)**
Sample size	3459	1900	1559	
Child's highest grade achieved	13.584	14.364	12.379	0.000
	(0.047)	(0.057)	(0.067)	
Children with at least one year in college	0.588	0.723	0.380	0.000
Proportion of sample				
Parental highest grade achieved	13.894	15.626	11.219	0.000
	(0.051)	(0.049)	(0.041)	
Grandparental highest grade achieved	10.347	11.699	8.258	0.000
	(0.105)	(0.128)	(0.165)	
Age of child	12.979	12.984	12.970	0.648
	(0.015)	(0.020)	(0.024)	
Female child	0.494	0.491	0.497	0.736
Proportion of sample				
Black child	0.131	0.096	0.186	0.000
Proportion of sample				
Hispanic child	0.115	0.068	0.187	0.000
Proportion of sample				
Size of household under 18 years of age	2.446	2.360	2.577	0.000
	(0.021)	(0.026)	(0.034)	
Single mothers	0.214	0.172	0.279	0.000
Proportion of sample				
Current income (1997)	40831	51166	24874	0.000
	(737)	(1057)	(715)	
Log of permanent income (1999-2002)	62287	75807	41410	0.000
	(859)	(1181)	(936)	
ASVAB percentile	45.937	54.699	32.407	0.000
	(0.598)	(0.765)	(0.837)	
Parental Effectiveness Index	2.805	3.000	2.794	0.000
	(0.024)	(0.030)	(1.338)	
Child Effectiveness Index	2.814	2.894	2.690	0.000
	(0.019)	(0.026)	(0.029)	
Expectation of Pregnancy	0.016	0.008	0.027	0.000
	(0.002)	(0.002)	(0.004)	
Expectation of attending school next year	0.817	0.881	0.720	0.000
	(0.007)	(0.008)	(0.013)	
Expectation of getting drunk	0.169	0.179	0.153	0.057
	(0.007)	(0.009)	(0.010)	
Index of positive expectations	0.878	0.898	0.846	0.000
	(0.004)	(0.004)	(0.006)	
Homes owning a dictionary	0.961	0.976	0.937	0.000
Proportion of sample				
Homes owning a computer	0.612	0.755	0.392	0.000
Proportion of sample				
Homes with a quiet place to study	0.905	0.924	0.877	0.000
Proportion of sample				
Hours spent doing homework over weekend	0.754	0.843	0.644	0.001
	(0.034)	(0.044)	(0.052)	
Hours spent on extra lesson over weekend	0.191	0.219	0.148	0.058
	(0.018)	(0.024)	(0.028)	
Hours spent watching television over weekend	5.782	5.504	6.211	0.000
	(0.093)	(0.115)	(0.156)	
Hours spent reading for pleasure over weekend	0.791	0.883	0.648	0.002
	(0.039)	(0.053)	(0.054)	
Index of productive time use	(4.047)	(3.560)	(4.798)	0.000
	(0.111)	(0.144)	(0.170)	

TABLE 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES		Standardized values of Child's Highest Grade Completed					
Grandparental Highest Grade Completed (Standardized)	.07152	.03611	.06096	.03311	.03564	.03127	.03328
	[0.0287]**	[0.0267]	[0.0264]**	[0.0250]	[0.0261]	[0.0250]	[0.0261]
Parent lived in one parent household	-.148	-.118	-.135	-.11	-.106	-.111	-.109
	[0.0397]***	[0.0368]***	[0.0359]***	[0.0339]***	[0.0349]***	[0.0340]***	[0.0350]***
Parental Highest Grade Completed (Standardized)	.307	.223	.269	.203	.204	.202	.203
	[0.0203]***	[0.0198]***	[0.0187]***	[0.0184]***	[0.0191]***	[0.0184]***	[0.0191]***
Nonresponse to Parental Questionnaire	-.323	-.245	-.343	-.264	-.243	-.272	-.264
	[0.211]	[0.196]	[0.193]*	[0.182]	[0.187]	[0.183]	[0.187]
Age of child (Standardized)	.05571	.0567	.133	.127	.11	.128	.108
	[0.0154]***	[0.0144]***	[0.0148]***	[0.0140]***	[0.0143]***	[0.0139]***	[0.0143]***
Female child dummy	.26	.23	.18	.168	.181	.164	.175
	[0.0307]***	[0.0289]***	[0.0287]***	[0.0272]***	[0.0280]***	[0.0272]***	[0.0280]***
Black child dummy	.01207	.152	-.04892	.06973	.101	.06924	.09794
	[0.0405]	[0.0393]***	[0.0386]	[0.0374]*	[0.0388]***	[0.0373]*	[0.0388]**
Hispanic child dummy	.189	.243	.146	.197	.197	.197	.197
	[0.0464]***	[0.0448]***	[0.0431]***	[0.0422]***	[0.0433]***	[0.0423]***	[0.0433]***
Size of household under 18 years of age (Standardized)	-.04571	-.04576	-.05106	-.04999	-.04931	-.04898	-.04801
	[0.0174]***	[0.0165]***	[0.0157]***	[0.0151]***	[0.0158]***	[0.0151]***	[0.0158]***
Single Mother Household dummy	-.123	-.13	-.08104	-.09298	-.101	-.09597	-.102
	[0.0413]***	[0.0386]***	[0.0383]**	[0.0364]**	[0.0374]***	[0.0364]***	[0.0374]***
Log of current (1997) income (Standardized)	.03241	.0172	.03147	.01886	.01895	.01637	.01668
	[0.0311]	[0.0274]	[0.0271]	[0.0245]	[0.0263]	[0.0245]	[0.0262]
Log of permanent income (Standardized)	.1	.07261	.08149	.05904	.07366	.05751	.07328
	[0.0278]***	[0.0257]***	[0.0241]***	[0.0226]***	[0.0249]***	[0.0224]**	[0.0247]***
Parental Efficacy index (Standardized)	.05437	.03536	.03409	.02133	.01867	.02255	.01916
	[0.0217]**	[0.0206]*	[0.0207]*	[0.0199]	[0.0205]	[0.0199]	[0.0204]
Child has dictionary at home	.216	.168	.11	.08168	.105	.07748	.09338
	[0.0805]***	[0.0762]**	[0.0718]	[0.0684]	[0.0744]	[0.0683]	[0.0740]
Child has computer at home	.398	.317	.329	.268	.276	.267	.276
	[0.0368]***	[0.0351]***	[0.0337]***	[0.0325]***	[0.0335]***	[0.0325]***	[0.0335]***
Child has quiet environment at home	.26	.193	.119	.07875	.08392	.06812	.07291
	[0.0519]***	[0.0481]***	[0.0485]**	[0.0454]*	[0.0463]*	[0.0458]	[0.0465]
ASVAB percentile (Standardized)		.323		.278	.297	.283	.301
		[0.0179]***		[0.0167]***	[0.0171]***	[0.0169]***	[0.0173]***
Child Efficacy Index (Standardized)			.04365	.02193	.01934	.03441	.02968
			[0.0153]***	[0.0145]	[0.0148]	[0.0155]**	[0.0160]*
Child Mental distress index (Standardized)			-.113	-.109	-.131	-.109	-.133
			[0.0158]***	[0.0150]***	[0.0156]***	[0.0154]***	[0.0160]***
Index of positive expectations (1- index of adverse exp)			.271	.245		.246	
			[0.0163]***	[0.0153]***		[0.0153]***	
Index of productive time use (Standardized)			.07041	.04752	.05168	.04494	.04954
			[0.0166]***	[0.0161]***	[0.0165]***	[0.0161]***	[0.0168]***
Interaction: Asvab & Mental Index						.0069642	.02
						[0.0146]	[0.0151]
Interaction: Asvab & Positive Expectations						-.03513	

						[0.0148]**	
Interaction: Asvab & Child Efficacy						-.03177	-.02619
						[0.0137]**	[0.0142]*
Interaction: Asvab & Productive Time Use						.01389	.01247
						[0.0158]	[0.0165]
Index of positive expectations (in 5 years)					.173		.184
					[0.0148]***		[0.0158]***
Interaction: Asvab & Positive Expectations in 5 years							-.04198
							[0.0143]***
Constant	-.753	-.666	-.426	-.393	-.443	-.365	-.407
	[0.0924]***	[0.0859]***	[0.0836]***	[0.0783]***	[0.0836]***	[0.0790]***	[0.0840]***
Observations	3,459	3,459	3,459	3,459	3,413	3,459	3,413
Adjusted R-squared	0.292	0.376	0.394	0.454	0.431	0.456	0.434

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

TABLE 3

VARIABLES	Standardized values of Child's Highest Grade Completed
High Asvab	.503
	[0.0325]***
Low Asvab	-.07701
	[0.0355]**
Child Efficacy Index (Standardized)	.0036917
	[0.0181]
Index of positive expectations (1- index of adverse exp)	.266
	[0.0180]***
Index of productive time use (Standardized)	.0319
	[0.0184]*
Interaction: High Asvab & Positive Expectations	-.08205
	[0.0324]**
Interaction: High Asvab & Child Efficacy	.0048252
	[0.0281]
Interaction: High Asvab & Productive Time Use	.04044
	[0.0313]
Interaction: Low Asvab & Positive Expectations	.03498
	[0.0321]
Interaction: Low Asvab & Child Efficacy	.149
	[0.0358]***
Interaction: Low Asvab & Productive Time Use	.006984
	[0.0367]
Constant	-.497
	[0.0789]***
Observations	3,459
Adjusted R-squared	0.444

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

TABLE 4

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				College Attendance (Binary)			
Grandparental Highest Grade Completed (Standardized)	1.18	1.1	1.16	1.09	1.09	1.08	1.09
	[0.0946]**	[0.0938]	[0.101]*	[0.101]	[0.102]	[0.100]	[0.102]
Parent lived in one parent household	.692	.719	.692	.721	.734	.719	.732
	[0.0745]***	[0.0800]***	[0.0788]***	[0.0847]***	[0.0842]***	[0.0846]***	[0.0842]***
Parental Highest Grade Completed (Standardized)	2.15	1.89	2.1	1.86	1.86	1.86	1.85
	[0.133]***	[0.123]***	[0.135]***	[0.127]***	[0.126]***	[0.128]***	[0.126]***
Nonresponse to Parental Questionnaire	.362	.407	.32	.353	.39	.338	.375
	[0.201]*	[0.231]	[0.187]*	[0.211]*	[0.228]	[0.204]*	[0.221]*
Age of child (Standardized)	1.04	1.04	1.26	1.26	1.21	1.27	1.21
	[0.0439]	[0.0465]	[0.0582]***	[0.0612]***	[0.0581]***	[0.0617]***	[0.0586]***
Female child dummy	1.81	1.76	1.58	1.56	1.6	1.54	1.58
	[0.156]***	[0.159]***	[0.145]***	[0.148]***	[0.151]***	[0.147]***	[0.150]***
Black child dummy	1.25	1.82	1.1	1.55	1.61	1.56	1.62
	[0.141]**	[0.219]***	[0.133]	[0.196]***	[0.204]***	[0.201]***	[0.208]***
Hispanic child dummy	1.75	2.14	1.61	1.97	1.95	2.01	1.97
	[0.236]***	[0.314]***	[0.225]***	[0.297]***	[0.295]***	[0.306]***	[0.301]***
Size of household under 18 years of age (Standardized)	.891	.884	.889	.889	.876	.893	.879
	[0.0434]**	[0.0441]**	[0.0441]**	[0.0456]**	[0.0459]**	[0.0459]**	[0.0461]**
Single Mother Household dummy	.848	.822	.95	.918	.894	.905	.884
	[0.0925]	[0.0935]*	[0.109]	[0.109]	[0.106]	[0.108]	[0.105]
Log of current (1997) income (Standardized)	.986	.944	.993	.954	.955	.951	.951
	[0.0771]	[0.0738]	[0.0802]	[0.0789]	[0.0794]	[0.0792]	[0.0800]
Log of permanent income (Standardized)	1.3	1.23	1.26	1.2	1.24	1.19	1.23
	[0.104]***	[0.0944]***	[0.0914]***	[0.0882]**	[0.0935]***	[0.0885]**	[0.0934]***
Parental Efficacy index (Standardized)	1.09	1.05	1.05	1.01	1	1.01	.998
	[0.0646]	[0.0660]	[0.0666]	[0.0676]	[0.0669]	[0.0673]	[0.0669]
Child has dictionary at home	1.98	1.92	1.73	1.72	1.78	1.73	1.74
	[0.462]***	[0.450]***	[0.444]**	[0.432]**	[0.442]**	[0.436]**	[0.431]**
Child has computer at home	2.22	2	2.06	1.88	1.89	1.88	1.89
	[0.208]***	[0.196]***	[0.201]***	[0.192]***	[0.191]***	[0.192]***	[0.193]***
Child has quiet environment at home	1.93	1.73	1.52	1.4	1.33	1.4	1.33
	[0.281]***	[0.256]***	[0.235]***	[0.221]**	[0.206]*	[0.226]**	[0.210]*
ASVAB percentile (Standardized)		2.16		2.06	2.12	2.09	2.13
		[0.108]***		[0.108]***	[0.111]***	[0.112]***	[0.114]***
Child Efficacy Index (Standardized)			1.14	1.09	1.08	1.12	1.11
			[0.0534]***	[0.0535]*	[0.0524]*	[0.0571]**	[0.0557]**
Child Mental distress index (Standardized)			.805	.805	.768	.8	.763
			[0.0392]***	[0.0404]***	[0.0387]***	[0.0408]***	[0.0390]***
Index of positive expectations (1- index of adverse exp)			1.9	1.86		1.88	
			[0.0977]***	[0.100]***		[0.106]***	
Index of productive time use (Standardized)			1.19	1.15	1.16	1.14	1.15
			[0.0605]***	[0.0615]**	[0.0629]***	[0.0603]**	[0.0620]**
Interaction: Asvab & Mental Index						1.07	1.09
						[0.0586]	[0.0592]
Interaction: Asvab & Positive Expectations						.952	
						[0.0533]	
Interaction: Asvab & Child Efficacy						.899	.924
						[0.0453]**	[0.0462]
Interaction: Asvab & Productive Time Use						1.1	1.09
						[0.0640]	[0.0667]
Index of positive expectations (in 5 years)					1.64		1.66
					[0.0836]***		[0.0877]***
Interaction: Asvab & Positive Expectations in 5 years							.941
							[0.0495]
Constant	.152	.159	.25	.247	.246	.249	.254
	[0.0412]***	[0.0431]***	[0.0733]***	[0.0715]***	[0.0712]***	[0.0723]***	[0.0730]***
Observations	3,459	3,459	3,459	3,459	3,413	3,459	3,413

Robust seeform in brackets

*** p<0.01, ** p<0.05, * p<0.1

TABLE 5	(1)
VARIABLES	College Attendance (Binary)
High Asvab	3.66
	[0.462]***
Low Asvab	.775
	[0.0919]**
Child Efficacy Index (Standardized)	1.03
	[0.0651]
Index of positive expectations (1- index of adverse exp)	1.94
	[0.135]***
Index of productive time use (Standardized)	1.11
	[0.0631]*
Interaction: High Asvab & Positive Expectations	.927
	[0.122]
Interaction: High Asvab & Child Efficacy	1.03
	[0.121]
Interaction: High Asvab & Productive Time Use	1.24
	[0.252]
Interaction: Low Asvab & Positive Expectations	.99
	[0.124]
Interaction: Low Asvab & Child Efficacy	1.45
	[0.180]***
Interaction: Low Asvab & Productive Time Use	.93
	[0.111]
Constant	.194
	[0.0566]***
Observations	3,459

Robust seeform in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 6	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Differential	Endowments	Coefficients	Interaction	Explained	Unexplained
Grandparental Highest Grade Completed		-.04573	-.02231	.101	.01666	.01633
		[0.0187]**	[0.00755]***	[0.0266]***	[0.0128]	[0.00710]**
Parent lived in one parent household		-.0016186	.03462	-.01939	-.01428	.02789
		[0.00624]	[0.0171]**	[0.0117]*	[0.00708]**	[0.0125]**
Size of household under 18 years of age		.0021168	-.0076859	.01272	.0086383	-.0014849
		[0.00397]	[0.00379]**	[0.00593]**	[0.00315]***	[0.00151]
Single Mother Household dummy		.0078607	-.0088259	.0033585	.0088817	-.0064885
		[0.00528]	[0.0200]	[0.00764]	[0.00403]**	[0.0165]
Log of current (1997) income		.02183	.0041466	-.02284	.0079304	-.0047914
		[0.0141]	[0.00409]	[0.0211]	[0.0105]	[0.00724]
Log of permanent income (Standardized)		.0106	-.0070137	.04447	.02667	.02139
		[0.0111]	[0.00437]	[0.0235]*	[0.0101]***	[0.0123]*
Parental Efficacy index (Standardized)		.0020926	-.0035899	.01546	.01146	.0024968
		[0.0110]	[0.00361]	[0.0147]	[0.00736]	[0.00273]
Child has dictionary at home		.0036863	-.0063273	-.000266655	.003203	-.0061106
		[0.00320]	[0.141]	[0.00595]	[0.00280]	[0.144]
Child has computer at home		.123	-.04283	-.03984	.103	-.06236
		[0.0181]***	[0.0257]*	[0.0240]*	[0.0129]***	[0.0364]*
Child has quiet environment at home		.000537233	.08169	.00421	.0025362	.0839
		[0.00285]	[0.0825]	[0.00438]	[0.00221]	[0.0841]
ASVAB percentile (Standardized)		.213	.000596493	-.0031478	.209	.0021143
		[0.0217]***	[0.00458]	[0.0242]	[0.0158]***	[0.00423]
Child Efficacy Index (Standardized)		-.0028579	-.0047701	.01325	.0064181	-.000800295
		[0.00441]	[0.00299]	[0.00677]*	[0.00322]**	[0.00185]
Child Mental distress index		.01823	-.000993262	.0019914	.01865	.000575594
		[0.00571]***	[0.00285]	[0.00568]	[0.00495]***	[0.00111]
Index of positive expectations		.06795	-.000252365	.000444753	.06921	-.0010588
		[0.0113]***	[0.00473]	[0.00834]	[0.0108]***	[0.00111]
Index of productive time use		.0079915	-.0015213	.0059152	.01179	.000599249
		[0.00431]*	[0.00187]	[0.00662]	[0.00382]***	[0.00178]
Interaction: Asvab & Mental Index		-3.41e-05	-.0031939	-.000449764	-.000354521	-.0033233
		[0.000478]	[0.00426]	[0.00114]	[0.000809]	[0.00442]
Interaction: Asvab & Expectations		-.000483182	.000643901	.000274954	-.000325165	.000760839
		[0.000980]	[0.00236]	[0.00105]	[0.000577]	[0.00264]
Interaction: Asvab & Child Efficacy		-.0029573	.0024587	.000936408	-.0015964	.0020342
		[0.00243]	[0.00505]	[0.00201]	[0.00133]	[0.00568]
Interaction: Asvab & Time Use		.000125151	.0010934	.0029448	.0035146	.000648855
		[0.00469]	[0.00240]	[0.00640]	[0.00312]	[0.00475]
Total		.434	.21	.133	.509	.269
		[0.0315]***	[0.0375]***	[0.0346]***	[0.0258]***	[0.0335]***
Prediction_1	.467					
	[0.0223]***					
Prediction_2	-.31					

	[0.0261]***					
Difference	.778					
	[0.0343]***					
Constant			.22			.22
			[0.170]			[0.169]
Observations	3,413	3,413	3,413	3,413	3,413	3,413

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 7		(1)
VARIABLES	(Differential)	(Explained)
Grandparental Highest Grade Completed		.0054576
		[0.00724]
Parent lived in one parent household		-.0027607
		[0.00275]
Parental Efficacy index (Standardized)		.0023632
		[0.00378]
Size of household under 18 years of age		.0038512
		[0.00189]**
Single Mother Household dummy		.00045904
		[0.00250]
Log of current (1997) income		-.0029341
		[0.00564]
Log of permanent income (Standardized)		.01343
		[0.00588]**
Child has dictionary at home		.04283
		[0.00685]***
Child has computer at home		.0020664
		[0.00127]
Child has quiet environment at home		.0034451
		[0.00159]**
ASVAB percentile (Standardized)		.08862
		[0.00615]***
Child Efficacy Index (Standardized)		.0040184
		[0.00190]**
Child Mental distress index		.0077765
		[0.00179]***
Index of positive expectations		.03424
		[0.00272]***
Index of productive time use		.0043836
		[0.00150]***
Interaction: Asvab & Mental Index		7.19e-05
		[0.000782]
Interaction: Asvab & Expectations		-1.17e-05
		[0.000683]
Interaction: Asvab & Child Efficacy		5.38e-05
		[0.000608]
Interaction: Asvab & Time Use		.0014526
		[0.000954]
Prediction (Pr(Y!=0|G=0))	0.72127029	
Prediction (Pr(Y!=0|G=1))	0.37756773	
Difference	0.34370257	
Total explained	0.21871557	

Observations	3,413

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1