

# Changes in the Returns to Education Evidence from Three Cohorts of the NLSY

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## Abstract

I study the changes in the returns to education for men over time using three cohorts of the NLS. I find an increase in the college wage premium conditional on cognitive ability and occupation, from 35% for those born between 1941 and 1952 to 56% for those born between 1957 and 1964 followed by a fall to 41% for those born between 1980 and 1984. I also find a similar pattern for high school graduates and those with some college. I decompose the returns to education into those parts that are related to cognitive ability, occupation and neither cognitive ability or occupation, and find that the portion associated with neither is the largest of the three. However cognitive ability is responsible for a larger portion than occupational sorting. I also decompose the changes in the returns to education between cohorts, I find that cognitive ability and occupation play a larger part in the change in returns to education between cohorts than the portion associated with neither. Cognitive ability is responsible for a larger part of these changes between cohorts than occupation. I add non-cognitive abilities and decompose the changes and find that they are not as important as cognitive abilities but are on par with occupation at lower education levels.

# 1 Introduction

With the rising costs of college education in the US, the returns to that education have been under particular scrutiny. The importance of major, college quality and the channels through which graduation actually improves income are still not completely understood and so predictions of how it evolves over time may not be accurate. Whether education is a signal of a persons ability or it is a reflection of the skills and knowledge gained in the process of education or a means of developing peer networks or a combination of the all of those is something that is not yet conclusively known, and the importance of each of those factors might also change over time. Acemoglu (2002), for example suggests that skill biased technical change has affected the returns to education for most of the twentieth century but technical change was skill replacing in the nineteenth century. A simple look at the returns to education and abilities might be warranted for the more recent past, particularly with the recent changes in the effect of skill biased technical change that Beaudry et al. (2016) show after 2000.

Autor et al. (2008), Goldin and Katz (2009) and Castex and Dechter (2014) among many others have studied the returns to education in more recent decades. The central finding of this research is an increase in the returns to education over time particularly for those at higher education levels. Goldin and Katz (2009) shows evidence that between 1950 and 2005 the returns to college relative to a high school graduate increased from 36.7% to 86.6%. More recently Castex and Dechter (2014) for example find that the returns to a bachelors degree increases 14% between the 1980s and 2000s, this increase becomes 43% when controlling for cognitive ability.

Using data from three cohorts of the National longitudinal survey, the Original Cohort(born 1941-52), the NLSY79(born 1957-64) and the NLSY97(born 1980-84), I study the returns to education, cognitive ability and occupation for men and their changes over time. As you might expect from the earlier previous research, I find an increase in the returns to education between the Original Cohort(41% for college graduates) and the NLSY79(105% for college graduates). However, unlike the literature I find that there is a fall in the returns to education for those in the NLSY97(70% for college graduates). When controlling for cognitive ability and occupations these changes are lower in magnitude but follow a similar pattern, an increase between the Original Cohort(35% for college graduates) and the NLSY79(56% for college graduates) followed by a reduction for those in the NLSY97(41% for college graduates). The returns to cognitive ability, follows a similar pattern, a large increase between the Original Cohort(4%) and NLSY79(18%) followed by a reduction in the NLSY97(10%).

The differences between the unconditional returns to education and the returns conditional on cognitive ability are not insignificant, particularly for the NLSY79(47% decline for college graduates) and NLSY97(42% decline for college graduates). I decompose these differences into the portions due to cognitive ability and occupation and find that a larger portion of the difference between the returns to education is due to cognitive ability, particularly for the returns to lower education levels. The role of occupation increases with each education level.

I also look at the differences in the conditional and unconditional returns to education between each cohort pair(The Original Cohort-NLSY79 and NLSY79-NLSY97). I decompose these changes into the portions associated with cognitive ability and occupation and find that similar to the general decomposition cognitive ability is responsible for a larger portion of the unconditional returns to education(27% to 38%), though once again occupation seems to become more important as the education level increases(11% to 29%).

Though most of the research on labour market outcomes has focused on cognitive ability and education in the past, the importance of non-cognitive abilities in the labour market have become increasingly studied. This interest in non-cognitive ability has been spurred by the reducing importance of cognitive ability in wage determination as computers are better able to perform tasks that used to require cognitive skill. However, there might there might be non-cognitive skills that technology has not been able to substitute effectively yet. Deming (2017) for instance shows the growing importance of social skills in the labour market and shows growth in jobs that require both social skills and cognitive ability while there is a drop in the jobs requiring just cognitive skills.

The NLSY79 and NLSY97 have non-cognitive skill measures in the form of measures for the Big-5 personality traits. I conduct the same analysis as above with controls for non-cognitive skills for these two cohorts and find that there is an increase in the effect of non-cognitive ability on wages between the NLSY79 and NLSY97 which is consistent with earlier research(Heckman et al. (2006) and Deming (2017)). I find that non-cognitive ability does not have a large effect on the returns to cognitive ability. Non-cognitive skills seem to affect the returns to high school and some college to a similar extent as occupation(between 4% and 11% of the unconditional returns to education), though occupation plays a bigger role for those with a college degree(occupation accounts for roughly 17% of the unconditional returns to a college degree compared to 7% for non-cognitive ability). When doing this for the change in the returns to education across cohorts, non-cognitive ability seems to be more important than occupation but less important than cognitive ability for the change in returns to some college unlike for high school graduates and college graduates. Roughly 7% of the unconditional changes in the returns to a college degree can be attributed to non-cognitive ability, compared to 19% for occupation and 28% for cognitive ability.

## 2 Data and Empirical Approach

I use three cohorts of the National Longitudinal Survey (NLS) to compile data on income, education, cognitive ability and demographic characteristics. These three cohorts include the Young Men's sample of the Original Cohort of the NLS, the NLSY79 cohort and the NLSY97 cohort.

The NLS Original Cohort data includes 4 sets of surveys for cohorts born between 1941 and 1952, I use only data from the survey of the Young men that I will refer to simply as the Original Cohort of the NLS. Respondents were between the ages of 14 and 24 at the time of the initial survey. The 5,225 young men were surveyed beginning in 1966, and were then followed until 1981 when they were between the ages of 29 and 39.

The NLSY79 follows 12,686 individuals born between 1957 and 1964 and are between the ages of 14 and 22 at the time of their first interview in 1979. The most recent wave was in 2014 when the respondents were between the ages of 49 and 57.

The NLSY97 surveys 8,984 individuals born between 1980 and 1984 who were between 12 and 18 during their first interview in 1997. The survey is still ongoing, the latest available data is for 2015 at which point the subjects were between the ages of 30 and 36.

I only run the analyses on men in the three surveys, this roughly halves the number of individuals from the NLSY79 and NLSY97. I do this as the analysis involves looking at income between 1967 and 2015, this was a period of change for the labour force participation of women, their wages and education. These other trends that might also affect their wages in ways that might complicate the analysis.

Respondents of all the cohorts are asked about their annual income, and I convert annual incomes to income at a particular age. Age specific income measures are then converted to 2012 dollars, and mean annual income<sup>1</sup> earned between the ages of 25 and 35 is calculated and used as the primary dependent variable. Observations where an individual was enrolled in school are excluded from the mean income calculation, but years in which they reported zero income while not enrolled in school are included.

The 25-35 age range was chosen to maximize the number of observations, while still observing respondents from the three data sets at the same ages, thus allowing for direct comparability across cohorts. None of the results presented below are sensitive to reasonable alternative age ranges. Given the cohorts of respondents from each survey and the use of the 25-35 age range, wages for individuals from the Original Cohort are observed between 1967 and 1981, individuals from the NLSY79 are observed between 1982 and 1998, individuals from the NLSY97 are observed between 2005 and 2015.

Educational attainment for each individual is based on reported highest education level between the ages of 18 and 25. For individuals with no reported degree, highest grade completed was used to fill in the gaps. Education dummies are created for those with no high school diploma, those with only a high school diploma, those with some college or an associates degree and those who are college graduates.

Cognitive skill measures are also available in all three data sets, but the exact measures vary by sample. Specifically, the Original Cohorts contain a variety of standardized tests, which are referred to as “IQ test scores” in NLS documentation, while the NLSY79 and the NLSY97 have AFQT scores. The standardized test scores used to measure “IQ” for the Original Cohorts were collected by surveying the high schools of the respondents, and each high school administered different standardized tests<sup>2</sup> and reported the scores in different ways. Kohen (1973) describes how

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<sup>1</sup>This includes income from wages, income from farms, income from businesses and income from other sources, most of these are available for every year used in the data, some additional sources of income such as from rent, stock and interest are included for the 97 as they are included in the other sources of income for the earlier cohorts. Some respondents only report income in a range, in which case the mean of the two extreme values for each category is used.

<sup>2</sup>The “IQ” tests included Otis/Beta/Gamma and California Test of Maturity which make up over half of the tests observed in our sample. Henmon-Nelson Test, Preliminary & Scholastic Aptitude Tests, Lorge-Thorndike

the NLS administrators rescale the various scores so that they can be pooled and are comparable across tests. I utilize all available IQ scores, except for those imputed from GPA. The AFQT scores in the NLSY79 and NLSY97 have been adjusted to account for type of test and age at testing using the procedures suggested by Altonji et al. (2012) as used in Castex and Dechter (2014), and all test scores are scaled to have a mean of zero and a standard deviation of one.

I also utilize data on occupations in the three samples. Specifically, I use seven broad occupational classifications from Census occupation codes that are comparable across the utilized cohorts and result in minimal observation loss. The utilized occupation categories are: 1) Professional, technical and kindred workers, 2) Managers, officials and proprietors, 3) Clerical and kindred, 4) Sales workers, 5) Service workers, 6) Farm workers, and 7) Labourers, Craftsmen, operatives and kindred workers.

Finally, I construct variables measuring demographic characteristics for use as controls. These include birth cohort, race (White, African American or Other), the fraction of observations occurring between ages 25 and 35 when the individual resided in the South<sup>3</sup> and in an MSA, the ages at which income was observed, and the total number of annual observations used to construct the income measure. All of the estimates reported below apply sampling weights<sup>4</sup>, although I demonstrate below that none of the findings are substantively changed if sampling weights are omitted.<sup>5</sup>

The final sample looks at 2,517 men from the NLS Original Cohort, 4,638 men from the NLSY79 and 2,517 men from the NLSY97. Table 1 reports means of the variables used in the analysis. There is a reduction in average income over this period between each cohort. The reduction in average years of education followed by an increase is also reflected in the dummies for educational attainment<sup>6</sup>. The means for the geographical control variables are for living in the south and residence in an MSA, they are based on the proportion for each individual between the ages of 25 and 35, both see an increase over time. The occupation measures created for each individual occupation category are the proportion of observations between 25 and 35 the individual was employed in that particular occupation category.

I estimate variants of the following earnings equation in each of the three samples described above:

$$\ln(\text{income}) = \beta_0 + \beta_1 \text{EDU}_i + \beta_2 \text{Cog.Ab.}_i + \beta_{3j} \text{occ}_i^j + \beta_k X_i + \varepsilon_i \quad (1)$$

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Intelligence Test, School and College Ability Test, Iowa Test of Educational Development, Differential Aptitude Test, Test of Educational Ability, Primary Mental Ability Test, American College Testing Program and National Merit Scholarship Qualifying Test make up the rest of the observed tests with the last 5 mentioned making up less than ten percent in the sample.

<sup>3</sup>Only a distinction between the Southern and non-Southern states are available when describing the region of residence for those in the Original Cohort of the NLSY.

<sup>4</sup>I use <https://www.nlsinfo.org/weights> for custom weights covering all survey years for the NLSY79 and NLSY97, for the Original Cohort custom weights are unavailable so I use weights from the first year of the survey.

<sup>5</sup>Appendix Table A2-A4

<sup>6</sup>The differences in the education proportions across the three cohorts are due to the importance of number of years of education completed in determining highest level of education in comparison with the other two cohorts, using number of years of education across all three cohorts results in the education levels being more similar. The levels in all three years are similar to levels in the same cohorts of the ACS/Census Data.

where *income* is the average annual income of the years the individual was not enrolled in school between the ages of 25 and 35, *EDU* is a vector of dummy variables for each level of education (high school, some college, college and beyond), *Cog.Ab.* is the cognitive ability measure, and *X* is a vector of other controls including birth cohort, race, Southern residence, residence in an MSA, the ages at which income was observed, and the total number of income observations.

I first report the results of estimating this specification in each of the three samples, both with and without the covariates measuring cognitive ability and occupation. To better understand the nature of changes in the wage structure over time, I also estimate versions of the above equation that include interactions between the independent variables of interest and cohort indicators, again with and without the cognitive ability and occupation controls, and use the method suggested by Gelbach (2016) to decompose the part played by cognitive ability and occupation in determining the returns to education and the changes in returns to education.

### 3 Results

#### 3.1 The change in the returns to education

In Table 2 I report the results of estimating variations of equation 1 for all three cohorts separately. The first three columns present models that do not include cognitive skills or occupation controls, while cognitive skills and occupation controls are included in the last three.

Table 2 shows an increase in the returns to education between the Original Cohorts and the NLSY79, and then a fall between the NLSY79 and the NLSY97. For instance, in the Original Cohort, college graduates earned 41% more than individuals who had not completed high school. This college earnings premium increased to 105% in the NLSY79, before declining to 70% in the NLSY97. Individuals with only some college in the Original Cohort receive wages that are 28% higher than those who have not graduated high school, this rises 86% for those in the NLSY79 and drops down to 49% for those in the NLSY97. Similarly men in the Original Cohort who have graduated high school earn 12% more than those without a high school diploma, this premium jumps to 61% for those in the NLSY79 and drops to 31% for those in the NLSY97.

Columns 4-6 of Table 2 report results when controls for cognitive ability and occupation are added to the specification <sup>7</sup>. The returns to education conditional on cognitive ability and occupation are generally lower than the unconditional returns, but follow the same pattern as the unconditional returns, i.e. an increase between the Original Cohort and the NLSY79 followed by a fall between the NLSY79 and the NLSY97. The returns to college graduation for example is 35% in the Original Cohort which increases to 56% for those in the NLSY79 followed by a reduction to 41% for those in the NLSY97. The returns to some college are slightly lower at 25% for the Original Cohort, 50% for the NLSY79 and 32% for the NLSY97. The returns to a high school diploma is much lower in the Original Cohorts at 12% which sees a large jump to 39% for those in the NLSY79 and a reduction to 20% for those in the NLSY97.

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<sup>7</sup>The omitted occupation category is Labourers, Craftsmen, Operatives and Kindred Workers

The returns to cognitive ability follow a similar pattern across cohorts: There is a return of 4% for each standard deviation increase in cognitive ability for those in the Original Cohort which rises to 18% for those in the NLSY79, followed by a reduction between the NLSY79 and NLSY97 from 18% to 10% for each standard deviation increase in cognitive ability.

Occupational sorting, like education and cognitive ability, has particularly large effects on income for those in the NLSY79, with smaller effects for those in the Original Cohort and the NLSY97 for most occupation categories. Most notable are large spikes between the Original Cohorts and the NLSY79 in the wage premium associated with being in professional or managerial occupations, which then fall again in the NLSY97, while the opposite pattern is observed for workers in farm and service occupations. Clerical workers see a slight decline in wages and then plateau.

The observed increases in the returns to education (both unconditional and conditional) for cohorts born in the 1940s versus those in the late 1950s and early 1960s is consistent with large bodies of existing research (e.g. Katz and Murphy (1992), Acemoglu (2002), Beaudry and Green (2005), Autor et al. (2003), Autor et al. (2006)), the observed declines in the returns to education in more recent cohorts may seem surprising. For example, contrary to Table 2, Castex and Dechter (2014) find significant increases in returns to education education between the cohorts particularly when controlling for cognitive ability. The most important difference is the additional years of data available and the change in the age range under study from 18-28 to 25-35. There are also some differences in the measures used in this paper compared to Castex and Dechter (2014), they use individual year observations of *hourly pay* in their analysis as opposed to the the average *annual income* of each individual<sup>8</sup>. They also limit their analysis to only a portion of the sample with an hourly pay between \$3 and \$100, who work more than 20 hours a week and have more than 5 years of education which this paper does not do.

Since a large part of the literature shows increases in the returns to education inconsistent with my findings particularly the unconditional returns, I also try to run similar regressions using ACS/Census data<sup>9</sup>. This should show me if this pattern is specific to my sample of the NLS data. The ACS/Census data is also slightly inconsistent with earlier research. Table 3 shows there is a rise in the returns to education between the cohorts included in the Original Cohort(78% for college graduates) and the NLSY79(123% for college graduates) groups. This data also shows a slight reduction in returns to both high school and some college between the cohorts included in the NLSY79(63% for high school graduates) and NLSY97(42% for high school graduates) groups. The returns to college do not change much in this period(123% for college graduates in the NLSY79 to 125% for college graduates in the NLSY97). These results could point toward there not being a simple increase in returns to education across the board between cohorts of the NLSY79 and NLSY97 as shown by earlier research.

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<sup>8</sup>Running the regressions with average hourly pay between the ages of 25 and 35 instead does result in a similar reduction in returns to education between the NLSY79 and NLSY97

<sup>9</sup>The differentiation by cohort is done by sorting individuals using the birth years that correspond to the three NLSY cohorts. Individuals are only included if they were between the ages of 25 and 35 when observed. All other covariates have been matched to their NLSY counterparts as closely as possible.

These declines might however be consistent with the arguments in Beaudry et al. (2016) who show a decline in the demand for cognitive tasks after 2000 resulting in a different market for those after. They suggest a college degree might be a way to open doors to higher paying jobs but also a way to set yourself above less educated workers for jobs that they might otherwise be qualified to perform. Ashworth et al. (2017) find a reduction in returns to a college degree between the NLSY79 and NLSY97 as well, though they split the NLSY79 cohort to two groups to show a similar hump shape in the returns to college over time. Valletta (2017) use CPS data to show a decline in the wage premium for college graduates after 2000 before a flattening out to 2000 levels between 2010 and 2015.

Overall, the results in Table 2 indicate that the wage structure shifted significantly across the three sets of studied cohorts. In addition to dramatic changes in the returns to education, there were large, simultaneous shifts in the returns to cognitive ability and the wage effects of occupational sorting. Also while not directly addressed by the regressions from Table 2, there are changes over time in the association of education with cognitive ability and occupation (Appendix Table A1). All of these factors could contribute to the observed changes in the returns to education, and the next section systematically investigates the nature of these changes in the wage structure.

## 3.2 Decomposing the Returns to Education

To better understand changes in the returns to education over time I decompose the differences between the coefficients for equation 1 with and without cognitive ability and occupation controls. To accurately decompose the change from the addition of two different sets of variables simultaneously I use the method suggested by Gelbach (2016). This technique uses the omitted variable bias formula to allow addition of variables in any order. In this case it involves running the regression with and without cognitive ability and occupation. The difference in the returns to education between the two specifications can then be split apart into the portion that was due to occupation and the portion due to cognitive ability. Using the basic properties of the regression and the correlation between the covariates and the coefficient of interest, this method suggests a way to assign the correct proportion of the change to the variable responsible for it.

In the case of college education and cognitive ability for example, the reduction in the returns to college education from including cognitive ability in the regression is the product of the coefficient on the college education dummy from a regression on cognitive ability and the coefficient on the college education dummy from the full regression with cognitive ability and occupation included.<sup>10</sup>

### 3.2.1 Within Cohort Decompositions

I decompose the returns to education within each of the studied cohorts, and the results are shown in Table 4. The first row of each section of Table 4 simply reports the change in the returns

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<sup>10</sup>Gelbach (2016) considers a regression  $Y = \beta_0 + \beta_1 X + \beta_2 Z + \varepsilon$  where the regression initially omits  $Z$ , the omitted variable bias for  $\beta_1$  is  $\delta = (X'X)^{-1}X'Z\hat{\beta}_2$

to each level of educational attainment that occurred due to conditioning on cognitive ability and occupation from Table 2. For example, within the NLSY79 the coefficient on the college graduate indicator fell from 1.054 when only baseline controls were included, to .558 after conditioning on cognitive ability and occupation, a reduction of .496, and this difference is reported in Row 1 of section c in Table 4. The second and third rows of each section then use the Gelbach technique described above to decompose these reductions into portions attributable to cognitive ability (0.299 for college graduates in the NLSY79) and occupational sorting (0.197 for college graduates in the NLSY79).

An interesting pattern that emerges in Table 4 is that as the education level increases, occupational sorting seems to play a larger part for those in the NLSY79 and NLSY97 with the opposite being true for the Original Cohort. Cognitive ability, being responsible for more than half of the change in returns, seems to be the more important of the two factors in all three cohorts at every education level.

For instance, focusing on the returns to being a college graduate, in the Original Cohort most of the difference between the conditional and unconditional change in returns (0.0537) is attributable to cognitive ability (0.0516), occupational sorting seems to explain a relatively small portion (0.00213). This changes significantly for college graduates in the NLSY79 and NLSY97, roughly sixty percent of the change in returns can be explained by cognitive ability and the rest by occupation. This similarity between the NLSY79 and NLSY97 seem to only be true in proportion of the change explained, the magnitudes of these changes are higher for the NLSY79. For the Original Cohort between 13% and 15% of the unconditional returns to education are associated with cognitive ability as opposed to between 1% and 10% is associated with occupation. Between 21% and 28% of the unconditional returns to education in the NLSY79 and NLSY97 are associated with cognitive ability and between 6% and 19% with occupation.

### 3.2.2 Decomposing Changes in the Returns to Education across Cohorts

Distinct from the question of what factors influence the returns to education within the studied cohorts is the question of what explains the changes in educational premiums between the studied cohorts. Tables 5 and 6 present results that help to better understand the determinants of the changing returns to education across the three sets of cohorts.

Table 5 begins by estimating models that pool two of the cohorts together (first the Original Cohort and the NLSY79, and then the NLSY79 and the NLSY97), and include interactions between the education variables and cohort indicators. The results are reported in Columns 1 and 4 of Table 5, and the coefficients on the interactions are conceptually and numerically similar to comparing the returns to education across cohorts, as in Table 2.

Columns 2 and 5 of Table 5 then add the covariates measuring cognitive ability and occupation as well their interaction with the cohort indicator, and Columns 3 and 6 report the resultant reduction in the coefficients on the education-cohort interactions. These reductions represent the portion of the *change* in the returns to education attributable to the additional covariates. Finally,

Table 6 decomposes the portion of the returns to education that are attributable to cognitive ability and occupational sorting, respectively. For example if we consider the difference in the returns to college between the NLSY79 and NLSY97, the unconditional change in returns from column 4 of Table 5 is -0.350, when cognitive ability and occupation are included the change in returns drops to -0.150 in column 5. The difference between the conditional and unconditional returns, -0.200 is presented in column 6. This difference is decomposed in Table 6, in this case column 6, the -0.200 is decomposed into the -0.130 associated with cognitive ability in the second row and the -0.0705 associated with occupation in row 3.

The results in Table 6 reveal that the underlying causes of patterns in the returns to schooling don't differ much by the level of educational attainment. Specifically, of the .210 log point change in the returns to high school completion that occurred between the Original Cohorts and the NLSY79, .0148 log points can be attributed to cognitive ability. Similarly, of the .110 log point decline in the returns to high school graduation that occurred between the NLSY79 and the NLSY97, .0782 log points can be attributed to cognitive ability. Both the .436 log point increase in the returns to college graduation between the Original Cohorts and the NLSY79 and the subsequent .200 log point decline between the NLSY79 and the NLSY97 are due mostly to cognitive ability as well, though occupation plays a relatively larger part compared to its role in the changes in returns to a high school diploma.

The portion of the change in the unconditional returns to education associated with cognitive ability and occupation is larger than the portion associated with neither for those with a college degree and those with some college. As mentioned earlier cognitive ability is responsible for a large portion of the change for both cohorts. This might be due to the special circumstances for those in the NLSY79, high returns to cognitive ability, and the strong association between cognitive ability and education in this period.

### 3.3 Non-cognitive abilities

Non-cognitive skills have been put forward as a possible explanation for the returns to college for several reasons. For instance it has been suggested that the relative cost of attending and completing college for those with high non-cognitive ability is lower, therefore they select themselves into higher education levels and the returns to education might be a reflection of the returns to these non-cognitive skills. There has been some recent research on the returns to non-cognitive skills in the labour market, pointing out that even among cognitive task intensive occupations, those that have higher needs for non-cognitive skills have been growing faster. Considering its possible importance I look at change in returns to Non-cognitive abilities over time and how they effect the returns to education.

The NLSY79 and NLSY97 also have some non-cognitive skill measures that they record during the surveys<sup>11</sup>. I use measures of the Big 5 personality traits, extraversion, agreeableness, conscien-

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<sup>11</sup>The personality traits are measured at different point of time in the two surveys, however meta- analysis of personality traits such as Roberts et al. (2006) seem to suggest stability in personality traits for the most part at

tiousness, neuroticism and openness. The individuals are asked two questions for each of the five measures, the standardised mean of their responses on a 1-8 scale is used in the analysis.

The first two columns of Table 7 shows the returns to education, without occupation and cognitive ability controls, the third and fourth columns include controls for cognitive ability and occupation and the last two columns add non-cognitive ability controls along with those for cognitive ability and occupation. The difference in the returns to education between the specification in the first two columns and the other columns is stark as noticed in Table 2 as well. However the addition of cognitive ability does not seem to significantly change the returns to education. For example the returns to college in the NLSY79 drop from 55% to 52% when non-cognitive ability is added, as opposed to the 100% returns suggested by the partial specification. Similarly in the NLSY97 the addition of non-cognitive ability reduces the returns to a college degree from 44% to 38%, a larger drop than in the NLSY79 but still much smaller than the drop from 70% that results from the addition of cognitive ability and occupation. The returns to cognitive skills in both cohorts is also very similar after controlling for non-cognitive skills, the returns in the NLSY79 sees a slight reduction from 16% to 15% while in the NLSY97 there is a slight increase from 9% to 10%.

The last two columns of Table 7 also show the returns to the Big 5 personality traits. There is an increase in the returns a standard deviation increase in extraversion from 6% to 9% between the NLSY79 and the NLSY97, considering this is a common proxy for social skill this increase seems likely given previous literature on the increase in returns to social skill over time (Deming, 2017). Agreeableness and openness seem to be detrimental to earnings in the NLSY97 unlike in the NLSY79. There is also a fall in the returns to conscientiousness, while neuroticism or mental stability seems to have small but stable effect on wages.

Table 8 decomposes the within cohort changes in education into the portions explained by cognitive ability, occupation and non-cognitive ability. The first three columns however give results of the decomposition for just cognitive ability and occupation for the sub-sample that has non-cognitive data for comparison. For those with a high school diploma or some college non-cognitive ability seems to be as important as occupation in explaining the returns to education, cognitive ability still seems to be the most important factor. However for those with a college degree both cognitive ability and occupation seem to be more important than non-cognitive ability for those in both cohorts. This is mostly due to the increased importance of occupation for those with a college degree as noted in Table 4. For those in the NLSY97 for instance of the 0.320 log point change, 0.161 log points is due to cognitive ability, 0.114 due to occupation and only 0.045 due to non-cognitive ability as opposed to when non-cognitive skills are not included and the 0.265 log point change in total returns is decomposed into 0.144 associated with cognitive ability and 0.121 associated with occupation.

Similar to Table 6, Table 9 decomposes the differences in the changes in returns to education between the NLSY79 and NLSY97 when controlling for cognitive ability, occupation and Non-cognitive ability. The portion of the difference explained by occupation remains fairly similar when

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these age ranges.

non-cognitive ability is included compared to when it is not. However the portion that is explained by cognitive ability does see a small drop as the differences in changes in returns themselves do not see a large change. The importance of non-cognitive ability in explaining these changes over time seem seems greatest in the case of those with more education than a high school diploma who do not have atleast a bachelors degree, where of the 0.184 log point change 0.095 is due to cognitive ability, 0.053 due to non-cognitive ability and 0.036 due to occupation as opposed to when cognitive ability is not included and of the 0.169 log point change 0.122 is associated with cognitive ability and 0.0362 with cognitive ability. The inclusion of non-cognitive ability seems to reduce the importance of cognitive ability in the change in the returns to education between the cohorts.

## 4 Alternative specifications

I also run the analyses using other specifications to test if the results are unique to my sample and variable choice.

I use hourly pay measures as used in Castex and Dechter (2014) though without limiting sample by number of hours worked, for the same age range as earlier as the main analysis. As seen in Table 10, the patterns seen earlier between the NLSY79 and NLSY97 in Table 2 are also found in these results, a reduction in the returns over that time period. However the results for the Original Cohort are different, this might be because of the quality of the hourly pay data which had to be converted from monthly, weekly, daily and annual pay when hourly pay was not reported. Table 11 shows the decomposition of the returns to education, they are also slightly different in the case of hourly pay, the importance of occupation in explaining these changes in returns is much greater than that of cognitive ability unlike in the case of annual pay for all education levels. I also report the decomposition of the differences in changes to the returns to education between cohorts in Table 12. The results in this table are different from the main results in several ways, for example the magnitude of the difference in the change in returns to education is the same for both college graduates and those with some college, and nearly all of the difference can be attributed to cognitive ability in both cases.

I also run the analyses for mean income calculated over a wider age range, between 21 and 35 and an age range 25 to 30 so that everyone in the NLSY97 is recorded at the oldest possibly available age. For the sample considering everyone from 21 to 35(Table 13), though the magnitudes of the returns are lower the larger patterns in the changes in the returns to education and cognitive ability observed in the main analysis hold for this sample too. The lower magnitudes of the returns to education might be expected as incomes are measured at earlier ages than previously and education is still based on education at age 25. The results of decomposing the returns are once again very similar to the larger sample(Table 14). The importance of occupation however seems to have diminished slightly when looking at the decomposition of the changes between cohorts(Table 15). For the analysis run for those between 25 and 30 however all the results are much more similar to those in the main analysis, which may not be surprising since we are considering a sub-sample of

those observations (Table 16-18).

Tables 19 to 22 report the results of the main regression without any controls to test if the results are because of my particular set of controls and I find similar results to those previously described. There is an increase in the returns to education followed by a fall, however when controlling for cognitive ability and occupation the fall between the NLSY79 and NLSY97 is considerably smaller. The decompositions are similar to the previous results, though the relative importance of cognitive ability in all the decompositions is higher.

The measure of cognitive ability in the Original Cohort is different to the other two cohorts. Though there is significant correlation between the two measures, they do work on different scales and there have been suggestions that the AFQT measures some skills that most IQ tests do not (Borghans et al., 2016). I therefore create indicators for the quartile groups of each cognitive skill by cohort. I replace the standard normal cognitive skill measure with indicators for each of the cohorts. The conditional returns to education don't seem to be very different from those obtained by using a standardised cognitive ability measure. The returns to being in each quartile increases with quartile as might be expected and there is an increase in returns between the Original Cohort and NLSY79 followed by a fall in the NLSY97 as reported in Table 22. There are some differences when the returns to education for each cohort are decomposed in Table 23, cognitive ability seems to play a relatively smaller role here. However when returning to the decomposition of the changes between cohorts in Table 24 the results look similar to Table 5.

## 5 Conclusion

While some studies have found steady increases in the returns to education in the past half century, I show that while there might have been growth in the returns to education for those born between 1957 and 1964 relative to those born between 1941 and 1952, they do not seem to continue to rise for those born between 1980 and 1984. This fall in the returns after the NLSY79 seems to hold true for cognitive ability as well after it saw a large rise in returns compared to the seventies. This fall in the returns to education might be due to increased supply of skilled labour, though Goldin and Katz (2009) seem to suggest relatively small changes in the skilled labour supply. Another possible explanation can be found Beaudry et al. (2016), they suggest skill biased technical change might have an initial phase where the market would require cognitive ability in a large scale, but as new technology is developed the need for this cognitive ability becomes less strong as it is replaced by technology, this period would therefore be followed by lower demand and returns for skills that can be replaced. They also suggest the due to a reduction in demand, you could expect "de-skilling" where you have "high-skilled workers pushing low-skilled workers even further down the occupational ladder". The demand for cognitive skills in the nineties, followed by a reduction in demand for cognitive tasks (Beaudry et al., 2016) which is also reflected in the returns as shown above might be indicative of this being true. That the returns to education follow the same pattern, even when controlling for cognitive ability might reflect the fact that the skills

acquired or indicated by education might not be in as much demand. Though some literature suggests that portions of the returns to education might be attributable to non-cognitive ability, I find they are not related to the measures available in the data I use. However unlike cognitive ability and education, the influence of non-cognitive ability seems to have increased for those born between 1980 and 1984.

I decompose the returns to education into the portions attributable to cognitive ability, occupation and neither. I find that a significant portion of the returns are due to cognitive ability and occupation, though occupation has less of an impact than cognitive ability it becomes important at higher education levels. In most cases the portion attributable to neither cognitive ability and occupation is the largest of the three suggesting that others factors besides cognitive ability and occupation play a large part in the returns to education. Besides the returns to education in each cohort I try to find the change in the returns between each of the cohorts and decompose those into the portions attributable to cognitive ability and occupation as well. Once again the largest portion of the change in returns between cohorts cannot be attributed to either cognitive ability or occupation. But for the portions that can, cognitive ability still seems to have played the largest part. This might suggest that that the decline in the returns to education might not have been entirely responsible for the drop in the unconditional returns to education. There seem to be other factors associated with education whose relative value in the labour market might be declining as well.

The NLSY79 and NLSY97 having some measures of non-cognitive skills allows me to find their returns and their changes over times. I find an increase in its importance in determining wages in general, particularly Extraversion, often used as a proxy for social skills, though there is a reduction in the effect of Conscientiousness. They seem to not play a large role in determining the returns to education, particularly as education level increases. Interestingly this holds when looking at how they effect the changes in returns to education across cohorts as well. Cognitive ability still plays a much bigger part.

These results are robust for multiple other specifications including different age ranges, different income measures, different weighting, etc. However when split into samples based on race the fall in the returns to college between the NLSY79 and NLSY97 seems to be flat for the sample of only white individuals when controlling for cognitive ability, whereas there is a large drop for non-white individuals. This race based difference might be related to differing returns to cognitive ability by race across cohorts. Further study into the exact nature of these differences and whether they represent a widening or a narrowing of differences in returns by race. Study into the effect of these changes on the wages of women might be of interest as well, these differences in the returns to education might also have implications for the gender wage gap.

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# Tables<sup>1</sup>

Table 1: Descriptive Statistics

	(1) Original Cohort	(2) NLSY79	(3) NLSY97
Income	\$53946	\$46818	\$43899
Years of Education	13.68	12.99	13.61
High School	0.35	0.56	0.59
Some College	0.22	0.08	0.06
College Degree	0.34	0.21	0.26
Cognitive ability	0.28	0.00	0.08
Race:Black	0.06	0.14	0.14
Race:Other	0.01	0.02	0.11
South	0.28	0.33	0.36
MSA	0.75	0.81	0.95
Occupation			
Professional, Technical & Kindred	0.24	0.16	0.18
Managers, Officials & Proprietors	0.16	0.14	0.13
Clerical & kindred	0.07	0.07	0.09
Sales Workers	0.07	0.05	0.1
Service Workers	0.05	0.1	0.15
Farm Workers	0.03	0.02	0.01
Labourers, Craftsmen & Operatives	0.39	0.46	0.34
<i>N</i>	2517	4638	2517

<sup>1</sup>Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 2: Returns to education and cognitive ability across cohorts for men.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.127 (0.0837)	0.612*** (0.0702)	0.357*** (0.0585)	0.114 (0.0813)	0.368*** (0.0726)	0.217*** (0.0572)
Some College	0.321*** (0.0847)	0.892*** (0.0861)	0.571*** (0.0760)	0.284** (0.105)	0.488*** (0.0912)	0.346*** (0.0771)
College Graduate	0.455*** (0.0837)	1.085*** (0.0736)	0.791*** (0.0611)	0.376** (0.115)	0.510*** (0.0859)	0.389*** (0.0681)
Cognitive ability				0.0360 (0.0239)	0.197*** (0.0310)	0.128*** (0.0183)
Professional, Technical & Kindred				0.0502 (0.0866)	0.313*** (0.0594)	0.128* (0.0545)
Managers, Officials & Proprietors				0.0880 (0.140)	0.697*** (0.0698)	0.409*** (0.0563)
Clerical & Kindred				-0.304 (0.161)	-0.269* (0.126)	-0.323*** (0.0612)
Sales Workers				-0.0818 (0.207)	0.119 (0.203)	0.00559 (0.0626)
Service Workers				-0.0900 (0.0904)	-0.577*** (0.130)	-0.342*** (0.0544)
Farm Workers				-0.347*** (0.0927)	-0.387* (0.165)	0.106 (0.167)
<i>N</i>	2318	4578	2296	2318	4578	2296

Table 3: Returns to education across cohorts for men in the ACS and Census.

	Original Cohort	NLSY79	NLSY97
High School	0.464*** (0.007)	0.626*** (0.010)	0.422*** (0.012)
Some College	0.570*** (0.008)	0.891*** (0.010)	0.814*** (0.012)
College Graduate	0.786*** (0.007)	1.226*** (0.010)	1.254*** (0.011)
<i>N</i>	536,996	689,246	548,869

Table 4: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.0133 (0.0184)	0.244*** (0.0235)	0.140*** (0.0209)
Change due to cognitive ability	0.0188 (0.0137)	0.181*** (0.0212)	0.106*** (0.0157)
Change due to occupation	-0.00548 (0.0138)	0.0622*** (0.0138)	0.0334* (0.0143)
b) Some College			
Total Change in returns	0.0370 (0.0377)	0.404*** (0.0369)	0.226*** (0.0304)
Change due to cognitive ability	0.0370 (0.0268)	0.266*** (0.0313)	0.130*** (0.0202)
Change due to occupation	-0.0000825 (0.0302)	0.139*** (0.0264)	0.0959*** (0.0245)
c) College degree			
Total Change in returns	0.0799 (0.0565)	0.576*** (0.0438)	0.402*** (0.0379)
Change due to cognitive ability	0.0504 (0.0365)	0.327*** (0.0372)	0.215*** (0.0288)
Change due to occupation	0.0294 (0.0497)	0.249*** (0.0360)	0.187*** (0.0305)
<i>N</i>	2318	4578	2296

Table 5: The change in returns to education and cognitive ability across cohorts.

	Original cohort - NLSY79			NLSY97 - NLSY79		
	Partial Specification	Full Specification	Difference	Partial Specification	Full Specification	Difference
High School	0.120 (0.0846)	0.107 (0.0821)		0.611*** (0.0701)	0.368*** (0.0726)	
High School* $I_{cohort}$	0.492*** (0.110)	0.262* (0.110)	0.299*** (0.0333)	-0.256** (0.0915)	-0.155 (0.0927)	-0.102** (0.0391)
Some College	0.313*** (0.0848)	0.277** (0.105)		0.890*** (0.0858)	0.487*** (0.0911)	
Some College* $I_{cohort}$	0.581*** (0.121)	0.214 (0.139)	0.367*** (0.0546)	-0.327** (0.115)	-0.152 (0.120)	-0.176** (0.0582)
College Graduate	0.449*** (0.0835)	0.373** (0.115)		1.085*** (0.0737)	0.511*** (0.0860)	
College Graduate* $I_{cohort}$	0.636*** (0.111)	0.139 (0.143)	0.497*** (0.0729)	-0.295** (0.0958)	-0.124 (0.110)	-0.171* (0.0740)
Cognitive Ability		0.0363 (0.0240)			0.196*** (0.0310)	
Cognitive Ability* $I_{cohort}$		0.159*** (0.0393)			-0.0679 (0.0360)	
Professional, Technical & kindred		0.0448 (0.0871)			0.314*** (0.0597)	
Professional, Technical & kindred* $I_{cohort}$		0.270* (0.106)			-0.186* (0.0811)	
Managers, Officials & Proprietors		0.0826 (0.139)			0.698*** (0.0699)	
Managers, Officials & Proprietors* $I_{cohort}$		0.616*** (0.156)			-0.285** (0.0894)	
Clerical & Kindred		-0.307 (0.161)			-0.272* (0.126)	
Clerical & Kindred* $I_{cohort}$		0.0333 (0.204)			-0.0481 (0.141)	
Sales Workers		-0.0785 (0.208)			0.122 (0.203)	
Sales Workers* $I_{cohort}$		0.197 (0.291)			-0.117 (0.212)	
Service Workers		-0.0796 (0.0903)			-0.578*** (0.130)	

	Original cohort - NLSY79			NLSY97 - NLSY79		
	Partial Specification	Full Specification	Difference	Partial Specification	Full Specification	Difference
Service Workers* $I_{cohort}$		-0.502** (0.158)			0.239 (0.141)	
Farm Workers		-0.348*** (0.0931)			-0.390* (0.166)	
Farm Workers * $I_{cohort}$		-0.0409 (0.189)			0.480* (0.236)	
$N$	6896	6896	6896	6874	6874	6874

$I_{cohort}$  is an indicator for the 79 cohort when running the Original cohort-79 regression and an indicator for 97 in the 79-97 regression. The second variables are therefore the change between the cohorts.

Table 6: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.229*** (0.0333)	0.367*** (0.0546)	0.497*** (0.0729)	-0.102** (0.0391)	-0.176** (0.0582)	-0.171* (0.0740)
Change due to Cognitive Ability	0.161*** (0.0264)	0.226*** (0.0418)	0.273*** (0.0526)	-0.0732* (0.0320)	-0.133** (0.0430)	-0.109 (0.0586)
Change due to Occupation	0.0684** (0.0225)	0.140*** (0.0416)	0.224*** (0.0624)	-0.0286 (0.0243)	-0.0429 (0.0445)	-0.0617 (0.0596)
$N$	6896	6896	6896	6874	6874	6874

## Non-cognitive abilities

Table 7: Returns to education, cognitive ability and non-cognitive ability across cohorts.

	Unconditional		Partial Specification		Full Specification	
	NLSY79	NLSY97	NLSY79	NLSY97	NLSY79	NLSY97
High School	0.576*** (0.0852)	0.371*** (0.0662)	0.347*** (0.0837)	0.251*** (0.0645)	0.319*** (0.0830)	0.217*** (0.0640)
Some College	0.864*** (0.0989)	0.584*** (0.0801)	0.490*** (0.105)	0.379*** (0.0816)	0.447*** (0.105)	0.346*** (0.0812)
College Graduate	1.027*** (0.0883)	0.793*** (0.0683)	0.461*** (0.101)	0.426*** (0.0742)	0.432*** (0.102)	0.367*** (0.0736)
Cognitive ability			0.179*** (0.0366)	0.118*** (0.0200)	0.167*** (0.0340)	0.125*** (0.0198)
Professional, Technical & kindred			0.351*** (0.0736)	0.138* (0.0564)	0.344*** (0.0734)	0.147** (0.0546)
Managers, Officials & Proprietors			0.683*** (0.0758)	0.410*** (0.0584)	0.607*** (0.0734)	0.359*** (0.0568)
Clerical & Kindred			-0.180 (0.124)	-0.289*** (0.0657)	-0.168 (0.123)	-0.278*** (0.0630)
Sales Workers			0.132 (0.268)	-0.00446 (0.0664)	0.0929 (0.261)	-0.0208 (0.0655)
Service Workers			-0.469** (0.167)	-0.334*** (0.0589)	-0.460** (0.165)	-0.328*** (0.0572)
Farm Workers			-0.304 (0.204)	0.122 (0.168)	-0.298 (0.199)	0.0953 (0.164)
Extroversion					0.0515* (0.0244)	0.0983*** (0.0148)
Agreeableness					0.0106 (0.0238)	-0.0532*** (0.0156)
Conscientiousness					0.111** (0.0346)	0.0965*** (0.0165)
Neuroticism					0.0244 (0.0308)	0.0400* (0.0194)
Openness					0.0283 (0.0215)	-0.0394* (0.0164)
<i>N</i>	2898	2093	2898	2093	2898	2093

Table 8: Decomposing the returns to education due to cognitive ability ,occupation and non-cognitive ability.

	(1)	(2)	(3)	(4)
	NLSY79	NLSY97	NLSY79	NLSY97
a) High School				
Total Change in returns	0.229*** (0.0284)	0.120*** (0.0215)	0.257*** (0.0297)	0.154*** (0.0252)
Change due to cognitive ability	0.166*** (0.0257)	0.0896*** (0.0155)	0.154*** (0.0256)	0.0950*** (0.0156)
Change due to occupation	0.0638*** (0.0167)	0.0301* (0.0153)	0.0582*** (0.0161)	0.0290* (0.0145)
Change due to non-cognitive ability			0.0448*** (0.0102)	0.0300* (0.0138)
b) Some College				
Total Change in returns	0.374*** (0.0433)	0.204*** (0.0308)	0.417*** (0.0452)	0.237*** (0.0355)
[1em] Change due to cognitive ability	0.229*** (0.0358)	0.111*** (0.0199)	0.213*** (0.0356)	0.118*** (0.0200)
Change due to occupation	0.145*** (0.0323)	0.0929*** (0.0252)	0.129*** (0.0316)	0.0899*** (0.0240)
Change due to non-cognitive ability			0.0742*** (0.0167)	0.0293 (0.0191)
c) College degree				
Total Change in returns	0.566*** (0.0534)	0.366*** (0.0387)	0.595*** (0.0540)	0.425*** (0.0407)
Change due to cognitive ability	0.300*** (0.0454)	0.187*** (0.0289)	0.280*** (0.0453)	0.198*** (0.0287)
Change due to occupation	0.266*** (0.0443)	0.179*** (0.0314)	0.249*** (0.0437)	0.171*** (0.0304)
Change due to non-cognitive ability			0.0657*** (0.0135)	0.0561*** (0.0163)
<i>N</i>	2898	2093	2898	2093

Table 9: Decomposing the change in returns to education.

	Partial Specification			Full Specification		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	-0.108** (0.0399)	-0.168** (0.0586)	-0.197** (0.0749)	-0.101* (0.0435)	-0.177** (0.0631)	-0.166* (0.0769)
Change due to Cognitive Ability	-0.0741* (0.0322)	-0.115** (0.0429)	-0.109 (0.0593)	-0.0579 (0.0320)	-0.0931* (0.0426)	-0.0789 (0.0592)
Change due to Occupation	-0.0338 (0.0255)	-0.0531 (0.0455)	-0.0871 (0.0609)	-0.0292 (0.0243)	-0.0404 (0.0439)	-0.0779 (0.0598)
Change due to Non-Cognitive Ability				-0.0137 (0.0189)	-0.0436 (0.0271)	-0.00882 (0.0239)
<i>N</i>	4991	4991	4991	4991	4991	4991

## Alternative Specifications

### Hourly Pay

Table 10: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.284** (0.0941)	0.225*** (0.0197)	0.120** (0.0391)	0.178 (0.0950)	0.0943*** (0.0204)	0.0455 (0.0388)
Some College	0.457*** (0.114)	0.413*** (0.0355)	0.272*** (0.0586)	0.230 (0.120)	0.192*** (0.0379)	0.119* (0.0582)
College Graduate	0.773*** (0.125)	0.508*** (0.0249)	0.431*** (0.0428)	0.398** (0.142)	0.167*** (0.0313)	0.162** (0.0504)
Cognitive ability				0.0369 (0.0413)	0.0986*** (0.0108)	0.0525*** (0.0128)
Professional, Technical & Kindred				0.614*** (0.145)	0.302*** (0.0367)	0.234*** (0.0443)
Managers, Officials & Proprietors				0.697*** (0.173)	0.268*** (0.0376)	0.300*** (0.0473)
Clerical & Kindred				0.435* (0.185)	-0.179*** (0.0486)	-0.246*** (0.0438)
Sales Workers				0.584** (0.205)	0.248*** (0.0628)	-0.0450 (0.0490)
Service Workers				-0.102 (0.196)	-0.258*** (0.0356)	-0.204*** (0.0430)
Farm Workers				0.702* (0.311)	-0.389*** (0.0808)	-0.148 (0.150)
<i>N</i>	1242	4403	2555	1242	4398	2554

Table 11: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.106*** (0.0295)	0.131*** (0.0107)	0.0735*** (0.0153)
Change due to cognitive ability	0.0198 (0.0198)	0.0906*** (0.00871)	0.0462*** (0.0116)
Change due to occupation	0.0865*** (0.0230)	0.0407*** (0.00686)	0.0272* (0.0109)
b) Some College			
Total Change in returns	0.227*** (0.0503)	0.221*** (0.0164)	0.153*** (0.0220)
Change due to cognitive ability	0.0386 (0.0384)	0.131*** (0.0127)	0.0558*** (0.0142)
Change due to occupation	0.189*** (0.0360)	0.0907*** (0.0122)	0.0969*** (0.0187)
c) College degree			
Total Change in returns	0.375*** (0.0711)	0.342*** (0.0184)	0.268*** (0.0285)
Change due to cognitive ability	0.0487 (0.0484)	0.163*** (0.0150)	0.0898*** (0.0219)
Change due to occupation	0.326*** (0.0574)	0.179*** (0.0152)	0.179*** (0.0232)
<i>N</i>	1242	4398	2554

Table 12: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.0275 (0.0241)	-0.00398 (0.0381)	-0.0305 (0.0501)	-0.0563** (0.0196)	-0.0694* (0.0288)	-0.0749* (0.0343)
Change due to Cognitive Ability	0.0730*** (0.0175)	0.0960*** (0.0291)	0.120*** (0.0361)	-0.0425** (0.0149)	-0.0724*** (0.0197)	-0.0706** (0.0266)
Change due to Occupation	-0.0455** (0.0173)	-0.100*** (0.0278)	-0.150*** (0.0406)	-0.0138 (0.0133)	0.00296 (0.0227)	-0.00437 (0.0278)
<i>N</i>	5640	5640	5640	6952	6952	6952

Alternate age range of 21-35

Table 13: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.192** (0.0618)	0.483*** (0.0575)	0.370*** (0.0461)	0.162* (0.0631)	0.265*** (0.0587)	0.255*** (0.0460)
Some College	0.306*** (0.0690)	0.722*** (0.0773)	0.562*** (0.0626)	0.233** (0.0785)	0.380*** (0.0798)	0.383*** (0.0636)
College Graduate	0.420*** (0.0686)	0.842*** (0.0792)	0.718*** (0.0504)	0.270** (0.0840)	0.373*** (0.0813)	0.388*** (0.0576)
Cognitive ability				0.0330* (0.0151)	0.185*** (0.0249)	0.102*** (0.0149)
Professional, Technical & Kindred				0.167** (0.0567)	0.319*** (0.0673)	0.103 (0.0532)
Managers, Officials & Proprietors				0.239** (0.0773)	0.729*** (0.0819)	0.472*** (0.0592)
Clerical & Kindred				-0.295* (0.139)	-0.201* (0.102)	-0.342*** (0.0601)
Sales Workers				0.0905 (0.0757)	-0.00754 (0.161)	-0.0472 (0.0571)
Service Workers				-0.268** (0.0880)	-0.610*** (0.119)	-0.380*** (0.0467)
Farm Workers				-0.173* (0.0800)	-0.205 (0.154)	-0.143 (0.177)
<i>N</i>	2692	5387	2883	2692	5387	2883

Table 14: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.0302* (0.0124)	0.218*** (0.0196)	0.114*** (0.0168)
Change due to cognitive ability	0.0175* (0.00822)	0.167*** (0.0177)	0.0864*** (0.0128)
Change due to occupation	0.0127 (0.00981)	0.0508*** (0.0115)	0.0280* (0.0118)
b) Some College			
Total Change in returns	0.0729*** (0.0219)	0.342*** (0.0302)	0.179*** (0.0251)
Change due to cognitive ability	0.0319* (0.0147)	0.237*** (0.0253)	0.109*** (0.0168)
Change due to occupation	0.0411* (0.0178)	0.106*** (0.0216)	0.0698*** (0.0206)
c) College degree			
Total Change in returns	0.149*** (0.0328)	0.469*** (0.0340)	0.330*** (0.0318)
Change due to cognitive ability	0.0447* (0.0206)	0.275*** (0.0285)	0.174*** (0.0239)
Change due to occupation	0.104*** (0.0289)	0.194*** (0.0279)	0.156*** (0.0266)
<i>N</i>	2692	5387	2883

Table 15: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.189*** (0.0260)	0.271*** (0.0407)	0.323*** (0.0532)	-0.104*** (0.0309)	-0.166*** (0.0467)	-0.141* (0.0586)
Change due to Cognitive Ability	0.150*** (0.0203)	0.206*** (0.0305)	0.232*** (0.0375)	-0.0815** (0.0257)	-0.129*** (0.0347)	-0.103* (0.0458)
Change due to Occupation	0.0389* (0.0175)	0.0649* (0.0307)	0.0917* (0.0453)	-0.0227 (0.0193)	-0.0378 (0.0355)	-0.0380 (0.0481)
<i>N</i>	8079	8079	8079	8270	8270	8270

Alternate age range of 25-30

Table 16: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.136 (0.0832)	0.622*** (0.0708)	0.333*** (0.0577)	0.124 (0.0805)	0.413*** (0.0717)	0.219*** (0.0577)
Some College	0.327*** (0.0894)	0.918*** (0.0860)	0.511*** (0.0780)	0.289* (0.113)	0.581*** (0.0900)	0.333*** (0.0795)
College Graduate	0.456*** (0.0827)	1.051*** (0.0761)	0.733*** (0.0616)	0.364** (0.121)	0.556*** (0.0861)	0.397*** (0.0690)
Cognitive ability				0.0267 (0.0229)	0.183*** (0.0270)	0.112*** (0.0194)
Professional, Technical & Kindred				0.104 (0.0860)	0.271*** (0.0632)	0.0811 (0.0562)
Managers, Officials & Proprietors				0.0523 (0.141)	0.517*** (0.0715)	0.367*** (0.0574)
Clerical & Kindred				-0.298 (0.161)	-0.157 (0.106)	-0.236*** (0.0598)
Sales Workers				-0.0514 (0.231)	0.0926 (0.173)	-0.0221 (0.0608)
Service Workers				-0.125 (0.0900)	-0.498*** (0.112)	-0.293*** (0.0523)
Farm Workers				-0.299** (0.109)	-0.644* (0.315)	0.0758 (0.152)
<i>N</i>	2088	4339	2118	2088	4339	2118

Table 17: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.0121 (0.0184)	0.209*** (0.0226)	0.114*** (0.0198)
Change due to cognitive ability	0.0142 (0.0147)	0.165*** (0.0205)	0.0868*** (0.0151)
Change due to occupation	-0.00211 (0.0126)	0.0435*** (0.0122)	0.0274* (0.0135)
b) Some College			
Total Change in returns	0.0374 (0.0386)	0.336*** (0.0357)	0.178*** (0.0286)
Change due to cognitive ability	0.0279 (0.0287)	0.243*** (0.0303)	0.107*** (0.0194)
Change due to occupation	0.00946 (0.0292)	0.0932*** (0.0243)	0.0705** (0.0229)
c) College degree			
Total Change in returns	0.0918 (0.0585)	0.495*** (0.0434)	0.337*** (0.0375)
Change due to cognitive ability	0.0375 (0.0386)	0.302*** (0.0365)	0.184*** (0.0291)
Change due to occupation	0.0542 (0.0504)	0.193*** (0.0341)	0.153*** (0.0299)
<i>N</i>	2088	4339	2118

Table 18: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.197*** (0.0319)	0.299*** (0.0539)	0.403*** (0.0734)	-0.0928* (0.0371)	-0.156** (0.0551)	-0.155* (0.0725)
Change due to Cognitive Ability	0.151*** (0.0262)	0.215*** (0.0422)	0.264*** (0.0534)	-0.0766* (0.0307)	-0.133** (0.0414)	-0.115* (0.0581)
Change due to Occupation	0.0462* (0.0199)	0.0841* (0.0389)	0.139* (0.0611)	-0.0162 (0.0224)	-0.0229 (0.0410)	-0.0401 (0.0570)
<i>N</i>	6427	6427	6427	6457	6457	6457

No Controls

Table 19: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.114 (0.0836)	0.706*** (0.0709)	0.382*** (0.0622)	0.0798 (0.0803)	0.358*** (0.0723)	0.208*** (0.0585)
Some College	0.288*** (0.0740)	0.944*** (0.0855)	0.648*** (0.0805)	0.196* (0.0981)	0.421*** (0.0902)	0.376*** (0.0794)
College Graduate	0.447*** (0.0758)	1.220*** (0.0747)	0.866*** (0.0648)	0.285* (0.111)	0.474*** (0.0852)	0.396*** (0.0686)
Cognitive ability				0.0507 (0.0272)	0.268*** (0.0268)	0.157*** (0.0177)
Professional, Technical & Kindred				0.114 (0.0987)	0.248*** (0.0558)	0.0753 (0.0526)
Managers, Officials & Proprietors				0.194 (0.137)	0.706*** (0.0705)	0.408*** (0.0571)
Clerical & Kindred				-0.287 (0.166)	-0.367** (0.129)	-0.351*** (0.0619)
Sales Workers				-0.00133 (0.229)	0.134 (0.198)	0.0289 (0.0621)
Service Workers				-0.131 (0.0798)	-0.665*** (0.128)	-0.411*** (0.0563)
Farm Workers				-0.294** (0.0913)	-0.351* (0.173)	0.0889 (0.169)
<i>N</i>	2318	4578	2296	2318	4578	2296

Table 20: Decomposing the returns to education due to cognitive ability and occupation.

	(1) Original Cohort	(2) NLSY79	(3) NLSY97
a) High School			
Total Change in returns	0.0341 (0.0192)	0.347*** (0.0258)	0.175*** (0.0229)
Change due to cognitive ability	0.0290 (0.0148)	0.277*** (0.0231)	0.138*** (0.0173)
Change due to occupation	0.00517 (0.0136)	0.0701*** (0.0148)	0.0368* (0.0154)
b) Some College			
Total Change in returns	0.0922* (0.0392)	0.523*** (0.0392)	0.272*** (0.0335)
Change due to cognitive ability	0.0580* (0.0292)	0.387*** (0.0328)	0.176*** (0.0231)
Change due to occupation	0.0342 (0.0302)	0.136*** (0.0273)	0.0951*** (0.0258)
c) College degree			
Total Change in returns	0.162** (0.0583)	0.746*** (0.0454)	0.469*** (0.0399)
Change due to cognitive ability	0.0774* (0.0388)	0.492*** (0.0390)	0.284*** (0.0307)
Change due to occupation	0.0849 (0.0506)	0.253*** (0.0376)	0.186*** (0.0315)
<i>N</i>	2318	4578	2296

Table 21: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.313*** (0.0370)	0.431*** (0.0578)	0.583*** (0.0756)	-0.173*** (0.0439)	-0.252*** (0.0649)	-0.276*** (0.0780)
Change due to Cognitive Ability	0.248*** (0.0297)	0.329*** (0.0451)	0.415*** (0.0559)	-0.139*** (0.0356)	-0.210*** (0.0486)	-0.208*** (0.0625)
Change due to Occupation	0.0649** (0.0232)	0.102* (0.0421)	0.169** (0.0637)	-0.0333 (0.0260)	-0.0412 (0.0463)	-0.0678 (0.0614)
<i>N</i>	6896	6896	6896	6874	6874	6874

## Cognitive ability quantiles

Table 22: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.127 (0.0837)	0.612*** (0.0702)	0.357*** (0.0585)	0.119 (0.0841)	0.383*** (0.0699)	0.240*** (0.0579)
Some College	0.321*** (0.0847)	0.892*** (0.0861)	0.571*** (0.0760)	0.313** (0.0983)	0.514*** (0.0883)	0.366*** (0.0779)
College Graduate	0.455*** (0.0837)	1.085*** (0.0736)	0.791*** (0.0611)	0.418*** (0.106)	0.558*** (0.0834)	0.448*** (0.0681)
Cognitive ability 2nd quartile				0.0893 (0.0554)	0.296*** (0.0637)	0.232*** (0.0408)
Cognitive ability 3rd quartile				-0.0145 (0.0643)	0.350*** (0.0736)	0.177*** (0.0422)
Cognitive ability 4th quartile				-0.165 (0.141)	0.408*** (0.0792)	0.237*** (0.0471)
Professional, Technical & Kindred				0.0780 (0.0797)	0.383*** (0.0593)	0.163** (0.0547)
Managers, Officials & Proprietors				0.0996 (0.141)	0.733*** (0.0706)	0.436*** (0.0564)
Clerical & Kindred				-0.287 (0.158)	-0.254* (0.127)	-0.308*** (0.0618)
Sales Workers				-0.0868 (0.207)	0.160 (0.203)	-0.000488 (0.0640)
Service Workers				-0.0979 (0.0902)	-0.569*** (0.131)	-0.336*** (0.0542)
Farm Workers				-0.344*** (0.0924)	-0.369* (0.165)	0.0898 (0.173)
<i>N</i>	2318	4578	2296	2318	4578	2296

Table 23: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.00880 (0.0173)	0.229*** (0.0242)	0.117*** (0.0203)
[1em] Change due to cognitive ability	0.0118 (0.0102)	0.158*** (0.0214)	0.0804*** (0.0146)
Change due to occupation	-0.00298 (0.0138)	0.0704*** (0.0141)	0.0368* (0.0146)
b) Some College			
Total Change in returns	0.00872 (0.0324)	0.379*** (0.0371)	0.206*** (0.0300)
Change due to cognitive ability	0.00253 (0.0119)	0.221*** (0.0304)	0.0990*** (0.0189)
Change due to occupation	0.00619 (0.0300)	0.158*** (0.0268)	0.107*** (0.0250)
c) College degree			
Total Change in returns	0.0370 (0.0510)	0.527*** (0.0429)	0.343*** (0.0365)
Change due to cognitive ability	-0.00760 (0.0120)	0.244*** (0.0350)	0.137*** (0.0264)
Change due to occupation	0.0446 (0.0491)	0.283*** (0.0363)	0.206*** (0.0309)
<i>N</i>	2318	4578	2296

Table 24: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.219*** (0.0330)	0.369*** (0.0511)	0.492*** (0.0681)	-0.110** (0.0387)	-0.170** (0.0580)	-0.181* (0.0717)
Change due to Cognitive Ability	0.145*** (0.0244)	0.216*** (0.0331)	0.249*** (0.0375)	-0.0765* (0.0308)	-0.119** (0.0411)	-0.104 (0.0542)
Change due to Occupation	0.0739** (0.0229)	0.153*** (0.0418)	0.242*** (0.0622)	-0.0335 (0.0250)	-0.0511 (0.0454)	-0.0772 (0.0602)
<i>N</i>	6896	6896	6896	6874	6874	6874

# A Appendix

## A.1 Correlation with education

Table A1: Correlation between Education level and other covariates.

	Cognitive Skills			Professional & Kindred			Managers & proprietors		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.47*** (0.07)	0.78*** (0.04)	0.77*** (0.07)	0.03** (0.01)	-0.01 (0.01)	0.06*** (0.02)	0.03** (0.01)	0.01 (0.01)	0.01 (0.02)
Some College	0.88*** (0.08)	1.04*** (0.06)	0.8*** (0.1)	0.13*** (0.02)	0.04* (0.02)	0.14*** (0.02)	0.11*** (0.02)	0.08** (0.03)	0.16*** (0.03)
College Grad	1.09*** (0.09)	1.13*** (0.05)	1.26*** (0.08)	0.44*** (0.02)	0.22*** (0.02)	0.11*** (0.02)	0.1*** (0.02)	0.16*** (0.02)	0.29*** (0.03)
Cognitive Ab.				0.06*** (0.01)	0.09*** (0.01)	0.01 (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.06*** (0.01)
	Clerical & Kindred			Sales workers			Service workers		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.02 (0.01)	0.02** (0.01)	0.01 (0.02)	0.03** (0.01)	0.02*** (0.01)	0.02 (0.02)	0.02 (0.01)	0.02 (0.01)	-0.03 (0.03)
Some College	0.04* (0.02)	0.02 (0.01)	0.00 (0.02)	0.08*** (0.02)	0.05** (0.02)	0.01 (0.03)	0.03 (0.02)	0.06** (0.02)	-0.05 (0.04)
College Grad	0.01 (0.02)	0.02 (0.01)	-0.01 (0.02)	0.08*** (0.02)	0.06*** (0.01)	0.03 (0.02)	-0.011 (0.02)	-0.01 (0.02)	-0.13*** (0.03)
Cognitive Ab.	0.01 (0.01)	0.01* (0.00)	0.01* (0.01)	-0.02** (0.01)	0.01** (0.00)	0.00 (0.01)	-0.01 (0.01)	-0.03*** (0.01)	-0.01 (0.01)
	Farm Workers			Labourers & Operatives					
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97			
High School	0.02 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.18*** (0.03)	-0.07*** (0.02)	-0.03 (0.03)			
Some College	0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.44*** (0.03)	-0.27*** (0.03)	-0.2*** (0.05)			
College Grad	0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.63*** (0.03)	-0.4*** (0.02)	-0.33*** (0.04)			
Cognitive Ab.	-0.01 (0.00)	-0.00 (0.00)	-0.01 (0.00)	-0.05*** (0.01)	-0.11*** (0.01)	-0.08*** (0.01)			
<i>N</i>	2517	4638	2517	2517	4638	2517	2517	4638	2517

## A.2 Additional Robustness Checks

I run some additional robustness checks besides those from section 4. Running the regression without any weights only results in changes in the magnitude of the results, the patterns observed in the main results hold for each of these analyses as well. The results are presented in tables A2, A3 and A4.

I also run the analysis from the main regression broken down by race, the results for white (Tables A5-A7) and non-white populations (Tables A8-A10) are different. The change in returns to education, across all education levels when not controlling for cognitive ability and occupation follow the same pattern as the larger sample. There is an increase in returns to education between the original cohort and the NLSY79 and a reduction between the NLSY79 and NLSY97. When controlling for cognitive ability and occupation however the pattern diverges, for the sample of white individuals (Table A5) there is an increase between the Original cohort (0.335) and the NLSY79 (0.457), but unlike the larger sample and the non-white population for the white sub-sample the reduction in the returns to a college degree is small for the NLSY97 (0.444). The returns to cognitive ability also follows the same pattern as the original results, an increase for the NLSY79 followed by a reduction for both race sub samples. The decomposition of the returns to education for the white sub-sample (Table A6) yields similar results to the results for the larger sample for the most part. For those in the Original cohort and NLSY79, cognitive ability is the most important factor that seems to determine the returns to education and the importance of occupation increases with the education level. For the NLSY97 however occupation seems to play a much larger part than for the larger sample, particularly for those with some college and those with a college degree. The pattern for the non-white sub-sample (Table A9) is similar to that in the whole sample, with cognitive ability playing the most important part across education levels and samples, the one exception being the decomposition of the returns to college for those in the NLSY79, where occupation seems to play a particularly large part. I also decompose the changes in returns to education between cohorts (Table A7 and A10), for the original cohort and NLSY79 cohort pair the results are consistent for the main sample and the two race sub samples. However for the NLSY79 NLSY97 cohort pair, the difference in reduction in returns is mostly explained by cognitive ability for the white sub-sample whereas for the non-white sub-sample occupation seems to be the more important factor.

### A.2.1 Unweighted

Table A2: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.167* (0.0683)	0.656*** (0.0612)	0.361*** (0.0555)	0.143* (0.0704)	0.382*** (0.0647)	0.216*** (0.0538)
Some College	0.333*** (0.0784)	0.998*** (0.0793)	0.590*** (0.0713)	0.267** (0.0870)	0.516*** (0.0840)	0.363*** (0.0715)
College Graduate	0.482*** (0.0749)	1.189*** (0.0633)	0.804*** (0.0576)	0.361*** (0.0926)	0.528*** (0.0748)	0.393*** (0.0639)
Cognitive ability				0.0471* (0.0199)	0.232*** (0.0273)	0.134*** (0.0166)
Professional, Technical & Kindred				0.0758 (0.0725)	0.383*** (0.0623)	0.110* (0.0524)
Managers, Officials & Proprietors				0.137 (0.101)	0.719*** (0.0671)	0.403*** (0.0546)
Clerical & Kindred				-0.297* (0.149)	-0.315* (0.141)	-0.272*** (0.0568)
Sales Workers				0.0170 (0.119)	0.0915 (0.149)	-0.0129 (0.0579)
Service Workers				-0.131 (0.0810)	-0.637*** (0.129)	-0.366*** (0.0520)
Farm Workers				-0.341*** (0.0877)	-0.586** (0.192)	0.0916 (0.173)
<i>N</i>	2318	4578	2296	2318	4578	2296

Table A3: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.0242 (0.0167)	0.275*** (0.0251)	0.145*** (0.0204)
Change due to cognitive ability	0.0249 (0.0128)	0.209*** (0.0232)	0.115*** (0.0160)
Change due to occupation	-0.000717 (0.0122)	0.0658*** (0.0139)	0.0301* (0.0136)
b) Some College			
Total Change in returns	0.0658 (0.0336)	0.482*** (0.0414)	0.227*** (0.0309)
Change due to cognitive ability	0.0489* (0.0247)	0.321*** (0.0359)	0.146*** (0.0214)
Change due to occupation	0.0169 (0.0261)	0.161*** (0.0294)	0.0813*** (0.0241)
c) College degree			
Total Change in returns	0.121* (0.0518)	0.661*** (0.0486)	0.411*** (0.0388)
Change due to cognitive ability	0.0666* (0.0334)	0.382*** (0.0415)	0.232*** (0.0294)
Change due to occupation	0.0544 (0.0453)	0.279*** (0.0401)	0.180*** (0.0313)
<i>N</i>	2318	4578	2296

Table A4: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.250*** (0.0360)	0.414*** (0.0596)	0.539*** (0.0806)	-0.128** (0.0390)	-0.252*** (0.0606)	-0.246** (0.0770)
Change due to Cognitive Ability	0.184*** (0.0285)	0.271*** (0.0462)	0.315*** (0.0574)	-0.0924** (0.0331)	-0.172*** (0.0468)	-0.148* (0.0612)
Change due to Occupation	0.0666** (0.0237)	0.144** (0.0443)	0.224** (0.0687)	-0.0355 (0.0232)	-0.0797 (0.0447)	-0.0980 (0.0621)
<i>N</i>	6896	6896	6896	6874	6874	6874

## A.2.2 White only

Table A5: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.121 (0.0929)	0.523*** (0.0823)	0.329*** (0.0685)	0.106 (0.0898)	0.260** (0.0865)	0.213** (0.0688)
Some College	0.307*** (0.0923)	0.819*** (0.0978)	0.527*** (0.0880)	0.268* (0.113)	0.393*** (0.105)	0.305*** (0.0920)
College Graduate	0.434*** (0.0910)	0.978*** (0.0843)	0.751*** (0.0711)	0.357** (0.122)	0.400*** (0.100)	0.406*** (0.0807)
Cognitive ability				0.0384 (0.0249)	0.197*** (0.0356)	0.0948*** (0.0225)
Professional, Technical & Kindred				0.0433 (0.0898)	0.268*** (0.0650)	0.150* (0.0626)
Managers, Officials & Proprietors				0.0802 (0.144)	0.685*** (0.0711)	0.430*** (0.0666)
Clerical & Kindred				-0.303 (0.171)	-0.290* (0.143)	-0.363*** (0.0786)
Sales Workers				-0.0809 (0.212)	0.0927 (0.220)	0.0227 (0.0755)
Service Workers				-0.0567 (0.0995)	-0.604*** (0.161)	-0.286*** (0.0682)
Farm Workers				-0.345*** (0.0954)	-0.338 (0.180)	0.0892 (0.187)
<i>N</i>	1986	3052	1451	1986	3052	1451

Table A6: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.0149 (0.0210)	0.263*** (0.0286)	0.116*** (0.0257)
Change due to cognitive ability	0.0206 (0.0157)	0.200*** (0.0254)	0.0772*** (0.0184)
Change due to occupation	-0.00574 (0.0158)	0.0634*** (0.0174)	0.0387* (0.0187)
b) Some College			
Total Change in returns	0.0383 (0.0420)	0.426*** (0.0435)	0.222*** (0.0378)
Change due to cognitive ability	0.0394 (0.0297)	0.284*** (0.0363)	0.0922*** (0.0227)
Change due to occupation	-0.00110 (0.0337)	0.142*** (0.0315)	0.130*** (0.0328)
c) College degree			
Total Change in returns	0.0774 (0.0620)	0.578*** (0.0498)	0.345*** (0.0460)
Change due to cognitive ability	0.0539 (0.0405)	0.344*** (0.0424)	0.156*** (0.0349)
Change due to occupation	0.0236 (0.0544)	0.234*** (0.0402)	0.188*** (0.0374)
<i>N</i>	1986	3052	1451

Table A7: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.246*** (0.0388)	0.385*** (0.0615)	0.499*** (0.0797)	-0.145** (0.0483)	-0.202** (0.0716)	-0.230** (0.0855)
Change due to Cognitive Ability	0.176*** (0.0311)	0.241*** (0.0474)	0.286*** (0.0589)	-0.120** (0.0379)	-0.189*** (0.0499)	-0.184** (0.0677)
Change due to Occupation	0.0695** (0.0262)	0.144** (0.0468)	0.214** (0.0675)	-0.0248 (0.0315)	-0.0132 (0.0570)	-0.0459 (0.0682)
<i>N</i>	5038	5038	5038	4503	4503	4503

### A.2.3 Non-White only

Table A8: Returns to education and cognitive ability across cohorts.

	Partial specification			Full Specification		
	Original Cohort	NLSY79	NLSY97	Original Cohort	NLSY79	NLSY97
High School	0.107 (0.126)	0.853*** (0.134)	0.436*** (0.109)	0.0918 (0.127)	0.633*** (0.134)	0.239* (0.102)
Some College	0.309* (0.156)	1.117*** (0.210)	0.688*** (0.149)	0.316 (0.165)	0.660** (0.214)	0.454*** (0.135)
College Graduate	0.734*** (0.139)	1.564*** (0.147)	0.926*** (0.114)	0.630*** (0.181)	0.789*** (0.167)	0.363** (0.124)
Cognitive ability				-0.0216 (0.0760)	0.245*** (0.0547)	0.205*** (0.0293)
Professional, Technical & Kindred				0.0311 (0.217)	0.753*** (0.172)	0.105 (0.112)
Managers, Officials & Proprietors				0.381 (0.247)	0.947** (0.314)	0.310** (0.102)
Clerical & Kindred				-0.220 (0.289)	-0.114 (0.269)	-0.226* (0.0941)
Sales Workers				0.396 (0.436)	0.642* (0.324)	0.0185 (0.105)
Service Workers				-0.338* (0.172)	-0.383 (0.220)	-0.442*** (0.0849)
Farm Workers				-0.927 (0.482)	-0.742 (0.397)	0.342 (0.243)
<i>N</i>	332	1526	845	332	1526	845

Table A9: Decomposing the returns to education due to cognitive ability and occupation.

	(1)	(2)	(3)
	Original Cohort	NLSY79	NLSY97
a) High School			
Total Change in returns	0.0150 (0.0347)	0.220*** (0.0411)	0.197*** (0.0381)
Change due to cognitive ability	-0.00622 (0.0143)	0.151*** (0.0368)	0.177*** (0.0309)
Change due to occupation	0.0212 (0.0335)	0.0685** (0.0222)	0.0207 (0.0224)
b) Some College			
Total Change in returns	-0.00693 (0.0720)	0.457*** (0.0761)	0.235*** (0.0567)
Change due to cognitive ability	-0.0219 (0.0492)	0.264*** (0.0643)	0.234*** (0.0439)
Change due to occupation	0.0149 (0.0601)	0.193*** (0.0531)	0.00125 (0.0357)
c) College degree			
Total Change in returns	0.104 (0.139)	0.775*** (0.106)	0.563*** (0.0733)
Change due to cognitive ability	-0.0275 (0.0617)	0.336*** (0.0795)	0.363*** (0.0532)
Change due to occupation	0.132 (0.133)	0.439*** (0.0944)	0.201*** (0.0598)
<i>N</i>	332	1526	845

Table A10: Decomposing the change in returns to education.

	NLSYOC-NLSY79			NLSY79-NLSY97		
	High School	Some College	College Graduate	High School	Some College	College Graduate
Total Change in returns	0.205* (0.0858)	0.454** (0.163)	0.641* (0.292)	-0.0150 (0.0704)	-0.210 (0.110)	-0.202 (0.165)
Change due to Cognitive Ability	0.157** (0.0525)	0.280* (0.119)	0.353* (0.145)	0.0298 (0.0610)	-0.0237 (0.0899)	0.0318 (0.121)
Change due to Occupation	0.0478 (0.0673)	0.173 (0.126)	0.288 (0.276)	-0.0449 (0.0384)	-0.186** (0.0707)	-0.234 (0.141)
<i>N</i>	1858	1858	1858	2371	2371	2371