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# Explaining Intergenerational Income Persistence: Non-cognitive Skills, Ability and Education

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## Abstract

The recent literature on intergenerational mobility in the UK has been focused on measuring the level and change in the relationship between parental income and children's earnings as adults among recent cohorts. This paper is the first to analyse in detail the factors that generate these links. The paper seeks to account for the level of income persistence in the 1970 BCS cohort and also to explore the decline in mobility in the UK between the 1958 NCDS cohort and the 1970 cohort. The mediating factors considered are childhood health, cognitive skills, non-cognitive traits, educational attainment and labour market attachment. We find that these variables together explain slightly more than half of the intergenerational link for men. Changes in the relationships between these variables, parental income and earnings are able to explain three quarters of the rise in intergenerational persistence across the cohorts. The increased persistence in the second cohort comes from an increased influence of parental income in determining educational attainment, especially higher education, and labour market attachment. It is also clear that the stronger relationship between parental income and education comes in part through the growing relationship between parental income and the non-cognitive characteristics that influence education outcomes.

**Keywords:** J62, I2, D31

**JEL Classification:** Intergenerational Mobility, Earnings, Family Income, Education

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## 1. Introduction

Intergenerational mobility is concerned with the relationship between the socio-economic status of parents (often their income or social class) and the socio-economic outcomes of their children as adults. A strong association between incomes across generations indicates weak intergenerational income mobility, and may mean that those born to poorer parents do not achieve their economic potential and have restricted life chances. Recent innovations in research on intergenerational mobility have been concentrated on improving the measurement of the extent of intergenerational mobility, and making comparisons across time and between nations.

The evidence for the UK suggests that intergenerational mobility fell when comparisons are made between the 1958 NCDS and the 1970 BCS birth cohorts (see Blanden et al. 2004) and that the level of mobility in the UK is low by international standards (Jantii et al, 2006, Corak, 2006 and Solon, 2002). The aim of this paper is to take this research to the next stage, to describe the mechanisms that lead to the connection between parental income and later earnings. The existing literature signposts a variety of possible avenues for exploration and our intention is to concentrate on evaluating the relative importance of education, ability, non-cognitive (or 'soft') skills and labour market experience in generating intergenerational persistence in the UK and then to consider their importance in explaining its decline. We focus here on men for reasons of brevity and because issues of birth timing and absence from the labour market create substantial additional complications for women.

This paper focuses on transmission mechanisms; those variables that are related to family incomes and that have a return in the labour market. Education is the most obvious of these. It is quite clear that richer children obtain better educational outcomes, and that those with higher educational levels earn more. Education is therefore a prime candidate to explain mobility and changes in it.

Blanden, Gregg and Machin (2005) make a first pass at understanding the fall in intergenerational mobility in the UK by documenting how inequalities in educational attainment by parental income have evolved. The authors find that a strengthening relationship between family income and participation in post compulsory schooling can help to explain part of the fall in intergenerational mobility. This finding, however, raises many further questions as we then need to understand

changes in the mechanisms through which parental income shapes educational attainment.

Cognitive ability determines both educational attainment and later earnings, making it a leading factor in explaining the level and change in intergenerational persistence. We might expect a strong link between parental income and measured ability, both because of biologically inherited intelligence and due to the investments that better off parents can make in the home environment and education of their children. We seek to understand the extent to which differing achievements on childhood tests across income groups, which we see as proxies for ability, can explain differences in earnings both directly and through exam attainment and choices to pursue continued learning.

Galindo-Rueda and Vignoles (2005) investigate the changing influence of ability and family background in determining educational outcomes, focusing on whether young people achieve A-levels. They find that the role of early ability scores has declined in importance while family background has become a more important determinant of educational success. If ability has become a less important determinant of education, this raises the question of what is driving the increased relationship between family background and educational attainment.

A growing literature highlights that a variety of non-cognitive personality traits and personal characteristics earn rewards in the labour market and influence educational attainment and choices (see Heckman and Rubenstein, 2001, Heckman, Stixrud and Urzua, 2006, Bowles, Gintis and Osborne, 2001 and Carneiro, Crawford and Goodman (2006)). For example, Feinstein (2000) uses the 1970 cohort to investigate the impact of non-cognitive skills measured at age 10 on earnings at age 26. He finds self-esteem to be particularly important in determining earnings for males while a high locus of control score (a measure of personal efficacy) is particularly good at predicting labour market success for women.

In contrast to ability and education, few economics studies have explicitly considered the impact of family background on determining non-cognitive traits. The ethnographic research included in Lareau (2003) looks in details at how children's upbringings vary by different class backgrounds. She contrasts the 'concerted cultivation' approach of middle class parents with the 'accomplishment of natural growth' approach of parents in other social groups and discusses how the middle class approach of proving many activities for children and continual parent-child

negotiation allows these children to cultivate the social skills that enable them to perform better in later life, even though they may not be happier or more well-adjusted as children.

The quantitative study closest to our aims is Osborne-Groves (2005). In this study the author looks directly at the role of personality transmissions from father to son in explaining the intergenerational persistence of income. Using a locus of control score as her measure of personality, the author finds that 11 percent of the father-son correlation in earnings can be explained by the link between personalities alone. The author compares this with studies from the literature showing that the inheritance of IQ can explain between 4 and 11 percent of the intergenerational correlation.

The main objective of this paper is to consider how cognitive skills, non-cognitive skills and educational attainment shape the observed patterns of intergenerational mobility. We also take the opportunity to review the impact of some additional variables. Black, Devereux and Salvanes (2005) demonstrate the important influence of birth weight on children's development in Norway while Perisco, Postlewaite and Silverman (2004) describe the positive earnings premium to being tall and of having tall parents. We therefore explore the relationships between birth weight and childhood height, parental income and later earnings, to see the extent to which these measures of child health can provide any insight into intergenerational persistence. Finally, labour market experience and employment interruptions have long been found to influence earnings (see Faber, 1993 and Stevens 1997). Gregg and Tominey (2005) highlight, in particular, the negative impacts of spells of unemployment as young adults; we therefore analyse measures of labour market attachment as further ways in which family background might influence earnings.

Our approach is to build a sequential model where we measure the influence of the health variables, cognitive and non-cognitive traits on earnings. We then show the extent to which this can be explained through their influence on education. Labour market attachment variables form the final stage in the model, so that association between parental income and earnings can feed through from cognitive traits, non-cognitive traits and education to work history, as well as influencing labour market attachment directly.

In the next section we lay out our modelling approach in more detail. Section 3 considers our data, outlining in particular the measures of non-cognitive skills we use and also highlighting the compromises and assumptions that are necessary when

we consider the change in intergenerational mobility. Section 4 presents our results on accounting for the level of intergenerational mobility while Section 5 describes our attempt to understand the change. Section 6 offers conclusions.

## 2. Modelling Approach

The empirical work on intergenerational mobility is generally concerned with the estimation of $\beta$ in the following regression;

$$\ln Y_i^{children} = \alpha + \beta \ln Y_i^{parents} + \varepsilon_i \quad (1)$$

where $\ln Y_i^{children}$ is the log of some measure of earnings or income for adult children, and $\ln Y_i^{parents}$ is the log of income for parents, *i* identifies the family to which parents and children belong and $\varepsilon_i$ is an error term. $\beta$ is therefore the elasticity of children's income with respect to their parents' income and (1-$\beta$) can be thought of as measuring intergenerational mobility[1].

Conceptually, we are interested in the link between the permanent incomes of parents and children across generations. In reality, the measures of income available in longitudinal datasets are likely to refer to current income at a period in time. In some datasets multiple measures of current income can be averaged for parents and children, moving the measure somewhat closer to permanent income. Additionally it is usual to control for the ages of both generations. In the cohort datasets we use substantial measurement error is likely to remain, meaning that our estimates will be biased downwards as measures of intergenerational persistence. The issue of measurement error becomes particularly important when considering the changes in mobility across cohorts and this issue will be returned to below.

As in our previous work we report the intergenerational partial correlation *r*, alongside $\beta$ because differences in the variance of $\ln Y$ between generations will distort the $\beta$ coefficient. This is obtained simply by scaling $\beta$ by the ratio of the standard deviation of parents' income to the standard deviation of sons' income, as shown below.

[1] The regression approach to measuring connections across generations dates back to Galton's (1886) consideration of height. Non-linear measures of mobility are increasingly used and Jantti et al (2006) provides a good discussion of these.

$$r = \text{Corr}_{\ln Y^{parents},\ \ln Y^{son}} = \beta\left(\frac{SD^{\ln Y^{parents}}}{SD^{\ln Y^{son}}}\right) \quad (2)$$

The main objective in this paper is to move beyond the measurement of $\beta$, and indeed *r*, to understand the pathways through which parental income affects children's earnings. The role of non-cognitive skills can be used as an example, assuming for the moment that these are measured as a single index. We can measure the extent to which these skills are related to parental income $Noncog_i = \alpha_1 + \lambda \ln Y_i^{parents} + \varepsilon_{1i}$, and their pay-offs in the labour market $InY_i^{child} = \varpi_1 + \rho Noncog_i + u_{1i}$

This means that the overall intergenerational elasticity can be decomposed into the return to non-cognitive skills multiplied by the relationship between parental income and these skills, plus the unexplained persistence in income that is not transmitted through education.

$$\beta = \rho\lambda + \frac{Cov(u_{1i}, \ln Y_i^{parents})}{Var(\ln Y_i^{parents})} \quad (3)$$

In our analysis we consider non-cognitive skills among a number of mediating factors that generate the link between parental income and children's later earnings. More discussion of the variables used will be included in the next section but in summary the variables are grouped into the following categories:

*Health* – Birth weight and childhood height

*Early years* –Number of years in pre-school education

*Non-cognitive skills* – responses to questions by the mother and teacher about the child's behaviour and temperament.

*Cognitive skills* – Childhood test scores

*Exam results at age 16*

*Participation in post-compulsory schooling* - staying in education past age 16 and 18, number of A-levels obtained and degree achievement.

*Labour market attachment* - proportion of months not in education spent in unemployment and out of the labour force.

As shown above our decomposition approach requires us to estimate the univariate relationships between the variables used and parental income, and then combine these with the returns found for those variables in an earnings equation. We build up the

specifications of our earnings equations gradually, as we believe that many of the associations operate in a sequential way. For example, Heckman, Stixrud and Urzua (2006) show that part of the advantage of higher non-cognitive skills works through enabling children to reach a higher education level. In the previous example we have shown the unconditional influence of non-cognitive skills on intergenerational persistence. To show one route through which non-cognitive skill works through education levels, we can add the exams at 16 variable to the earnings equation.

$$InY_i^{child} = \varpi_2 + \delta Noncog_i + \pi Exam16 + u_{2i} \quad (4)$$

Then estimate the relationship between exams at 16 and parental income.

$$Exam16_i = \alpha_2 + \gamma \ln Y_i^{parents} + \varepsilon_{2i} \quad (5)$$

The conditional decomposition is then:

$$\beta = \delta\lambda + \pi\gamma + \frac{Cov(u_{2i}, \ln Y_i^{parents})}{Var(\ln Y_i^{parents})} \quad (6)$$

Where $\delta\lambda$ is the conditional contribution of non-cognitive skill and $\pi\gamma$ is the contribution of age 16 exam results. Therefore the difference between $\rho\lambda$ and $\delta\lambda$ shows the extent to which the non-cognitive skills contribute to intergenerational persistence by enabling more affluent children to achieve better qualifications at 16.

## 3. Data

We use information from the two publicly accessible mature British cohort studies, the British Cohort Study of those born in 1970 and the National Child Developmentt Study of those born in 1958. Both cohorts began with around 9000 baby boys included, although as we shall see our final samples are considerably smaller than this. We shall first provide a discussion of how we use the 1970 cohort, before considering how the data are used in the comparative section of the paper.

*British Cohort Study*

The BCS included all those born in Great Britain between 4th and 11th April 1970. Information was obtained about the sample members and their families at birth and at age 5, 10, 16 and 30. In the childhood surveys, information was obtained from parents on many topics including information on the child's birth weight and height, the

child's behaviour and personality and the material circumstances of the family. The child's teacher was also asked a number of questions about the child's progress and behaviour in school and tests were administered to measure the child's ability.

Particularly relevant for our purposes is the information obtained about parental income at age 10 and 16; where parents are asked to place their usual total income into the appropriate band (there were seven options at age 10 and eleven at age 16). We generate continuous income variables at each age by fitting a Singh-Maddala distribution to the data using maximum likelihood estimation. This is particularly helpful in allocating an expected value for those in the open top category[2]. We adjust the variable to net measures and impute child benefit for all families.

Earnings information is obtained at age 30, where individuals are asked to provide information on their usual pay. A limitation of the data is that information on self-employment income is poor; consequently, the self-employed are dropped from our analysis.

We combine the items on non-cognitive traits in the way recommended by Osborn and Milbank (1986). In the first part of the analysis we use teacher reports from when the child is age 10, of application, extroversion, clumsiness, hyper-activity and anxiety and mother reports, at age 5, to form the anti-social and neurotic scales. Questions addressed to the children give locus of control and self-esteem measures at age 10 and an anxiety measure at age 16. A fuller description is provided Appendix 1.

Information on cognitive skills is obtained from the English Picture Vocabulary test (EPVT) and a copying test at age 5. At age 10 the child took part in a reading test, maths test and British Ability Scale test (close to an IQ test). Exam results at age 16 were obtained from a follow-up survey fielded after the main age 16 variables were obtained. This includes detailed information on the number of exams passed (both GCE O level and CSE) and the grades obtained. Information on educational achievements beyond age 16 is available from the age 30 sample, as is information on all periods of labour market and educational activity from age 16 to 30. This information is used to generate the measures of labour market attachment[3].

[2] Singh and Madalla (1976). Many thanks to Christopher Crowe for providing his stata program smint.ado which fits Singh-Maddala distributions to interval data.

[3] The data on work histories in both cohorts was cleaned and coded by Fernando Galindo-Rueda, to whom we are grateful.

*Comparative Data on the Two Cohorts*

Some modifications must be made to the variables used when comparing the BCS with the earlier National Child Development Study (NCDS). The NCDS obtains data at birth and ages 7, 11, 16, 23, 33 and most recently at 42. In the NCDS parental income data is available only at age 16, meaning that the comparative analysis of this data is based only on income at this age. The questions that ask about parental income in the two cohorts are not identical and adjustments must be made to account for differences in the way income is measured (see Blanden, Chapter 4 for full details). Intergenerational parameters for the NCDS are obtained by regressing this parental income measure on earnings at age 33.

The non-cognitive variables pose the greatest difficulty in terms of comparability. In both cohorts, mothers are asked a number of items from the Rutter A scale. We use those that are included in both the NCDS age 11 data and the age 10 BCS data. Principal components analysis is used to form these variables into two scales, similar to the anti-social and anxious variables used in the BCS at age 5. These are referred to here as the Rutter externalising and Rutter internalising scales.

The teacher variables in the NCDS are based on the Bristol Social Adjustment Scale, which produce scores for 11 different behavioural "syndromes". These are discussed in more detail in Appendix 1. It is extremely difficult to know how to begin to match up the NCDS Bristol Social Adjustment Scale variables with what is available from the BCS. We use the scales derived from the teacher variables at age 10 in the BCS alongside the BSAS variables from age 11 for the NCDS, while admitting that these may not be comparable. We have no self-reported measures in the NCDS, so do not use these in the comparative analysis.

For cognitive skills; reading, maths and general ability scores at age 11 are broadly comparable with the reading, maths and British ability scale scores in the BCS. These were also the variables used in the comparative study of the importance of ability by Galindo-Rueda and Vignoles (2005). Information on exam results at 16 and 18 (if applicable) is obtained from a survey of all schools attended by the cohort members carried out in 1978. Unfortunately somewhat less detail is obtained concerning the grades obtained in individual subjects than is available for the BCS cohort so scores on Maths and English O level or CSE are added together and used as the measure of exam success at age 16 (i.e. a grade A is allocated five points, a B four points etc). Information on later education attainments is derived from the age 23 and

33 surveys for the NCDS, and the data on labour market attachment is taken from the work history information collected in the age 33 and 42 surveys.

*Attrition and Item Non-response*

Both cohorts may have begun with 9000 sons but attrition and missing information on parental income and earnings in the early thirties means that the final samples used in the intergenerational analysis presented is around 3400 for the BCS data using information on income at 10 and 16 (if one income measure is missing we use the income observation that is available and identify this using missing dummies). However, only around 2000 sons are available for each cohort in the comparative analysis. If the losses in sample are purely random then we need not be concerned, however systematic attrition and non-response can lead to biased coefficients, and if it differs, potentially misleading results on changes across the cohorts. Blanden (2005, Appendix) considers the issue of sample selection in the data used here. For the BCS in particular, it appears that the selections made result in a sample that has higher parental status and better child outcomes than the full sample. However, there is no evidence to suggest that this is artificially generated the increase in coefficients across the cohorts.

## 4. Accounting for Intergenerational Persistence

*Estimates of Intergenerational Persistence*

Table 1 details the estimates of intergenerational mobility that we attempt to understand in the first part of this paper, providing the intergenerational coefficient and the intergenerational partial elasticity. The estimates presented are conditional on average parental age and age-squared and the coefficients is .32 while the partial correlation is a little smaller at 0.27.

*Descriptive Statistics*

Table 2 provides means, standard deviations and the number of non-missing observations for all the variables used in our analysis of sons in the 1970 cohort. First we present the means and standard deviations for the income and earnings variables used to estimate mobility. A notable feature here is the variance of family income is considerably wider than the variance of sons' earnings. This is to be

expected given that income is the sum of several parts, including both parents' earnings. This emphasises once again the importance of bearing in mind the partial correlation even though our analysis is focused on the coefficient $\beta$.

The non-cognitive and cognitive variables have all been scaled to have a mean of 0 and a standard deviation of 1 in the full population of valid observations. This enables us to see how the means and variances change when we make the selections to obtain our intergenerational sample. Previous analysis in Blanden (2005) showed that the intergenerational sample is somewhat more advantaged than all observations, and this can be seen here for the cognitive scores. However, there is only limited evidence that this is the case for the non-cognitive variables, as variables have both positive and negative means and the standard deviations are generally close to 1.

The education variables show that individuals in the sample obtain on average 5 O-levels at A-C, and slightly less than 1 A-level. 44 percent stay on at school beyond age 16, with more than 20 percent continuing their education beyond age 18 and with most of these going on to achieve a degree.

*Decomposing Intergenerational Persistence*

The first stage in understanding which mediating factors are leading to the intergenerational persistence is to review which of them has a relationship with parental income, as without this link they cannot play a role in our explanation. The first column of Table 3 provides the results for sons from regressions of each variable on parental income, conditional on parental age, as in the intergenerational regression. With the exception of the mother's neurotic rating at age 5 all the variables we have chosen as possible mediating factors are strongly related to parental income. Better off children are heavier at birth, get more pre-school education, are taller, have better non-cognitive traits (whether recorded by teachers or mothers), and perform better in all cognitive tests. As they grow up they achieve more at all levels of education and have greater labour market attachment in their teens and 20s.

Our results show that the cognitive variables have stronger associations with parental income than the non-cognitive variables. Application and locus of control have the strongest association with parental income among the non-cognitive variables, and for these variables the magnitude of this association, at 0.3 is similar to

the 0.3-0.4 coefficients found for the cognitive variables. For any factor to be influential in describing intergenerational correlations, it must be both related to family background and have significant rewards in the labour market. The next stage therefore is to see if these variables also have returns to earnings for the sons at age 30. The remainder of Table 3 shows how we build a sequential picture through the earnings equations, showing how the early measures of health, education and skills impact on earnings though later education and labour market attachment.

The first two specifications of the earnings equations compare the predictive power of the cognitive test variables with those for non-cognitive indices. Health measures and years of pre-school education are entered in both specifications. The explanatory power of these two specifications is identical with R-squared of 0.10; a slightly larger group of non-cognitive skills are equally as good as cognitive skills in predicting later earnings. When both sets of variables are included in regression (3) the explanatory power of the model increases only marginally, implying that the two sets of variables are predicting much of the same thing[4].

The strongest association with earnings among the cognitive variables are for copying at age 5 and maths at age 10. The results suggest that a standard deviation increase in the copying score at age 5 is associated with 4.2% increase in earnings, whilst for the maths score this is 5.4%. The application and locus of control scores at age 10 and anxiety at age 16 have the largest earnings returns among the non-cognitive variables, at 4.7%, 3.0% and -3.4% respectively extra earnings associated with a one standard deviation increase[5].

Specification (4) adds the number of O-levels at grades A-C obtained at age 16 to the regression. As would be expected the number of O-levels is a strong predictor of earnings, with each O-level associated with a 3.5 percent increase in earnings[6]. Introducing the O-levels variable reduces the strength of the coefficients for the non-cognitive variables. This suggests that these non-cognitive skills are affecting earnings by helping children achieve more at age 16. The most strongly affected term

[4] This is perhaps not that surprising given that, for example, locus of control has a correlation with the maths score of 0.39, whilst application has a correlation with the maths score of 0.46.
[5] We have experimented with non-linear functions of the non-cognitive scales, but found that using these did not improve the fit of the model.
[6] An O-level score variable was also tested to see if there was a pay off attached to achieving an improved grade. This was found to be positive and significant although not as effective a measure as the number of O-levels grade A-C proved to be.

is the application score, which picks up concentration span; this becomes insignificant. However, the locus of control, clumsiness, anxiety and extrovert scores remain significant predictors of earnings. As we might expect, the important of the early cognitive variables also diminish as education variables are introduced.

Specification (5) introduces further educational attainment measures; participation beyond ages 16 and 18, the number of A-levels achieved and whether or not a degree is obtained. When these variables are added, the coefficient for the number of O-levels is reduced by around a half, demonstrating that a large part of the return to O-levels is due to opening up access to these higher levels of educational attainment. The return to having a degree is 15 percent for males (given the number of O- and A-levels achieved). The measures capturing post-16 education make only a marginal further difference to the estimated impact of both the cognitive and non-cognitive scores. This implies that these scores do not predict the likelihood of pursuing A-levels or a degree given age 16 attainment. We explore this more formally below.

In the final specification we add measures of labour market attachment. These variables are clearly explaining a significant part of the variation in earnings at thirty, with all coefficients significant and large in magnitude. Just under a quarter experience some unemployment and this group spend around 10% (19 months) of the time between leaving full-time education and age 30 in unemployment. These men on average have 12% lower wages when compared to those with no unemployment. It is interesting to note that labour market attachment is not strongly related to the cognitive and non-cognitive variables, given education attainment, as there is little change in the remaining significant non-cognitive variables when the labour market attachment variables are introduced.

We undertook a number of robustness checks for the final specification to assess whether we had omitted any substantive available information. We included measures of parental interest in the child's education and a large number of family background measures that may be acting as additional routes through which intergenerational mobility may be occurring (including breast-feeding, maternal depression, mothers' and fathers' education, fathers' social class and family structure). Collectively these measures added little to the model. Full results are included as Appendix 2.

Table 3 has shown that the cognitive, non-cognitive, education and labour market variables all have significant relationships with parental income. These variables also have an important relationship with earnings, either directly or indirectly through education. We bring these observations together in the decomposition results shown in Table 4 and they are illustrated graphically in Figure 1. The overall persistence of income can therefore be decomposed by multiplying each variable's coefficient in the earnings equations by its relationship with family income (from equation 1). These can be summed across groups of variables to give the explained component attributable to different transmission mechanisms. In addition, the correlation between the residual of the earnings equations and family income is interpreted as the unexplained component.

In Table 4 specifications 1 and 2 show that when the non-cognitive and cognitive variables are included separately we can explain respectively 0.07 points (22 percent) and 0.09 (27 percent) of the 0.32 intergenerational persistence estimate. When the two sets of variables are included in specification (3) the total explained persistence only rises to 0.10 (30 percent), reflecting that cognitive and non-cognitive scores strongly overlap. In this specification the total non-cognitive effect is 0.035 (11 percent), whilst the total cognitive effect is 0.059 (19 percent) indicating that cognitive measures explain a somewhat larger proportion of intergenerational mobility. Years of pre-school education and childhood health contribute little to the model. The contribution of these variables remains small if these measures are entered on their own (allowing them to explain intergenerational persistence through cognitive and non-cognitive attainments). The amount of time spent in early years education is therefore not a substantive contributor to intergenerational persistence.

The introduction of the number of O-levels achieved raises the persistence explained to nearly 40 percent. This variable alone explains 21 percent of the persistence for males, whilst the introduction of the post-compulsory education measures adds an additional 5 percent to the total explained persistence. Thus these summary measures of educational attainment and participation account for almost 30 percent of intergenerational mobility. The introduction of the labour market attachment variables in specification (6) takes the explained part of $\beta$ to over half (53 percent), with ten percent working through these labour market attachment variables.

Cognitive and non-cognitive measures are each responsible for just 6% of the intergenerational persistence given education and labour market attachment. Yet, it appears that these measures will be substantively driving attainment. The decline in the importance of these terms as we introduce measures of attainment and attachment can be seen as capturing the routes through which cognitive and non-cognitive test scores are operating.

Table 5 shows this in a different way by dividing up the unconditional impact of these variables by the routes that they take to affect earnings. Table 5 shows how the amount of persistence explained by each variable passes through the model. Column 1 repeats the results from Table 4 column 3 before we introduce measures of educational attainment and labour market attachment. Column 2 shows the direct component not associated with attainment or attachment, as in column 6 of Table 3. Columns 3 to 6 explains why the first two columns differ, showing how the variables work through each educational stage and through labour market attachment. To give some examples, the maths and application scores at age 10 are largely explained by their impact on O level attainment, while the better part of the impacts of the copying and locus of control scores do not operate through the routes highlighted.

## 5. Explaining the Decline in Intergenerational Mobility

*Estimates of the Change in Intergenerational Mobility*

Table 6 provides estimates of the change in intergenerational mobility for sons between the 1958 and 1970 cohorts. For sons born in 1958, the elasticity of own earnings with respect to parental income was .205; for sons born in 1970 the elasticity was .291. This is a clear and statistically significant growth in the relationship between economic status across generations. For the correlation estimates, the fall in mobility is even more pronounced. The correlation for the 1958 cohort is .166 compared with .286 for the 1970 cohort. The correlation is lower than the elasticity for the 1958 cohort because of the particularly strong growth in income inequality between when the parental income and sons' earnings data was collected. This is understandable when we remember that parental income was collected in 1974 whereas sons' earnings were measured in 1993.

The estimates show clear evidence of a fall in intergenerational mobility. The main concern is that the difference in the results between the two cohorts are a consequence of greater downward bias due to measurement error in the NCDS data compared with the BCS, there is no evidence that this is the case, and as shown in Blanden et al (2004), realistic assumptions about the extent of measurement error lead to no change in the basic finding that mobility has declined[7].

*Descriptive Statistics*

Table 7 provides means, standard deviations and the number of non-missing observations for all the variables used in the comparative analysis. As before, the cognitive and non-cognitive measures are standardised as mean 0, standard deviation 1. Once again our sample disproportionately contains those who tend to have higher cognitive scores. Also illustrated by the descriptive statistics is the sharp improvement between the cohorts in education achievement at age 16, and at all stages beyond this.

*Accounting for the Change in Mobility*

As before, the first stage in explaining mobility is to consider the relationships between family income and the potential intervening variables. These relationships are explored in column 1 of Table 8 for the NCDS and column 1 of Table 9 for the BCS. It is immediately clear that there are fewer significant associations between family income and our explanatory factors in the 1958 cohort compared to the 1970 cohort. The main difference between the Tables is that there are no relationships between family income and the non-cognitive scales in the earlier cohort. As we might expect from previous work, the relationships between family income and educational attainment are weaker in the first cohort too (e.g. Galindo-Rueda and Vignoles, 2005). Our results also show a growing negative association between parental income and the amount of time spent in unemployment[8]. The relationships between childhood test scores and parental income are of a similar magnitude across the cohorts.

[7] The results in Table 7 are reproduced from Blanden (2005, chapter 4) and issues concerned with the robustness of the conclusion that mobility has declined are discussed in greater length there. This chapter is available from Jo Blanden on request.

[8] Table 9 shows a small positive association between parental income and time spent of the labour force, in the NCDS cohort. It should be noted that for the men in this cohort this is a vey rare labour market state.

The first column of the two tables therefore points towards the strengthening influence of family income on non-cognitive traits, education and labour market attachment as an explanation for the fall in mobility shown in Table 6. To confirm this we must look at the relationship between these variables and earnings, a fall in the earnings return to these variables could counteract the stronger relationships with incomes.

The second columns of the Tables show that explanatory power of the health and non-cognitive variables is slightly higher in the NCDS than the BCS, with an R-squared of .079 compared with .059. It is clear that removing some of the non-cognitive variables, particularly locus of control, has a large impact of the ability of non-cognitive variables to predict earnings in the 1970 cohort (in comparison with Table 3). The fewer variables used in the BCS may lead us to expect that we are going to under-estimate the impact of non-cognitive variables in explaining the change in intergenerational mobility. Comparing the individual coefficients shows a mixed pattern, the coefficient on application in the BCS is larger than anything in the NCDS model, but the next four highest coefficients are in the NCDS regression.

The earnings regressions make it clear that the cognitive test scores have greater predictive power for the 1958 cohort than they do for the 1970 cohort. This replicates the results of Galindo-Rueda and Vignoles (2005) that ability has declined in its importance in determining children's outcomes. In the NCDS there is also less evidence that cognitive and non-cognitive scores are predicting the same attainment outcomes, with a marked increase in the R-squared when both sets of variables are added to the regression together. Hence column (3) in both tables shows that cognitive and non-cognitive variables together predict earnings to a much larger extent in the NCDS than they do in the BCS. At first brush, while the measures of cognition at age 10 and the non-cognitive test scores show an increasing association with family income they appear to be declining in their relationship with later earnings.

The education variables also reveal a mixed picture, with an increase in the impact on earnings of exams at age 16 and of degree holding, but a sharp fall in the return to staying on beyond age 16. There is no change in the influence of labour market attachment on earnings. The impact of the interactions between the changes in family income relationships and returns for the change in mobility is not immediately obvious from Tables 8 and 9, and we shall need to turn to the decomposition to show them more clearly.

Tables 10 and 11 provide a detailed breakdown of the contributions made by the different variables for each cohort while Figure 2 provides a pictorial summary. The Tables and Figure make it very clear that our mediating variables are doing a good job of explaining the change in intergenerational mobility. Overall, our most complete models explain broadly similar portions (52%, NCDS and 59%, BCS) of intergenerational persistence. The increase in persistence (fall in mobility) between the two cohorts is 0.086, our model accounts for 0.066, some three quarters of the change. Three factors contribute the bulk of the rise in intergenerational mobility: access to higher education (mainly through a strengthening on the relationship with family income), +0.032 or 37%; labour market attachment (entirely through the strength of the relationship with family income), +0.017 or 20%; and attainment at age 16, +0.01 or 12%. Non-cognitive traits are also increasingly important (again through the strengthening of the relationship with family background) but they operate mainly through educational attainment. This can be seen by comparing columns 3 and 4 for Tables 10 and 11.

The growing imbalance in access to higher education by family background as HE expanded has been noted in a number of other papers, (e.g. Blanden and Machin, 2004 and Glennester, 2002) and here we provide powerful evidence that this imbalance is driving the decline in intergenerational mobility in the UK. Probit models show an increase in the marginal effect of parental income on degree attainment from .160 (.002) to .252 (.002). As we know that obtaining a degree is strongly determined by prior attainment it could be the case that some of this growing income effect reflects growing imbalances in attainment at the O- and A-level stages. We can check this by estimating the relationship between family income and degree conditioning on all measures of non-cognitive skill, test scores and exam achievement. The marginal effects of parental income are reduced, they are .050 (.016) for the NCDS and .102 (.024) for the BCS, with the difference on the borders of significance. This indicates that inequalities earlier in the education system can explain some, but not all, of the growing inequality in degree attainment.

## 6. Conclusion

This paper has explored the role of education, ability, non-cognitive skills and labour market experience in generating intergenerational persistence in the UK. These variables are successful in suggesting how parents with more income produce higher

earning sons. The first part of this paper shows that they explain half of the association between parental income and children's earnings for the 1970 cohort. It is clear that inequalities in achievements at age 16 and in post-compulsory education are extremely important in determining the level of intergenerational mobility. However, the dominant role of education disguises an important role for cognitive and non-cognitive skills in generating persistence. These variables work indirectly through influencing the level of education obtained, but are nonetheless important, with the cognitive variables accounting for 20 percent of intergenerational persistence and non-cognitive variables accounting for 10 percent, when these groups of variables are entered into the model together. Attachment to the labour market after leaving full-time education is also a substantive driver of intergenerational persistence.

The second aim of the paper is to use these variables to understand why mobility has declined between the 1958 and 1970 cohorts. The variables we use are able to explain three quarters of the rise in the intergenerational coefficient, with the increased relationship between family income and education and labour market attachment explains a large part of the change. Once again though, the role of non-cognitive variables is important. In the earlier cohort there was very little relationship between non-cognitive variables and parental income, although there were some associations between these variables and children's later earnings. In the second cohort, parental income had much more impact on non-cognitive scores, and these scores once again impacted on earnings, although as we have seen primarily through enabling children to achieve more in education.

Equality of opportunity is a stated policy goal of the leaders of all major political parties in the UK. The results here suggest that the UK has moved decisively away from that goal through a strengthening of the social gradient associated with educational attainment. This in part stems from the growing importance of non-cognitive factors, and the increased relationship between these variables and parental background. In addition labour market attachment after leaving full-time education through to age 30 has become increasingly related to family background.

In policy terms three areas of attention would seem promising. First, policy could try to close the gap in non-cognitive skills between rich and poor children; our results suggest this should focus on the personal efficacy (the sense that your own actions can make a difference), concentration and anxiety of children from lowincome backgrounds. Such a policy would seem practical through action in primary schools,

pre-school settings and even perhaps as part of Sure Start. Second, continued action to raise attainment of children from less affluent backgrounds at 16 and support for continued learning, especially at A-level and in Higher Education. Finally, our research reveals the importance of ensuring that children from poorer backgrounds get a good start to their careers and do not experience early unemployment. The large fall in youth unemployment since 1992 offers the hope that labour market attachment may have improved and become less strongly associated with family background. Government policy has begun to focus on reducing the number of young NEETs (not in education, employment or training) and it appears that such a policy could have longterm benefits.

**Figure 1: Accounting for the Intergenerational Persistence of Sons Born in 1970**

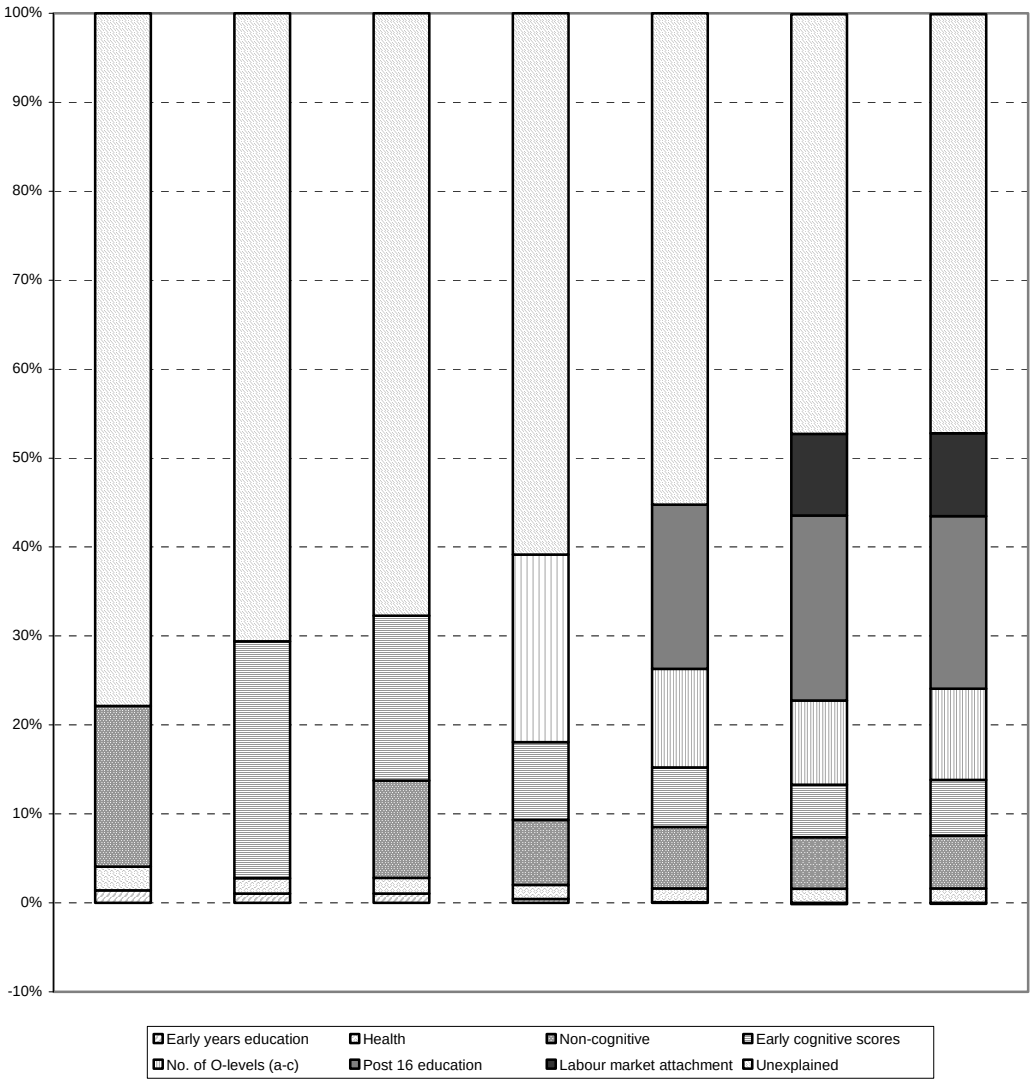

**Figure 2: Accounting for the Change in Intergenerational Persistence**

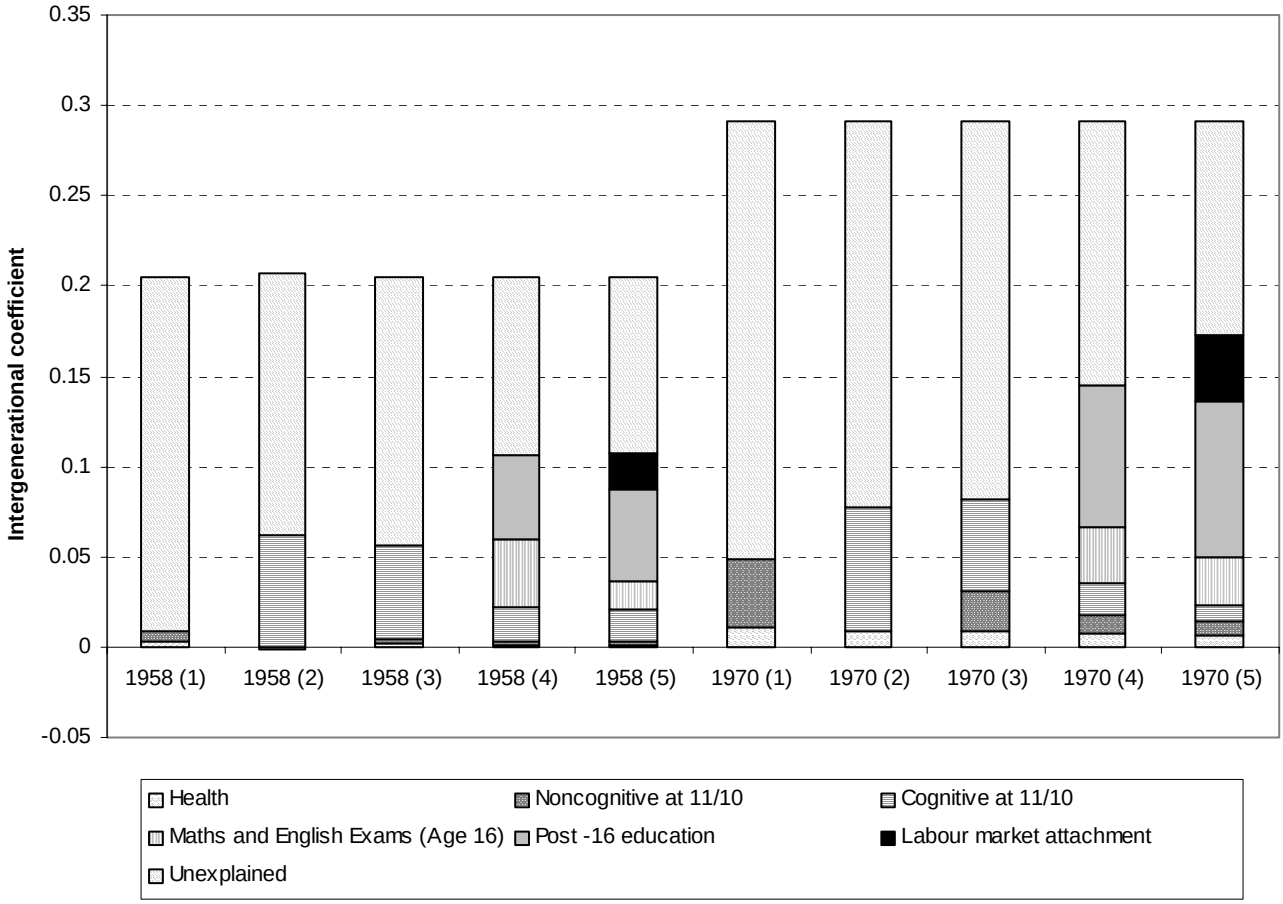

**Table 1: Intergenerational Persistence among Sons in the 1970 Cohort**

| Regression of Earnings at Age 30 on Average Family Income at age 10/16 | | |
|---|---|---|
| $\beta$ | **Partial Correlation (*r*)** | **Sample Size** |
| **0.3204** | **0.2729** | **3340** |
| **(0.0218)** | **(0.0186)** | |

Note: $\beta$ and *r* are from a regression of earnings at age 30 on average parental income at ages 16 and 10. The sample is formed from all those who have a parental income observation at either of these ages, dummy variables are included for those cases where one income report is missing.

**Table 2: Descriptive Statistics for Explanatory Variables (males), 1970 Cohort**

| | Mean (Standard Deviation) | Sample Size |
|---|---|---|
| **Intergenerational** | | |
| **Income Variables** | | |
| Earnings at 30 | £1886.7 (£1249) | 3340 |
| Log earnings 30 | 7.4160 (0.475) | 3340 |
| Family income | £599.14 (£583.1) | 3340 |
| Log fam. income | 5.8876 (1.078) | 3340 |
| **Early years** | | |
| Yrs of pre-sch | 1.9931 (0.649) | 2016 |
| **Health** | | |
| Birthweight (kg) | 3.3779 (0.539) | 3126 |
| Birthweight sq | 11.701(3.599) | 3126 |
| Height 5/10 (10 cm) | 12.483 (0.877) | 3251 |
| **Non-cognitive** | | |
| Anti-social 5 (Mum) | 0.0497 (0.910) | 3340 |
| Neurotic 5 | -0.0369 (0.966) | 2595 |
| Locus control 10 | 0.1267 (0.983) | 2848 |
| Self esteem | 0.1438 (0.950) | 2859 |
| Application 10 | -0.0368 (1.000) | 2500 |
| Clumsy 10 | 0.0522 (1.019) | 2485 |
| Extrovert 10 | 0.0006 (1.001) | 2757 |
| Hyper 10 | 0.1221(1.054) | 2795 |
| Anxious 10 | -0.0805 (0.986) | 2802 |
| Anxious 16 | -0.1550 (0.864) | 2111 |
| **Cognitive Tests** | | |
| IQ 10 | 0.1605 (1.013) | 2669 |
| Epvt 5 | 0.2201 (0.983) | 2694 |
| Copying 5 | 0.1124 (0.996) | 2850 |
| Reading 10 | 0.0945 (0.994) | 2672 |
| Maths 10 | 0.2154 (0.985) | 2676 |
| **O-level** | | |
| No. of O-levels | 4.8897 (3.450) | 2574 |
| **Post 16** | | |
| Stay on post16 | 0.4440 (0.497) | 3338 |
| A-levels | 0.9266 (1.450) | 2248 |
| **Post-18** | | |
| Stay on post18 | 0.2169 (0.412) | 3338 |
| Degree | 0.2374 (0.426) | 3340 |
| **Labour market** | | |
| Proportion of months not in education unemployed | 0.0269 (0.080) | 3340 |
| Proportion of months not in education inactive | 0.1131 (0.144) | 3340 |

Note: Earnings and incomes are monthly equivalents and expressed in 2000 pounds.

## Table 3: Relationships between Explanatory Variables, Earnings and Family Income

| | Family income | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| **Years of pre-sch ed** | **0.12910** | **0.0346** | **0.0256** | **0.0256** | **0.0111** | **0.0016** | **-0.0033** |
| | [0.0212]*** | [0.0162]** | [0.0158] | [0.0160] | [0.0155] | [0.0149] | [0.0147] |
| **Birthweight** | **0.1053** | **0.2559** | **0.1913** | **0.2028** | **0.2214** | **0.2274** | **0.1909** |
| | [0.0218]*** | [0.1300]** | [0.1224] | [0.1215]* | [0.1154]* | [0.0963]** | [0.1025]* |
| **Birthweight sqd** | **0.6808** | **-0.0373** | **-0.0305** | **-0.0319** | **-0.0334** | **-0.034** | **-0.0282** |
| | [0.1455]*** | [0.0195]* | [0.0184]* | [0.0183]* | [0.0175]* | [0.0144]** | [0.0154]* |
| **Height5/10** | **0.1602** | **0.044** | **0.039** | **0.0376** | **0.028** | **0.0264** | **0.0268** |
| | [0.0308]*** | [0.0116]*** | [0.0118]*** | [0.0118]*** | [0.0115]** | [0.0114]** | [0.0112]** |
| **Anti social5** | **-0.2371** | **-0.0287** | | **-0.0149** | **-0.0055** | **-0.0037** | **-0.0008** |
| | [0.0367]*** | [0.0093]*** | | [0.0093] | [0.0090] | [0.0091] | [0.0085] |
| **Neurotic5** | **0.0015** | **0.0214** | | **0.014** | **0.0106** | **0.0074** | **0.0085** |
| | [0.0351] | [0.0098]** | | [0.0096] | [0.0094] | [0.0094] | [0.0089] |
| **Locus of control10** | **0.2946** | **0.0535** | | **0.0297** | **0.0205** | **0.0203** | **0.0203** |
| | [0.0379]*** | [0.0093]*** | | [0.0097]*** | [0.0095]** | [0.0097]** | [0.0092]** |
| **Self esteem10** | **0.2233** | **0.0171** | | **0.0146** | **0.0121** | **0.0092** | **0.0061** |
| | [0.0369]*** | [0.0091]* | | [0.0090] | [0.0088] | [0.0093] | [0.0086] |
| **Application10** | **0.2946** | **0.0843** | | **0.0468** | **0.0208** | **0.018** | **0.0107** |
| | [0.0367]*** | [0.0114]*** | | [0.0118]*** | [0.0118]* | [0.0122] | [0.0111] |
| **Clumsy10** | **-0.1559** | **-0.0346** | | **-0.025** | **-0.0298** | **-0.0329** | **-0.0343** |
| | [0.0374]*** | [0.0104]*** | | [0.0103]** | [0.0101]*** | [0.0103]*** | [0.0095]*** |
| **Extrovert10** | **0.1264** | **0.0197** | | **0.0196** | **0.0211** | **0.0222** | **0.0214** |
| | [0.0403]*** | [0.0101]* | | [0.0100]* | [0.0098]** | [0.0094]** | [0.0094]** |
| **Hyper10** | **-0.1364** | **0.0234** | | **0.018** | **0.016** | **0.0153** | **0.0146** |
| | [0.0408]*** | [0.0108]** | | [0.0107]* | [0.0104] | [0.0106] | [0.0101] |
| **Anxious 10** | **-0.1009** | **0.0077** | | **0.0049** | **0.0026** | **0.0022** | **0.0005** |
| | [0.0393]** | [0.0105] | | [0.0104] | [0.0102] | [0.0100] | [0.0098] |
| **Anxious16** | **-0.0684** | **-0.0397** | | **-0.0338** | **-0.0343** | **-0.0379** | **-0.0286** |
| | [0.0327]** | [0.0140]*** | | [0.0140]** | [0.0136]** | [0.0113]*** | [0.0134]** |
| **IQ** | **0.4314** | | **0.0187** | **0.017** | **0.0087** | **0.0044** | **0.0088** |
| | [0.0408]*** | | [0.0116] | [0.0117] | [0.0115] | [0.0119] | [0.0107] |
| **Epvt5** | **0.3673** | | **0.0171** | **0.0115** | **0.0034** | **0.0059** | **0.0031** |
| | [0.0357]*** | | [0.0097]* | [0.0097] | [0.0095] | [0.0093] | [0.0093] |
| **Copy5** | **0.3829** | | **0.0504** | **0.0421** | **0.0271** | **0.0249** | **0.0223** |
| | [0.0379]*** | | [0.0094]*** | [0.0095]*** | [0.0093]*** | [0.0092]*** | [0.0090]** |
| **Reading10** | **0.4615** | | **0.0322** | **0.0128** | **0.0006** | **-0.0033** | **-0.0015** |
| | [0.0365]*** | | [0.0128]** | [0.0130] | [0.0130] | [0.0135] | [0.0126] |
| **Maths10** | **0.4729** | | **0.0779** | **0.0544** | **0.0262** | **0.0203** | **0.0136** |
| | [0.0361]*** | | [0.0135]*** | [0.0135]*** | [0.0133]** | [0.0138] | [0.0127] |
| **No. of O-levels** | **1.9053** | | | | **0.0355** | **0.0188** | **0.0161** |
| | [0.1210]*** | | | | [0.0029]*** | [0.0036]*** | [0.0036]*** |
| **No. of A-levels** | **0.6339** | | | | | **0.0236** | **0.0277** |
| | [0.0521]*** | | | | | [0.0089]*** | [0.0099]*** |
| **Degree** | **0.2499** | | | | | **0.1474** | **0.1616** |
| | [0.0178]*** | | | | | [0.0248]*** | [0.0244]*** |
| **Staying on post 16** | **0.3301** | | | | | **0.0252** | **0.0178** |
| | [0.0190]*** | | | | | [0.0208] | [0.0195] |
| **Staying on post 18** | **0.2330** | | | | | **-0.0016** | **0.0163** |
| | [0.0172]*** | | | | | [0.0260] | [0.0265] |
| **Time spent unemp** | **-0.0233** | | | | | | **-1.1891** |
| | [0.0040]*** | | | | | | [0.1089]*** |
| **Time spent other** | **-0.0062** | | | | | | **-0.3157** |
| | [0.0058] | | | | | | [0.0590]*** |
| **Observations** | | **3340** | **3340** | **3340** | **3340** | **3340** | **3340** |
| **R-squared** | | **0.10** | **0.10** | **0.12** | **0.17** | **0.20** | **0.24** |

Note: In order to maximise sample size we create dummies for missing values of the explanatory variables and treat these symmetrically. The coefficients on these variables are not included here.

**Table 4: Accounting for the Intergenerational Mobility of Sons Born in 1970**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Years of pre-school education | 0.0045 | 0.0033 | 0.0033 | 0.0014 | 0.0002 | -0.0004 |
| **Sum of pre-school** | **0.0045** | **0.0033** | **0.0033** | **0.0014** | **0.0002** | **-0.0004** |
| Birthweight | 0.0270 | 0.0201 | 0.0214 | 0.0233 | 0.0240 | 0.0201 |
| Birthweight squared | -0.0254 | -0.0208 | -0.0217 | -0.0227 | -0.0231 | -0.0192 |
| Height 5/10 | 0.0070 | 0.0062 | 0.0060 | 0.0045 | 0.0042 | 0.0043 |
| **Sum of health** | **0.0086** | **0.0056** | **0.0057** | **0.0051** | **0.0050** | **0.0052** |
| Anti social 5 | 0.0068 | | 0.0035 | 0.0013 | 0.0009 | 0.0002 |
| Neurotic 5 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Locus of control 10 | 0.0158 | | 0.0087 | 0.0060 | 0.0060 | 0.0060 |
| Self esteem 10 | 0.0038 | | 0.0033 | 0.0027 | 0.0021 | 0.0014 |
| Application 10 | 0.0248 | | 0.0138 | 0.0061 | 0.0053 | 0.0032 |
| Clumsy 10 | 0.0054 | | 0.0039 | 0.0046 | 0.0051 | 0.0053 |
| Extrovert 10 | 0.0025 | | 0.0025 | 0.0027 | 0.0028 | 0.0027 |
| Hyper 10 | -0.0032 | | -0.0025 | -0.0022 | -0.0021 | -0.0020 |
| Anxious 10 | -0.0008 | | -0.0005 | -0.0003 | -0.0002 | -0.0001 |
| Anxious 16 | 0.0027 | | 0.0023 | 0.0023 | 0.0026 | 0.0020 |
| **Sum of non-cognitive** | **0.0579** | | **0.0351** | **0.0234** | **0.0224** | **0.0187** |
| IQ | | 0.0081 | 0.0073 | 0.0038 | 0.0019 | 0.0038 |
| epvt5 | | 0.0063 | 0.0042 | 0.0012 | 0.0022 | 0.0011 |
| copy5 | | 0.0193 | 0.0161 | 0.0104 | 0.0095 | 0.0085 |
| Reading | | 0.0149 | 0.0059 | 0.0003 | -0.0015 | -0.0007 |
| Maths | | 0.0368 | 0.0257 | 0.0124 | 0.0096 | 0.0064 |
| **Sum of early cognitive** | | **0.0853** | **0.0593** | **0.0280** | **0.0217** | **0.0192** |
| No. of O-levels | | | | 0.0676 | 0.0358 | 0.0307 |
| **Sum of O-levels** | | | | **0.0676** | **0.0358** | **0.0307** |
| Stay on post 16 | | | | | 0.0083 | 0.0059 |
| No. of A-level's | | | | | 0.0150 | 0.0176 |
| Stay on post 18 | | | | | -0.0004 | 0.0038 |
| Degree | | | | | 0.0368 | 0.0404 |
| **Sum of post 16** | | | | | **0.0597** | **0.0676** |
| Proportion of time in unemp | | | | | | 0.0277 |
| Proportion of time in other | | | | | | 0.0020 |
| **Labour market** | | | | | | **0.0297** |
| **Observed persistence** | **0.0710** | **0.0943** | **0.1034** | **0.1256** | **0.1449** | **0.1706** |
| **Unobserved persistence** | **0.2495** | **0.2262** | **0.2171** | **0.1949** | **0.1754** | **0.1498** |
| **TOTAL PERSISTENCE** | **0.3204** | **0.3205** | **0.3205** | **0.3205** | **0.3203** | **0.3204** |

Note: The role of the missing dummies for the explanatory variables is accounted for in this Table; this means that the figures shown here cannot be derived from the coefficients provided in Table 3.

**Table 5: Simulation of effect on earnings of cognitive, non-cognitive and health characteristics through education and labour market attachment**

| | Total | Direct | O-levels | Post-16 education | Labour market attachment |
|---|---|---|---|---|---|
| Years of pre-school education | 0.0033 | -0.0003 | 0.0019 | 0.0012 | 0.0006 |
| **Sum of pre-school** | **0.0033** | **-0.0003** | **0.0019** | **0.0012** | **0.0006** |
| Birthweight | 0.0214 | 0.02 | -0.0019 | -0.0007 | 0.0039 |
| Birthweight squared | -0.0217 | -0.0191 | 0.001 | 0.0004 | -0.0039 |
| Height 5/10 | 0.006 | 0.0043 | 0.0015 | 0.0003 | -0.0001 |
| **Sum of health** | **0.0057** | **0.0052** | **0.0006** | **0.0001** | **-0.0002** |
| Anti social 5 | 0.0035 | 0.0002 | 0.0022 | 0.0004 | 0.0007 |
| Neurotic 5 | 0 | 0 | 0 | 0.0000 | 0.0000 |
| Locus of control 10 | 0.0087 | 0.0061 | 0.0027 | 0.0000 | 0.0000 |
| Self esteem 10 | 0.0033 | 0.0014 | 0.0006 | 0.0006 | 0.0007 |
| Application 10 | 0.0138 | 0.0032 | 0.0077 | 0.0008 | 0.0021 |
| Clumsy 10 | 0.0039 | 0.0053 | -0.0007 | -0.0005 | -0.0002 |
| Extrovert 10 | 0.0025 | 0.0027 | -0.0002 | -0.0001 | 0.0001 |
| Hyper 10 | -0.0025 | -0.002 | -0.0003 | -0.0001 | -0.0001 |
| Anxious 10 | -0.0005 | -0.0001 | -0.0002 | -0.0001 | -0.0001 |
| Anxious 16 | 0.0023 | 0.0019 | 0 | -0.0003 | 0.0006 |
| **Sum of non-cognitive** | **0.0351** | **0.0188** | **0.0117** | **0.0010** | **0.0037** |
| IQ | 0.0073 | 0.0037 | 0.0035 | 0.0019 | -0.0019 |
| epvt5 | 0.0042 | 0.0012 | 0.003 | -0.0010 | 0.0011 |
| copy5 | 0.0161 | 0.0085 | 0.0057 | 0.0009 | 0.0010 |
| Reading | 0.0059 | -0.0002 | 0.0056 | 0.0018 | -0.0008 |
| Maths | 0.0257 | 0.0066 | 0.0133 | 0.0028 | 0.0032 |
| **Sum of early cognitive** | **0.0593** | **0.0199** | **0.0313** | **0.0063** | **0.0025** |

Note:
The direct effect is from spec (3) of table 4. The total effect is spec (6) of table 4. The O-levels, Post-16 education and labour market attachment columns are therefore calculated by working out the difference in the coefficient of each variable when the new sets of variables are added.

## Table 6: Changes in Intergenerational Mobility for Sons

| | 1958 Cohort | 1970 Cohort | Change |
|---|---|---|---|
| $\beta$ | .205 (.026) | .291 (.025) | .086 (.036) |
| **Partial Correlation (*r*)** | .166 (.021) | .286 (.025) | .119 (.033) |
| **Sample Size** | 2163 | 1976 | |

Note: $\beta$ and *r* come from a regression of sons' earnings on parental income at age 16.

## Table 7: Descriptive Statistics for Explanatory Variables, Both Cohorts

| 1958 Cohort Sons | | | 1970 Cohort Sons | | |
|---|---|---|---|---|---|
| | **Mean (Standard Deviation)** | **Sample Size** | | **Mean (Standard Deviation)** | **Sample Size** |
| **Intergenerational income variables** | | | **Intergenerational income variables** | | |
| Parental Income | £1360 (£488) | 2163 | Parental Income | £1480 (£730) | 1976 |
| Earnings at 33 | £1867 (£1130) | 2163 | Earnings at 30 | £1932 (£1362) | 1976 |
| **Health** | | | **Health** | | |
| Birth weight (kgs) | 3.429 (.519) | 2074 | Birth weight (kgs) | 3.384 (.541) | 1839 |
| Average height age 7 and 11 (10 cm) | 13.288 (.770) | 1693 | Average height age 5and 10(10 cm) | 12.319 (.905) | 1514 |
| **Non-cognitive Age 11** | | | **Non-cognitive Age 10** | | |
| Rutter externalising | .091 (.974) | 1881 | Rutter externalising | .023 (.980) | 1777 |
| Rutter internalising | -.029 (.989) | 1836 | Rutter internalising | -.071 (.917) | 1689 |
| Unforthcoming | -.025 (.972) | 1916 | Application | -.016 (1.020) | 1492 |
| Withdrawn | .034 (1.021) | 1916 | Hyper-activity | .111 (1.051) | 1674 |
| Depression | -.017 (.974) | 1916 | Clumsiness | .040 (1.012) | 1488 |
| Anxious for acceptance from adults | -.080 (.850) | 1916 | Extroversion | .0214 (1.007) | 1654 |
| Hostile to adults | -.098 (.819) | 1916 | Anxiety | -.107 (.967) | 1679 |
| 'Writes off' adults | -.035 (.933) | 1916 | | | |
| Anxious for acceptance from children | -.004 (.999) | 1916 | | | |
| Hostile to children | -.098 (.807) | 1916 | | | |
| Restless | .0003 (1.038) | 1916 | | | |
| Inconsequential behaviour | .035 (1.004) | 1916 | | | |
| Nervous | -.0211 (.953) | 1916 | | | |
| Miscellaneous syndromes | -.067 (.963) | 1916 | | | |
| **Cognitive Tests Age 11** | | | **Cognitive Tests Age 10** | | |
| Reading | .203 (.983) | 1914 | Reading | .173 (.991) | 1589 |
| Maths | .240 (1.004) | 1914 | Maths | .273 (.988) | .987 |
| Verbal and non-verbal reasoning | .139 (.947) | 1914 | British ability scale | .213 (1.037) | 1585 |
| **Age 16 Exams** | | | **Age 16 Exams** | | |
| Combined English and Maths Score | 3.317 (3.185) | 1913 | Combined English and Maths Score | 5.240 (3.178) | 1182 |
| **Post 16 Education** | | | **Post 16 Education** | | |
| Stay on post 16 | .420 | 1900 | Stay on post 16 | .454 (.498) | 1975 |
| Number of A levels | .431 | 1923 | Number of A levels | .964 (1.474) | 1349 |
| **Post 18 Education** | | | **Post 18 Education** | | |
| Stayon post 18 | .181 | 1900 | Stayon post 18 | .235 (.424) | 1975 |
| Degree | .173 | 2161 | Degree | .266 (.442) | 1970 |

Note: Earnings and incomes are in 2000 pounds, converted to equivalent monthly amounts.

## Table 8: Relationships between Explanatory Variables, Earnings and Family Income, 1958 Cohort

| | Family Income regressions | Earnings at 33 regressions (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| **Health** | | | | | | |
| Birth weight (kgs) | .056 (.054) | . 103 (.157) | 115 (.154) | .084 (.154) | .076 (.148) | .045 (.141) |
| Birth weight$^2$ | .352 (1.77) | -.0087 (.0228) | -.015 (.022) | -.001 (.022) | -.009 (.021) | -.003 (.020) |
| Average height age 7 and 11 (10 cm) | .318 (.339) | .054 (.014)*** | .033 (.014)** | .034 (.014)** | .027 (.014)** | .016 (.013) |
| **Non-cognitive Age 11** | | | | | | |
| Rutter externalising | -.006 (.050) | -.020 (.011)* | | -.011 (.011) | -.009 (.010) | -.002 (.010) |
| Rutter internalising | -.021 (.052) | -.004 (.011) | | -.001 (.010) | .006 (.010) | -.004 (.010) |
| Unforthcoming | -.097 (.050) | -.014 (.013) | | -.0005 (.013) | -.003 (.012) | -.007 (.012) |
| Withdrawn | .036 (.049) | -.047 (.013)*** | | -.051 (.013)*** | -.053 (.012)*** | -.045 (.012)*** |
| Depression | -.076 (.052) | -.025 (.014)* | | -.005 (.014) | .003 (.013) | .005 (.013) |
| Anxious for acceptance from adults | .037 (.040) | -.010 (.013) | | -.007 (.013) | -.009 (.012) | -.012 (.012) |
| Hostile to adults | .045 (.053) | .053 (.017)*** | | .040 (.017)** | .045 (.016)*** | .041 (.015)*** |
| 'Writes off' adults | .003 (.047) | .0003 (.014) | | .011 (.014) | .007 (.014) | .012 (.013) |
| Anxious for acceptance from children | .007 (.056) | .024 (.0131)* | | .023 (.013) | .022 (.012) | .014 (.013) |
| Hostile to children | .066 (.045) | -.016 (.017) | | -.020 (.017) | -.022 (.016) | -.017 (.015) |
| Restless | -.064 (.062) | -.006 (.012) | | .0003 (.012) | .005 (.012) | .005 (.011) |
| Inconsequential behaviour | .017 (.052) | -.068 (.016)*** | | -.032 (.016)** | -.025 (.015) | -.017 (.014) |
| Nervous | -.019 (.048) | .001 (.011) | | .004 (.011) | .006 (.011) | .011 (.010) |
| Miscellaneous syndromes | -.017 (.058) | -.047 (.013)*** | | -.043 (.013)*** | -.051 (.013)*** | -.050 (.012)*** |
| **Cognitive Tests Age 11** | | | | | | |
| Reading | .294 (.054)*** | | .051 (.015)*** | .043 (.015)*** | .011 (.015) | .018 (.014) |
| Maths | .365 (.055)*** | | .091 (.018)*** | .078 (.017)*** | .024 (.018) | .016 (.017) |
| Verbal and non-verbal reasoning | .356 (.053)*** | | .038 (.019)** | .031 (.019) | .021 (.018) | .016 (.017) |
| **Age 16 Exams** | | | | | | |
| Combined English and Maths Score | 1.244 (.183)*** | | | | .019 (.005)*** | .015 (.004)*** |
| **Post 16 Education** | | | | | | |
| Stay on post 16 | .214 (.028)*** | | | | .082 (.027)*** | .074 (.025)*** |
| Number of A levels | .305 (.061)*** | | | | .043 (.013)*** | .048 (.013)*** |
| **Post 18 Education** | | | | | | |
| Stayon post 18 | .130 (.022)*** | | | | -.046 (.035) | -.029(.033) |
| Degree | .153 (.023)*** | | | | .110 (.035)*** | .125 (.033)*** |
| **Labour Market** | | | | | | |
| Proportion of time unemployed | -.014 (.004)*** | | | | | -1.712*** (.125) |
| Proportion of time inactive | .007(.002)*** | | | | | -.438 (.300) |
| R-squared | | .079 | .116 | .151 | .189 | .263 |

## Table 9: Relationships between Explanatory Variables, Earnings and Family Income, 1970 Cohort

| | Family Income Regression | Earnings Regressions (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| **Health** | | | | | | |
| Birth weight (kgs) | .068 (.045) | .360 (.0138)*** | .321 (.137)** | .299 (.136)** | .318 (.131)** | .292 (.126)** |
| Birth weight$^2$ | .529 (.211)** | -.045 (.020)** | -.042 (.020)** | -.039 (.020) | -.042 (.019) | -.038 (.019)** |
| Average height age 5 and 10 (10 cm) | .245 (.195) | .033 (.014)** | .027 (.013)** | .029 (.013)** | .017 (.013) | .014 (.012) |
| **Non-cognitive Age 10** | | | | | | |
| Rutter externalising | -.209 (.043)*** | -.012 (.012) | | -.007 (.012) | .007 (.011) | .006 (.010) |
| Rutter internalising | -.024 (.042) | -.007 (.013) | | -.007 (.013) | -.017 (.012) | -.011 (.012) |
| Application | .291 (.041)*** | .113 (.015)*** | | .062 (.016)*** | .028 (.016)* | .018 (.015) |
| Hyper-activity | -.146 (.045)*** | .033 (.015)** | | .030 (.015) | .027 (.014)* | .022 (.014) |
| Clumsiness | -.110 (.041)*** | -.041 (.015)*** | | -.036 (.015)** | -.043 (.014)*** | -.046 (.013)*** |
| Extroversion | .127 (.047)*** | .025 (.013)* | | .023 (.013) | .029 (.012)** | .031 (.012)** |
| Anxiety | -.096 (.044) | .016 (.014) | | .015 (.014) | .012 (.013) | .012 (.013) |
| **Cognitive Tests Age 10** | | | | | | |
| Reading | .466 (.041)*** | | .047 (.018)*** | .027 (.018) | .0001 (.017) | -.005 (.017) |
| Maths | .443 (.040)*** | | .080 (.018)*** | .063 (.018)*** | .022 (.018) | .012 (.017) |
| British ability scale | .404 (.047)*** | | .029 (.015)* | .028 (.015)* | .012 (.015) | .015 (.014) |
| **Age 16 Exams** | | | | | | |
| Combined English and Maths Score | 2.096 (.153)*** | | | | .022 (.005)*** | .023 (.005)*** |
| **Post 16 Education** | | | | | | |
| Stay on post 16 | .308 (.021)*** | | | | .019 (.025) | .025 (.025) |
| Number of A levels | .721 (.062)*** | | | | .033 (.011)*** | .036 (.010)*** |
| **Post 18 Education** | | | | | | |
| Stayon post 18 | .213 (.020)*** | | | | .005 (.034) | .016 (.033) |
| Degree | .251 (.020)*** | | | | .168 (.032)*** | .174 (.031) |
| **Labour Market** | | | | | | |
| Proportion of time unemployed | -.027 (.005)*** | | | | | -1.329 (.117)*** |
| Proportion of time inactive | -.005 (.006) | | | | | -.244 (.068)*** |
| R-squared | | .059 | .075 | .087 | .165 | .222 |

## Table 10: Accounting for Intergenerational Mobility, 1958 Cohort

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Birth weight (kgs) | 0.002 | 0.004 | 0.004 | 0.004 | 0.002 |
| Birth weight$^2$ | 0.004 | -0.003 | -0.003 | -0.003 | -0.001 |
| Average height age 7 and 11 (cm) | -0.003 | 0.0015 | 0.0015 | 0.001 | .0005 |
| **Health** | **0.003** | **-0.0018** | **0.0018** | **0.0014** | **0.0015** |
| Rutter externalising | 0.001 | | 0.001 | 0.001 | 0.001 |
| Rutter internalising | 0.001 | | 0.001 | 0.001 | 0.0008 |
| Unforthcoming | 0.001 | | 0.000 | 0.000 | 0.0007 |
| Withdrawn | -0.002 | | -0.002 | -0.002 | -0.0016 |
| Depression | 0.002 | | 0.0004 | 0.000 | 0.00035 |
| Anxious for acceptance from adults | 0.000 | | -0.0003 | 0.000 | 0.00045 |
| Hostile to adults | 0.002 | | 0.0018 | 0.002 | 0.0019 |
| 'Writes off' adults | 0.000 | | 0.0001 | 0.000 | 0.00003 |
| Anxious for acceptance from children | 0.002 | | 0.0016 | 0.002 | 0.0010 |
| Hostile to children | -0.001 | | -0.001 | -0.001 | -0.0011 |
| Restless | 0.000 | | 0.000 | 0.000 | -0.0003 |
| Inconsequential behaviour | -0.0010697 | | 0.0001 | 0.000 | -0.0002 |
| Nervous | -0.0000194 | | 0.000 | 0.000 | -0.0002 |
| Miscellaneous syndromes | 0.0008074 | | 0.0007 | 0.001 | 0.001 |
| **Non-cognitive Age 11** | **0.006** | | **0.003** | **0.002** | **0.002** |
| Reading | | 0.015 | 0.012 | 0.003 | 0.005 |
| Maths | | 0.033 | 0.028 | 0.009 | 0.006 |
| Verbal and non-verbal reasoning | | 0.014 | 0.011 | 0.008 | 0.006 |
| **Cognitive Tests Age 11** | | **0.062** | **0.052** | **0.019** | **0.017** |
| Combined English and Maths Score | | | | 0.020 | 0.016 |
| **Age 16 Exams** | | | | **0.020** | **0.016** |
| Stay on post 16 | | | | 0.019 | 0.017 |
| Number of A levels | | | | 0.017 | 0.018 |
| **Post 16 Education** | | | | **0.037** | **0.035** |
| Stayon post 18 | | | | -0.006 | -0.004 |
| Degree | | | | 0.016 | 0.018 |
| **Post 18 Education** | | | | **0.010** | **0.015** |
| Proportion of time unemployed | | | | | 0.024 |
| Proportion of time inactive | | | | | -.0004 |
| **Labour Market** | | | | | **0.020** |
| **Total explained** | 0.010 | **0.060** | **0.057** | **0.090** | **0.107** |
| **Total unexplained** | 0.195 | **0.145** | **0.148** | **0.115** | **0.098** |
| **TOTAL PERSISTENCE** | 0.205 | **0.205** | **0.205** | **0.205** | **0.205** |

**Table 11: Accounting for Intergenerational Mobility, 1970 Cohort**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Birth weight (kgs) | 0.031 | 0.027 | 0.026 | 0.027 | 0.025 |
| Birth weight$^2$ | -0.024 | -0.022 | -0.021 | -0.022 | -0.020 |
| Average height age 7 and 11 (cm) | .004 | .004 | .004 | .003 | .002 |
| **Health** | **0.011** | **0.009** | **0.009** | **0.008** | **0.007** |
| Rutter externalising | 0.001 | | 0.000 | -0.003 | -0.003 |
| Rutter internalising | 0.002 | | 0.002 | 0.002 | 0.001 |
| Application | 0.033 | | 0.018 | 0.008 | 0.005 |
| Clumsiness | 0.004 | | 0.004 | 0.005 | 0.004 |
| Extroversion | 0.004 | | 0.003 | -0.004 | 0.004 |
| Hyper-activity | -0.006 | | -0.005 | 0.004 | -0.003 |
| Anxiety | -0.001 | | 0.000 | 0.000 | -0.001 |
| **Non-cognitive Age 10** | **0.038** | | **0.022** | **0.010** | **0.008** |
| Reading | | 0.020 | 0.010 | -0.004 | -0.007 |
| Maths | | 0.037 | 0.030 | 0.013 | 0.010 |
| British ability scale | | 0.012 | 0.011 | 0.008 | 0.006 |
| **Cognitive Tests Age 10** | | **0.069** | **0.051** | **0.018** | **0.009** |
| Combined English and Maths Score | | | | 0.031 | 0.026 |
| **Age 16 Exams** | | | | **0.031** | **0.026** |
| Stay on post 16 | | | | 0.006 | 0.008 |
| Number of A levels | | | | 0.029 | 0.031 |
| **Post 16 Education** | | | | **0.035** | **0.039** |
| Stayon post 18 | | | | 0.001 | 0.003 |
| Degree | | | | 0.043 | 0.044 |
| **Post 18 Education** | | | | **0.044** | **0.047** |
| Proportion of time in work | | | | | 0.008 |
| Proportion of time unemployed | | | | | 0.029 |
| **Labour Market** | | | | | **0.037** |
| **Explained Persistence** | **0.048** | **0.078** | **0.082** | **0.145** | **0.173** |
| **Total unexplained** | **0.243** | **0.213** | **0.209** | **0.146** | **0.118** |
| **TOTAL PERSISTENCE** | **0.291** | **0.291** | **0.291** | **0.291** | **0.291** |

## Appendix 1: Data

*Non-cognitive variables in BCS*

Mother and teacher-reported scales are formed from principal components analyses of the parent/teacher ratings of the following variables. The respondent grades the incidence of the behaviour in the child along a 1-100 scale.

Mother reported variables from age 5:

*Antsocial;* disobedient, destructive, aggressive, irritable, restless and tantrum

*Neurotic;* miserable, worried, fearful, fussy and complains of aches and pains

Teacher reported variables from age 10[9]:

*Application;* 15 items, including the child's concentration and perseverance and his/her ability to understand and complete complex tasks.

*Clumsiness;* 12 items, includes items on bumping into things, and the use of small objects such as scissors.

*Extroversion;* 6 items concerning talkativeness and an explicit item about extroversion.

*Hyper-activity;* 6 items, includes the items squirmy, excitable, twitches, hums and taps.

*Anxious;* 9 items, includes items very similar to those which generate the mother reported anxiety scale.

Child reported variables:

At age 10 the children are asked to respond to the two sets of questions that form the CAROLOC score for locus of control (Gammage, 1975) and the LAWSEQ score for self-confidence (Lawrence, 1973, 1978).

At age 16 the young people are asked to complete the commonly used malaise inventory, which asks questions about general wellbeing and health and is designed to measure anxiety and depression (Rutter, 1970).

*Non-cognitive variables in the NCDS*

The teacher variables in the NCDS are based on the Bristol Social Adjustment Scale. Teachers were given a series of phrases and asked to underline those that he/she thought applied to the child. The phrases were grouped into 11 different behavioural

[9] Osborn and Milbank (1987) include two further scales; peer relations and conduct disorder, but we do not include these in our analysis as we find they have no relationship with earnings.

"syndromes": unforthcomingness, withdrawal, depression, anxiety for acceptance by adults, hostility towards adults, "writing off" of adults and adult standards, anxiety for acceptance by children, hostility towards children, restlessness, inconsequential behaviour, and miscellaneous.

*Comparative non-cognitive scores*

Rutter internalising is formed from mother's report at age 11/10 of headaches, stomach aches, sleeping difficulties, worried and fearful. Rutter externalising is based on fidget, destructive, fights, irritable and disobedient. We encountered two additional complexities in forming these scales. The first is that the BCS data for these variables was coded inversely, so that 0 was entered as the child exhibiting the stated behaviour 'a great deal' when this should have corresponded to 'not at all'. A further problem occurs because the NCDS variables are coded into three categories 'never, sometimes, frequently' while the BCS variables are coded as a continuous scale. We therefore recode the BCS variables as three categories based on the assumption that the proportion in the each category is the same as in the earlier cohort.

## Appendix 2 (Intended for Referees not for publication)

## Table A1: Adding Additional Controls to the 1970 cohort models in Table 3

| | Family income | (1) | (2) | (3) |
|---|---|---|---|---|
| **Years of pre-sch** | 0.12910 | 0.0425 | 0.0253 | -0.0077 |
| | [0.0212]*** | [0.0161]*** | [0.0155] | [0.0146] |
| **Birthweight** | 0.1053 | 0.3292 | 0.208 | 0.1963 |
| | [0.0218]*** | [0.1044]*** | [0.0999]** | [0.0937]** |
| **Birthweight squared** | 0.6808 | -0.0442 | -0.0326 | -0.0284 |
| | [0.1455]*** | [0.0156]*** | [0.0149]** | [0.0140]** |
| **Height5/10** | 0.1602 | | 0.0381 | 0.0301 |
| | [0.0308]*** | | [0.0118]*** | [0.0114]*** |
| **Anti social5** | -0.2371 | | -0.0152 | 0.0025 |
| | [0.0367]*** | | [0.0094] | [0.0089] |
| **Neurotic5** | 0.0015 | | 0.014 | 0.0124 |
| | [0.0351] | | [0.0097] | [0.0092] |
| **Locus of control10** | 0.2946 | | 0.0291 | 0.0204 |
| | [0.0379]*** | | [0.0100]*** | [0.0094]** |
| **Self esteem10** | 0.2233 | | 0.0133 | 0.0065 |
| | [0.0369]*** | | [0.0097] | [0.0091] |
| **Application10** | 0.2946 | | 0.0465 | 0.0136 |
| | [0.0367]*** | | [0.0126]*** | [0.0118] |
| **Clumsy10** | -0.1559 | | -0.025 | -0.0307 |
| | [0.0374]*** | | [0.0107]** | [0.0101]*** |
| **Extrovert10** | 0.1264 | | 0.0195 | 0.0206 |
| | [0.0403]*** | | [0.0098]** | [0.0092]** |
| **Hyper10** | -0.1364 | | 0.0187 | 0.0124 |
| | [0.0408]*** | | [0.0110]* | [0.0103] |
| **Anxious10** | -0.1009 | | 0.0045 | 0.0018 |
| | [0.0393]** | | [0.0104] | [0.0097] |
| **Anxious16** | -0.0684 | | -0.0328 | -0.0293 |
| | [0.0327]** | | [0.0117]*** | [0.0110]*** |
| **IQ** | 0.4314 | | 0.0165 | 0.0094 |
| | [0.0408]*** | | [0.0123] | [0.0116] |
| **Epvt5** | 0.3673 | | 0.0108 | -0.0003 |
| | [0.0357]*** | | [0.0097] | [0.0092] |
| **Copy5** | 0.3829 | | 0.0413 | 0.0192 |
| | [0.0379]*** | | [0.0095]*** | [0.0090]** |
| **Reading10** | 0.4615 | | 0.0118 | -0.0047 |
| | [0.0365]*** | | [0.0139] | [0.0131] |
| **Maths10** | 0.4729 | | 0.0538 | 0.0108 |
| | [0.0361]*** | | [0.0142]*** | [0.0135] |
| **No. of GCSEs** | 1.9053 | | | 0.0154 |
| | [0.1210]*** | | | [0.0035]*** |
| **No. of A-levels** | 0.6339 | | | 0.0254 |
| | [0.0521]*** | | | [0.0087]*** |
| **Degree class** | 0.2499 | | | 0.1563 |
| | [0.0178]*** | | | [0.0242]*** |
| **Stay on post 16** | 0.3301 | | | 0.0078 |
| | [0.0190]*** | | | [0.0204] |
| **Stay on post 18** | 0.2330 | | | 0.0189 |

| | | | | |
|---|---|---|---|---|
| | [0.0172]*** | | | [0.0253] |
| **Time unemployed** | -0.0233 | | | -1.157 |
| | [0.0040]*** | | | [0.0917]*** |
| **Time inactive** | -0.0062 | | | -0.327 |
| | [0.0058] | | | [0.0507]*** |
| **Mum high interest** | 0.2283 | | -0.0311 | |
| | [0.0202]*** | | [0.0253] | |
| **Dad high interest** | 0.2367 | | 0.0524 | |
| | [0.0188]*** | | [0.0280]* | |
| **Mother depressed** | -0.0891 | | | -0.0244 |
| | [0.0182]*** | | | [0.0179] |
| **Ethnicity** | -0.0060 | | | 0.0467 |
| | [0.0047] | | | [0.0687] |
| **English** | 0.0072 | | | -0.0122 |
| | [0.0073] | | | [0.0577] |
| **Mum age at birth** | -0.1294 | | | -0.0065 |
| | [0.1381] | | | [0.0028]** |
| **Dad's social class** | 0.9835 | | | 0.0101 |
| | [0.0493]*** | | | [0.0078] |
| **Smoked pregnant** | -0.0838 | | | 0.0198 |
| | [0.0206]*** | | | [0.0164] |
| **Quit smoking preg.** | -0.0077 | | | -0.0424 |
| | [0.0093] | | | [0.0368] |
| **Ever in care** | -0.0086 | | | -0.1625 |
| | [0.0053] | | | [0.0686]** |
| **Mum obese** | -0.0499 | | | -0.043 |
| | [0.0084]*** | | | [0.0355] |
| **Breastfed** | 0.1308 | | | 0.0046 |
| | [0.0191]*** | | | [0.0169] |
| **Mum's highed** | 1.1212 | | | 0.0087 |
| | [0.0534]*** | | | [0.0073] |
| **Dad's highed** | 1.4417 | | | 0.0088 |
| | [0.0695]*** | | | [0.0058] |
| **Clinic as baby** | 0.0094 | | | -0.0098 |
| | [0.0190] | | | [0.0168] |
| **No. of years married** | -0.7635 | | | 0.0049 |
| | [0.1309]*** | | | [0.0032] |
| **No. of older bros.** | -0.2159 | | | -0.0175 |
| | [0.0346]*** | | | [0.0110] |
| **No. of older sis.** | -0.1679 | | | 0.0164 |
| | [0.0326]*** | | | [0.0115] |
| **Observations** | | 3340 | 3340 | 3340 |
| **R-squared** | | 0.03 | 0.14 | 0.26 |

**Table A2: Adding Additional Controls to the 1970 cohort Decompositions in Table 4**

| | (1) | (2) | (3) |
|---|---|---|---|
| Years of pre-sch | 0.0055 | 0.0033 | -0.0010 |
| **Sum of pre-school** | **0.0055** | **0.0033** | **-0.0010** |
| Birthweight | 0.0347 | 0.0219 | 0.0207 |
| Birthweight squared | -0.0301 | -0.0222 | -0.0193 |
| Height5/10 | | 0.0061 | 0.0048 |
| **Sum of health** | **0.0046** | **0.0058** | **0.0062** |
| Anti social5 | | 0.0036 | -0.0006 |
| Neurotic5 | | 0.0000 | 0.0000 |
| Locus of control10 | | 0.0086 | 0.0060 |
| Self esteem10 | | 0.0030 | 0.0015 |
| Application10 | | 0.0137 | 0.0040 |
| Clumsy10 | | 0.0039 | 0.0048 |
| Extrovert10 | | 0.0025 | 0.0026 |
| Hyper10 | | -0.0026 | -0.0017 |
| Anxious10 | | -0.0005 | -0.0002 |
| Anxious16 | | 0.0022 | 0.0020 |
| **Sum of non cognitive** | | **0.0345** | **0.0184** |
| IQ | | 0.0071 | 0.0041 |
| Epvt5 | | 0.0040 | -0.0001 |
| Copy5 | | 0.0158 | 0.0074 |
| Reading10 | | 0.0054 | -0.0022 |
| Maths10 | | 0.0254 | 0.0051 |
| **Sum of early cognitive** | | **0.0578** | **0.0142** |
| No. of O-levels | | | 0.0293 |
| **Sum of O-levels** | | | **0.0293** |
| No. of A-levels | | | 0.0161 |
| Degree class | | | 0.0391 |
| Stay on post 16 | | | 0.0026 |
| Stay on post 18 | | | 0.0044 |
| **Sum of post-16** | | | **0.0621** |
| Time unemployed | | | 0.0270 |
| Time inactive | | | 0.0020 |
| **Sum of labour market** | | | **0.0290** |
| Mum high interest | | -0.0071 | |
| Dad high interest | | 0.0124 | |
| **Sum of parent interest** | | **0.0053** | |
| Mother depressed | | | 0.0022 |
| Ethnicity | | | -0.0003 |
| English | | | -0.0001 |
| Mum age at birth | | | 0.0008 |
| Dad's social class | | | 0.0099 |
| Smoked pregnant | | | -0.0017 |
| Quit smoking preg. | | | 0.0003 |

| | | | |
|---|---|---|---|
| Ever in care | | | 0.0014 |
| Mum obese | | | 0.0021 |
| Breastfed | | | 0.0006 |
| Mum's highed | | | 0.0098 |
| Dad's highed | | | 0.0127 |
| Clinic as baby | | | -0.0001 |
| No. of years married | | | -0.0037 |
| No. of older bros. | | | 0.0038 |
| No. of older sis. | | | -0.0028 |
| **Sum of controls** | | | **0.0350** |
| **Observed persistence** | **0.0101** | **0.1066** | **0.1933** |
| **Unobserved persistence** | **0.3104** | **0.2137** | **0.1272** |
| **TOTAL PERSISTENCE** | **0.3204** | **0.3204** | **0.3205** |

References

Black, S., P. Devereux and K. Salvanes (2005) 'From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes' NBER Working Paper No. 11796.

Blanden, J. (2005) *Essays on Intergenerational Mobility and its Variation over Time, Place and Family Structure*, PhD Thesis, University College London.

Blanden, J, A. Goodman, P. Gregg and S. Machin (2004) 'Changes in Intergenerational Mobility in Britain in M. Corak ed. *Generational Income Mobility in North America and Europe*, Cambridge University Press.

Blanden, J., P. Gregg and S. Machin (2005) 'Educational Inequality and Intergenerational Mobility' in A. Vignoles and S. Machin (eds) *What's the Good of Education?*, Princeton University Press.

Blanden, J. and S. Machin (2004) 'Educational Inequality and the Expansion of UK Higher Education', Scottish Journal of Political Economy, Vol. 51, pp. 230-249.

Bowles, S., H. Gintis and M. Osborne (2001) 'The Determinants of Earnings: A Behavioural Approach' Journal of Economic Literature, Vol. 39 pp. 1137-1176.

Carneiro, P., C. Crawford and A. Goodman (2006) 'Which skills matter?' Institute for Fiscal Studies, Mimeo.

Carneiro, P. and J. Heckman (2003), 'Human Capital Policy', in Inequality in America: What Role for Human Capital Policies, eds. J. Heckman and A. Krueger, MIT Press.

Carneiro, P., J. Heckman and D. Masterov (2005), "Labor Market Discrimination and Racial Differences in Pre-Market Factors", *Journal of Law and Economics*.

Corak, M. (2006) 'Do Poor Children Become Poor Adults? Lessons from a Cross Country Comparison of Generational Earnings Mobility' IZA Discussion Paper No. 1993.

Dearden, L., Machin, S. and Reed, H. (1997), 'Intergenerational Mobility in Britain', Economic Journal, Vol. 107, pp. 47-64.

Farber, H. (1993). 'The incidence and cost of job loss: 1982-91', *Brookings Papers on Economic Activity*, pp. 73-132.

Feinstein, L. (2000) 'The relative economic importance of academic, psychological and behavioural attributes developed in childhood' CEP Discussion Paper No. 443.

Feinstein, L. (2003) 'Inequality in the Early Cognitive Development of British Children in the 1970 Cohort' Economica, 70, 73-97.

Galton, F. (1886), 'Regression towards mediocrity in hereditary stature', Journal of the Anthropological Institute of Great Britain and Ireland, 15, pp. 246-263.

Galindo-Rueda, F. and A. Vignoles (2005) 'The Declining Relative Importance of Ability in Predicting Educational Attainment.' Journal of Human Resources Vol. 40 pp. 335-353.

Gammage, P (1975) *Socialisation, Schooling and Locus of Control*, PhD Thesis, Bristol University.

Glennester, H. (2002) 'United Kingdom Education 1997-2001' Oxford Review of Economic Policy, 18.

Gregg, P and E. Tominey (2005) 'The Wage Scar from Youth Unemployment' Labour Economics, 12, 487-509.

Heckman, J and Y. Rubinstein (2001) 'The Importance of Non-cognitive Skills: Lessons from the GED Testing Program.' American Economic Review, 91, 145-149.

Heckman, J., J. Stixrud and S. Urzua (2006) 'The Effects of Cognitive and Non-cognitive Abilities on Labor Market Outcomes and Social Behaviour', NBER Working Paper No. 12006.

Jäntti, M., B. Bratsberg, K. Røed, O. Raaum, R. Naylor, E. Osterbacka, A. Bjorklund, and T. Eriksson, (2006) 'American Exceptionalism in a New Light: A Comparison of Intergenerational Earnings Mobility in the Nordic Countries, the United Kingdom and the United States' IZA Discussion Paper No. 1938.

Lareau, A. (2003) *Unequal Chances: Class, Race and Family Life*, University of California Press.

Laurence, D. (1975) *Improved Reading Through Counselling*, Ward Lock, London.

Laurence, D (1978) *Counselling Students with Reading Difficulties: A Handbook for Tutors and Organisers* Good Reading, London.

Osborn, A. and J. Milbank (1987) *The effects of early education: a report from the Child Health and Education Study*, Clarendon Press, Ward Lock.

Osborne-Groves, M. (2005) 'Personality and the Intergenerational Transmission of Earnings' in S. Bowles, H. Gintis and M. Osborne Groves *Unequal Chances: Family Background and Economic Success*, Princeton University Press.

Perisco, N., A. Postlewaite and D. Silverman (2004) 'The Effect of Adolescent Experience on Labour Market Outcomes: The Case of Height' Journal of Political Economy, Vol. 112, pp. 1019-1053.

Rutter, M., J. Tizard and K. Whitmore (1970) *Education, Health and Behvaiour*, Longman, London.

Singh, S. and G. Maddala (1976) 'A Function for Size Distribution of Incomes' Econometrica, Vol. 44, pp. 963-970.

Solon, G. (2002) 'Cross-Country Differences in Intergenerational Earnings Mobility', Journal of Economic Perspectives, Vol. 16, pp. 59-66.

Solon, G. (2005) 'A Model of Intergenerational Mobility Variation over Time and Place,' in *Generational Income mobility in North America and Europe*, ed. Miles Corak, Cambridge University Press.

Stevens, A. H. (1997). 'Persistent effects of job displacement: the importance of multiple job losses', *Journal of Labor Economics*, vol. 15(1), pp. 165-88.