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Claire Tyler

Department of Quantitative Social Science

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The role of non-cognitive and cognitive skills in accounting for the intergenerational transmission of ‘top job’ status.

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Abstract

Enabling fair access to professional careers is an important strand of UK social mobility policy, however many high status employers demand a wide range of ‘soft skills’ in addition to strong cognitive skills to identify the best talent which can disadvantage individuals from less privileged backgrounds. This paper uses BCS data to estimate and decompose the intergenerational persistence in top job status to assess the contribution of four potential transmission mechanisms for this advantage: non-cognitive skills, cognitive skills, job aspirations and educational attainment. The results reveal that individuals with parents employed in a top job are 22.8 percentage points more likely to access a top job in adulthood than individuals with parents who are employed in a non top job. Childhood cognitive skills and later educational attainment are found to be particularly important contributors to this transmission of advantage, with childhood non cognitive skills also making a substantial contribution.

JEL codes: J62, I24, J44, J24

Keywords: Intergenerational Occupational Mobility, Non cognitive Skills, Cognitive Skills, Professional Labour Markets

Contact Details: Claire Tyler (cmfdoherty@hotmail.com) Department of Quantitative Social Science, Institute of Education, University of London, 20 Bedford Way London, WC1H 0AL

¹ Institute of Education, University College London

(1) Introduction

Enabling fair access to professional careers is an important strand of UK social mobility policy (Cabinet Office, 2011 and 2013) with a range of high profile government initiatives² currently underway to address policy concerns surrounding 'elitist Britain' (Cabinet Office 2012, SMCP 2014). Many education sector interventions also seek to promote equality of opportunity by improving the attainment of children from more disadvantaged backgrounds. However, despite these important initiatives, many high status employers demand a much wider range of 'soft skills' and competencies in addition to strong cognitive skills to identify the best talent for their top jobs. This can prove advantageous for individuals who can more readily demonstrate these competencies, such as individuals from more privileged backgrounds and those with professional parents, yet this can also create barriers to elite careers for individuals from less advantaged backgrounds. 'Character education' is therefore currently being promoted nationally in UK schools to enhance a wide range of non-cognitive skills in childhood with the aim of better preparing pupils for future careers and improving social mobility³.

This paper therefore provides new evidence to inform policy in this area by assessing the relative importance of non-cognitive skills and cognitive skills in promoting social mobility in elite occupations (termed 'top jobs'). Specifically, this research addresses the following questions:

- Is parental employment in a 'top job' associated with a child's chances of obtaining access to similar jobs in adulthood?
- How important are childhood non-cognitive and cognitive skills in the transmission of occupational advantage across generations?
- Are job aspirations and educational attainment also transmission mechanisms of occupational advantage across generations? To what extent do childhood non-cognitive and cognitive skills operate through these channels to be predictors of top job status in adulthood?

The most recently available data from the British Cohort Study (captured up to age 42) will be used to estimate and decompose the association between parent and child 'top job' status to identify the relative importance of non-cognitive skills, cognitive skills, job aspirations and educational attainment in accounting for this association. By analysing social mobility in terms of occupational status rather than income levels, this research is also able to include individuals who are often excluded

² Ongoing labour market initiatives include applying minimum wage legislation to unpaid internships, formalising recruitment and selection processes and promoting flexible entry and progression routes to elite careers, such as higher apprenticeships.

³<http://www.telegraph.co.uk/education/educationnews/11330877/Lessons-in-grit-and-resilience-recognised-by-new-award.html>

from intergenerational income mobility research due to issues of missing income data. For example, this research includes occupational data for mothers and daughters and also of individuals who are self employed or unemployed but looking for work.

Related literature on this topic is discussed in Section 2. Sections 3 and 4 describe the methodology and data applied in the analysis, followed by the key results discussed in Section 5 and conclusions summarised in Section 6.

(2) Related literature

The UK has been shown to have relatively low levels of intergenerational income mobility compared to international standards (Corak, 2013; Corak 2006, Solon 2002) therefore indicating particularly strong associations between the income levels of parents and children in the UK. Despite ongoing debates about the most appropriate way to measure social mobility (Blanden et. al., 2013; Goldthorpe and Mills, 2008; Gorard, 2008; Erikson and Goldthorpe, 2010; Goldthorpe, 2013), intergenerational occupational mobility research similarly reveals persistence in advantage across generations and is also particularly relevant to the analysis of the transmission of 'top job' status presented in this paper. For example, Bukodi and Goldthorpe (2009) find that having a father employed in a managerial or professional occupation (the 'salarial'), offers a clear advantage to sons when first accessing high status and high earning occupations, even when controlling for educational attainment. These parental occupational effects on access to high earning occupations are also shown to be true for women on entry to the labour market and also for men and women later in their careers at age 34 (Bukodi, 2009). In an analysis of intergenerational occupation class mobility, Goldthorpe and Jackson (2007) also demonstrate the advantage of having parents in the top occupational class (higher grade professionals, administrators and managers) although this varies by gender. Specifically, 43% of men from these Class 1 origins (of the 7 class Goldthorpe Schema) are themselves employed in Class 1 occupations by age 30, whereas the figure for females is 30%. In addition, focussing solely on professions, Macmillan (2009) highlights an increase in professionals originating from families with higher incomes between 1958 and 1970 in nine of the 12 professions examined. Specifically, the highest socially graded professions (medicine and law) became even more exclusive (i.e. individuals in these careers originated from families with even higher incomes in 1970), and journalism, banking and accounting showed large increases in exclusivity to become highly socially graded professions. More recently, Macmillan et al (2013) demonstrated a significant socio-economic gradient, including by parental occupation, in the likelihood of recent graduates accessing top jobs in the UK.

The research presented in this paper is also related to international empirical studies assessing the extent to which children are employed in the same organisations as their parents. For example, in Canadian and Danish labour markets, the transmission of employers from father to son is found to be positively associated with paternal earnings, rising distinctly and sharply at the top of the father's earnings distribution (Bingley, Corak and Westergård-Nielsen, 2011). Corak and Piraino (2010) also find that almost 70% of the sons of top percentile fathers have at some point worked for a firm that also employed their fathers and they highlight the significant incidence of family based succession in CEOs in the US. However, these authors refer to a much narrower transmission of occupational advantage, largely based on personal networks, than is considered in this paper which takes a broader approach focussing on the transmission of occupational class advantage, particularly at the elite end of the distribution.

The precise definition of 'top jobs' for the purposes of this paper is explained in a later section, but broadly these are defined as higher professional and managerial occupations which offer greater job security, more economic stability and higher long term earning prospects (Goldthorpe and McKnight, 2004). These careers are of particular importance to the UK economy as they are forecast to account for approximately 1.5 million additional jobs in the UK from 2010 to 2020, increasing their share of total employment in the UK from 29% to 32%⁴ (Wilson and Homenidou, 2011). Successive government panels and reports (Langlands 2005, Cabinet Office 2009 and 2012) have sought to highlight socio-economic barriers to these careers and the detrimental effects for professions and society of low mobility levels, yet there still remains limited academic research on access to 'top jobs' and the underlying drivers of transmission of advantage and disadvantage in relation to accessing these jobs.

The key transmission mechanisms of 'top job' status considered in this paper are non-cognitive skills, cognitive skills, job aspirations and educational attainment. These characteristics have been shown to have strong associations with parental socioeconomic status and be valuable predictors of labour market success. Firstly, as building the 'character' of UK school children has become a recent policy focus, the importance of non-cognitive skills is increasingly being discussed nationally (Paterson et al, 2014) in addition to the ongoing policy debates surrounding raising educational attainment in the UK. In practice, non-cognitive skills relate to 'a multiplicity of skills from time management to teamwork and leadership skills, self awareness and self control' (Crawford et al, 2011), including aspects of personality and character (Joshi, 2014) with little agreement on how they should be defined and measured (Gutman and Schoon, 2013). This poses challenges for any analysis using non-cognitive metrics, however it is widely agreed that these childhood skills can positively influence a range of adult outcomes. In fact, they may be just as important, or even more important, than cognitive skills in explaining academic and employment outcomes (Heckman et al., 2006) and are more important predictors of adult life satisfaction than childhood intellectual performance (Layard et al 2013). These skills are therefore labelled 'non-cognitive' in the sense that they are not usually measured in schools as part of academic attainment tests, however Heckman (2011) argues that at an empirical level, cognitive and non-cognitive skills can be difficult to separate. Cognitive skills usually refer to measures of general intelligence or IQ, and include components such as learning, memory and reasoning (Heckman, 2011), however the development of these cognitive skills is often helped by possessing a range of non-cognitive skills such as motivation, perseverance and confidence (Joshi, 2014). These interrelationships therefore lend support to the inclusion of both non-cognitive and cognitive skills in the analysis of the transmission of top job advantage presented in this paper.

Firstly considering non-cognitive skills, evidence highlighting the importance of non-cognitive skills for labour market outcomes and the variation in these skills by socioeconomic background is particularly relevant to the analysis of access to top

⁴ Percentages based on Standard Occupational Classification (SOC) classes 1 & 2.

jobs in this paper. Extensions to traditional human capital theory discuss the labour market value of unobserved characteristics such as behaviour, motivation and attitude (Bowles et al, 2001). Feinstein (2000) finds substantial labour market returns to non-academic human capital production, including attentiveness, peer relationships, sense of control and self-esteem, which are stated as important channels for the intergenerational transmission of inequality. Blanden et al (2007) further find an influential role for non-cognitive abilities in driving labour market outcomes and barriers to social mobility, and highlight the value of educational programmes supporting personal efficacy, self esteem and concentration. Jackson (2006) demonstrates the value of being outgoing (non-withdrawn) for managerial occupations and being passive (non-aggressive) for higher technical occupations. Goldthorpe (2001) also proposes that as higher education becomes more widely held in the population it provides less of a signal to employers, thereby increasing the focus of recruiters on 'soft skills' which he suggests may be more correlated with social class background than formal education.

The development of both childhood cognitive and non-cognitive skills are shown to be significantly associated with parental socio-economic background (Heckman et al 2006; Osborne-Groves 2005; Gregg, Proper and Washbrook 2008; Carneiro et al 2007), although whether policy interventions to improve non-cognitive skills are likely to be successful depends largely on the malleability of these skills over an individual's life cycle. Heckman (2011) argues that personality traits change over the life cycle and are a possible avenue for intervention. Other evidence suggests that early interventions to non-cognitive skills may be more effective amongst children from the poorest backgrounds and that later interventions targeting non-cognitive skills in adolescence may have the potential to be more effective than those targeting cognitive skills (Crawford et al 2011, Carneiro et al, 2007). However, Gutman and Schoon (2013) warn that there is currently little understanding of the malleability of non-cognitive skills nor of the longer term impact of such interventions, although they state that personality traits (defined by the OCEAN acronym⁵) are likely to be less malleable than other 'more flexible' characteristics such as self perception, motivation, perseverance, self control, meta-cognitive strategies, social competencies, resilience and coping and creativity. Two similar categorisations which are also prominently used in UK government policy development have also been considered in this paper to assist with the selection of non-cognitive skills analysed: 'Social and Emotional Aspects of Learning' (Humphrey et al 2010) which focuses on self awareness, self regulation, motivation, empathy, social skills and 'Cabinet Office: Skills for Life' which focus on resilience, self direction, forging relationships, communications (McNeil et al 2012)

Aspirations are yet another type of non-cognitive attribute which are particularly relevant to accessing competitive high status careers, and are associated with many of the traits listed previously. They are also included as a potential transmission

⁵ 'OCEAN' refers to the 'Big 5' personality traits, namely openness to experience, conscientiousness, extraversion, agreeableness and neuroticism (Digman, 1990)

mechanism of top job status in this paper as they are regularly cited as a key barrier to access to professional careers for more disadvantaged students however mixed evidence exists on this issue. For example, three times fewer young people from average or poorer backgrounds aspire to be a professional than those from professional backgrounds (Cabinet Office, 2008), however other evidence suggests that while young people from deprived backgrounds do not generally lack aspiration, they do lack understanding of how to fulfil career goals (Kintrea, 2011). The latter findings would seem to support the current government policy of improving information and guidance in relation to career pathways and improving inspection of school's career advice (SMCP, 2013).

In addition to non-cognitive skills and aspirations, childhood cognitive ability and later education attainment are also included in this paper as potential transmission mechanisms of top job status. These characteristics are known to vary significantly by socio-economic background in the UK (Devine and Li, 2013; Gregg and Macmillan, 2010; Goodman et al., 2011; Chowdry et al., 2012; Crawford et al., 2010; Jerrim, 2012; Green et al., 2012) and are particularly associated with family background in early childhood (Feinstein 2003a and 2003b, Blanden 2006, Gregg et al 2008). Human capital theory (since Becker 1962 and Mincer 1974) and the subsequent returns to education literature (reviews by Ashenfelter et al, 1999; Blundell et al, 1999; Card, 1999; Harmon et al, 2000 and 2003) also demonstrate that cognitive ability and educational attainment are substantial drivers of labour market earnings due to the accumulation of human capital driving increased productivity, although signalling theories (Spence, 1974) suggest an alternative mechanism. In addition, non-linear returns to education in years where qualifications are obtained (known as 'sheepskin effects') demonstrate the value of such credentials rather than the value of years of education per se (Hungerford and Solon 1987, Dickson and Smith 2011) which is likely to be particularly pertinent for elite careers which often rely on strict entry criteria based on prior academic attainment. Although this paper considers adulthood top job outcomes based on occupational class rather than income, top jobs as defined by occupational class are usually also the best paid occupations. For example, Goldthorpe and McKnight (2004) show a large earnings premium for NSSEC Class 1 occupations (higher managerial and professional) across the life cycle, particularly from approximately age 25 onwards. In terms of occupational outcomes, Devine and Li (2013) report persistent significant relationships between class origins and both education attainment and class destinations. Bukodi and Goldthorpe (2011) also highlight the influence of education, particularly higher tertiary qualifications, and class origin on access to the salariat, however they suggest that their research would be improved by the inclusion of women and analysis of non-cognitive skills.

This paper builds on these related areas of literature by applying a decomposition method from the intergenerational income mobility literature to analyse the persistence of occupational classes, specifically top jobs, across generations, as outlined in the following section.

(3) Methodology

This paper firstly estimates the intergenerational coefficient of 'top job' status in the UK, and secondly decomposes this association to identify the role of selected transmission mechanisms in the persistence of occupational advantage across generations. The method applied has previously been used to decompose the intergenerational income elasticity and identify the role of non cognitive skills, cognitive skills, educational attainment and labour market attachment in generating income persistence across generations (Blanden, Gregg & Macmillan, 2007). Green et al (2012) also discuss this method when decomposing the change in intergenerational income elasticity over time to observe the changing economic advantage to private school education, while Blanden, Gregg and Machin (2005) use this method to identify the change in the proportion of the intergenerational income elasticity accounted for by educational attainment over time. Macmillan (2013) further applies this method to decomposing the persistence of worklessness between fathers and sons to identify to the relative role of non-cognitive skills, cognitive skills and educational attainment. As in this paper, all of these papers mentioned also use BCS data for their decomposition analysis.

This paper firstly presents the 'intergenerational coefficient of top job status', as identified by β in equation 1⁶. As the top job variables are binary for both parents and children, β represents the increased chances (in percentage point terms) of a child accessing a top job in adulthood if they have a parent employed in a top job, rather than a non-top job, in childhood. This β coefficient represents an association between parental and childhood top job status rather than a causal relationship.

$$topjob_i^{child} = \alpha + \beta topjob_i^{parent} + \varepsilon_i$$

(1)

This β coefficient is subsequently decomposed to identify the relative contributions of non cognitive skills, cognitive skills, job aspirations and educational attainment to the transmission of top job status across generations. This decomposition analysis involves 3 stages: firstly analysing the early association between parental top job status and childhood skills (stage 1) and secondly assessing the association of these childhood skills with obtaining a top job in adulthood (stage 2). A strong relationship must be observed in both stages 1 and 2 for a skill to be identified as a key transmitter of top job status between generations (stage 3).

⁶ Age and age squared for both mother and father are controlled for in all equations as is usual in social mobility research (Blanden et al, 2007). Age controls are not required for cohort members who were all born in the same week in 1970. In line with the other studies mentioned, no other controls are included as the decomposition aims to identify the raw association of top job status across generations and highlight the role of selected transmission mechanisms. Missing dummy variables are included for all explanatory variables.

Considering initially solely the role of non-cognitive skills, β can be decomposed⁷ into the association of parental top job status with the child's non-cognitive skills, denoted by π_1 in equation 2 (stage 1), and the association of the child's non cognitive skills with their own top job status (conditional on parental top job status), denoted by γ_1 in equation 3 (stage 2). The stage 2 model is conditional on parental top job status due to the need to remove the effect of parental top job status on the non cognitive skills coefficient (as this effect was identified in stage 1).

$$\text{Stage 1: } \quad \text{noncog}_i^{\text{child}} = \alpha_1 + \pi_1 \text{topjob}_i^{\text{parent}} + \varepsilon_i \quad (2)$$

$$\text{Stage 2: } \quad \text{topjob}_i^{\text{child}} = \alpha_2 + \gamma_1 \text{noncog}_i^{\text{child}} + \delta \text{topjob}_i^{\text{parent}} + v_i \quad (3)$$

Substituting equation 2 into 3 and rearranging produces equation 4 (stage 3). The overall intergenerational coefficient of top job status (β) therefore equates to $(\gamma_1 \pi_1 + \delta)$ and hence can be decomposed into the portion explained by non-cognitive skills ($\gamma_1 \pi_1$) and the portion which remains unexplained by non-cognitive skills (δ).

$$\text{Stage 3: } \quad \text{topjob}_i^{\text{child}} = (\alpha_2 + \gamma_1 \alpha_1) + (\gamma_1 \pi_1 + \delta) \text{topjob}_i^{\text{parent}} + w_i \quad (4)$$

The method can be subsequently extended to incorporate a range of cognitive skills, job aspirations and educational attainment, by replicating equation 2 (stage 1) with these characteristics as the dependent variable (equations 5, 6 and 7).

$$\text{cog}_i^{\text{child}} = \alpha_3 + \pi_2 \text{topjob}_i^{\text{parent}} + \varepsilon_i \quad (5)$$

$$\text{asp}_i^{\text{child}} = \alpha_4 + \pi_3 \text{topjob}_i^{\text{parent}} + \varepsilon_i \quad (6)$$

$$\text{educ}_i^{\text{child}} = \alpha_5 + \pi_4 \text{topjob}_i^{\text{parent}} + \varepsilon_i \quad (7)$$

In addition to assessing whether these four sets of characteristics (non cognitive skills, cognitive skills, job aspirations and educational attainment) are transmission mechanisms of top job status from parent to child, the sets of characteristics are added sequentially by age in order to also observe potential relationships between earlier characteristics on later ones. Specifically, non-cognitive skills and cognitive skills at age 10 are initially included in the model, followed by job aspirations and educational attainment at age 16 and followed by later educational attainment in chronological order (A-level, undergraduate degree and postgraduate degree). Importantly, all coefficients represent associations between characteristics rather than causal relationships. Equation 3 (stage 2) therefore becomes:

⁷ The decomposition requires the use of linear models. For the models with binary outcomes these are linear probability models, such as those with top job status as a dependent variable. For these models, the majority of predicted probabilities fall with range 0 -1 (a maximum of 2.6% of cohort members fall outside this range in any one model).

$$topjob_i^{child} = \alpha_6 + \gamma_1 noncog_i^{child} + \gamma_2 cog_i^{child} + \gamma_3 asp_i^{child} + \gamma_4 educ_i^{child} + \delta topjob_i^{parent} + \varepsilon_i$$

(8)

Finally, substituting equations 5, 6 and 7 into 8, reveals that β now equates to $\gamma_1\pi_1 + \gamma_2\pi_2 + \gamma_3\pi_3 + \gamma_4\pi_4 + \delta$ (stage 3). Therefore the total intergenerational coefficient of top job status β can be split into portions explained by non-cognitive skills ($\gamma_1\pi_1$), cognitive skills ($\gamma_2\pi_2$), aspirations ($\gamma_3\pi_3$) and educational attainment ($\gamma_4\pi_4$) and a portion which remains unexplained by these characteristics (δ).

(4) Data

The intergenerational transmission of top job status is examined in this paper using data from the British Cohort Study (BCS), a longitudinal survey of an initial 17196 children born in Great Britain between 5th and 11th April 1970. Data has been collected across nine waves to date (birth and age 5, 10, 16, 26, 30, 34, 38 and 42), with attempts also made to track down individuals who may have been missed by the birth survey including those born abroad who subsequently moved to Great Britain, bringing the overall cohort size to 18740 members.

The BCS contains a wide range of cognitive and non cognitive measures in childhood alongside detailed educational attainment and occupational status data, making it particularly suitable for the analysis presented in this paper. Importantly, the cohort members are currently mid-career which allows for a range of life-cycle factors to be overcome which strengthens the analysis. For example, early career transitions experienced by many individuals are more likely to have stabilised, including individuals following 'non-traditional' entry pathways who may enter top jobs slightly later in their careers. Compared to more recent UK surveys (e.g. since the 1990s such as ALSPAC, LSYPE, DLHE) in which cohort members are currently in the very early stages of their careers, the BCS enables identification of individuals who have accessed top jobs during the whole of the first half of their potential working lives and hence offers a more representative measure of the intergenerational transmission of top job status.

(4.1) Top job status

Measures of occupational status in BCS

The BCS captures three measures of socio-economic status based on occupational data throughout adulthood: Social Class (SC, formerly Registrar General Social Class), Socio-economic Group (SEG) and National Statistics Socio-economic Classification (NSSEC). Since the early 2000s, NSSEC has replaced SC and SEG as the primary indicator of occupational status in the UK, with 'top jobs' being variously defined as analytic classes 1 to 3 out of 8 (Class 1: higher managerial, administrative and professional occupations; Class 2: lower professional and higher technical occupations; Class 3: intermediate occupations) or as a more elite subset of these groups, such as Class 1 only. The NSSEC classification was developed from the Goldthorpe Schema which categorises individuals based on employment relations, specifically the economic security, stability and prospects provided by their occupation.

As NSSEC is only available in the BCS from age 34 onwards this unfortunately does not capture early career data which would be required for a more comprehensive analysis of access to top jobs. However, due to the close alignment of SEG and NSSEC, a 'top job' metric has been created which combines four SEG categories (employers and managers in large establishments plus self employed and employed professionals) to closely approximate the Class 1 category in the seven-class

Goldthorpe Schema (professional, administrative and managerial employees – higher grade). This approach directly replicates the mapping applied by Goldthorpe & Jackson (2007) in their analysis of UK intergenerational class mobility using BCS (and NCDS) data. As the Goldthorpe Schema forms the basis of the NSSEC, this ‘top job’ grouping therefore aligns closely to Class 1 of the NSSEC 8 class version, namely higher managerial, administrative and professional occupations (Goldthorpe and McKnight, 2004). The main benefits of this approach are that SEG data is available in all adulthood waves (age 26 to 42) allowing a fuller representation of access to top jobs in adulthood and that SEG can be applied for both parents and cohort members allowing greater consistency when analysing the intergenerational transmission of top job status (NSSEC is unavailable for parents).

Cohort member top job status

Analysis of top job status by age in adulthood reveals that the overall proportion of cohort members employed in a top job remains very stable ranging from 16% to 18% (Table 1). However, at an individual level there appears to be substantial movement into and out of the top job category, in particular, 13% to 18% of cohort members report a non-top job in one wave yet report a top job in at least one other wave. The expectation that occupational status is fairly stable after age 30 may initially indicate that selecting one single wave of adulthood data would be adequate for analysis of access to top jobs, however this approach would define many cohort members as not accessing a top job in adulthood when in fact they do (i.e. understating the proportion of individuals accessing top jobs in adulthood). For example, using age 42 data only would categorise 1384 cohort members as being employed in a non-top job, when they report being in a top job in at least one other adulthood wave. Therefore in order to create a more comprehensive measure of access to top jobs, the five waves of data from age 26 to 42 will be combined in this paper to establish if the cohort member has *ever* (i.e. at least once) accessed a top job during this time (these figures are presented in column ‘ever’ in Table 1). This approach allows a top job status spanning age 26-42 to be created for 12,666 individuals which is substantially higher than is possible when using only one wave of data. Combining multiple waves also allows females a more equal chance of reporting their occupational status, when traditionally females may be excluded from similar analysis due to periods out of the labour market during the middle of their careers.

Table 1: Top job status by age of cohort member

Top job status	Age of cohort member					'Ever'
	26	30	34	38	42	
Top job	1282	1692	1332	1405	1521	3727
	17.6%	17.8%	16.3%	18.3%	17.8%	29.4%
Non-top job*	5995	7804	6850	6273	7014	8939
	82.4%	82.2%	83.7%	81.7%	82.2%	70.6%
Total (non-missing top job status)	7277	9496	8182	7678	8535	12666
Missing top job status	1726	1765	1483	1196	1306	6074
Total respondents per wave	9003	11261	9665	8874	9841	18740
Individuals reporting a non top job, who report a top job in at least one other wave.	1278	1477	1097	1359	1384	
	17.6%	15.6%	13.4%	17.7%	16.2%	
<i>*The 'non top job' category also includes individuals who report being 'unemployed-looking for work' but does not include individuals who are inactive in the labour market.</i>						
<i>All percentages calculated excluding missing data.</i>						

Parental top job status

A cohort member is defined as having a parent in a top job if either their mother or father ever reports being employed in a top job (using the same SEG definition) when the cohort member is aged 10 or 16.

Sample definition

As this paper is focussed on the intergenerational transmission of top job status, the estimation sample is restricted to 11154 cohort members (5672 males and 5482 females) for whom top job status data for themselves and their parents is available⁸. Top jobs are defined as 'employers and managers in large establishments plus self employed and employed professionals', whereas 'non top jobs' are defined as all other jobs plus individuals who are 'unemployed-looking for work' in order to capture all cohort members in the labour market who are available to access top or non-top jobs. For this sample, 17.6% of cohort members have a parent employed in a top job (at age 10 or 16) and 30.2% of cohort members access a top job in adulthood (age 26-42), as shown in Table 2. All figures in the remainder of the paper therefore relate only to this estimation sample, unless otherwise stated.

⁸ See Table A1 in the appendix for a reconciliation between the estimation sample of 11154 and the 18740 cohort members who have ever appeared in the survey. The difference is due to missing data in either their parents and/or their own top job status.

Relationship between parent and cohort member top job status

Initial descriptive statistics suggest a clear relationship between the top job status of parents and cohort members. Table 2 shows a 2x2 matrix of the top job and non-top job status of cohort members and their parents. Table 3 summarises the absolute mobility (and immobility) rates for the sample. These rates specifically relate to the two broad 'top job' and 'non top job' categories. This approach does not address much finer measures of mobility and immobility between the many occupational categories contained within top job and non-top job categories and therefore the rates stated here will be significantly different (lower for total mobility and higher for total immobility) to those stated in related literature (e.g. Goldthorpe and Jackson 2007). The overall rate of immobility for the sample (the sum of the two relevant diagonals) is 69.7%, indicating that this proportion of cohort members retain the same top job/non top job status as their parents. This figure includes 8.8% of 'immobile' cohort members who access a top job themselves in adulthood and whose parents report having a top job. Due to the relatively elite nature of top jobs, these figures appear modest when expressed as a percentage of the sample as in Table 2. Expressed alternatively, this shows that 49.6% (n=977/1968) of cohort members with a parent in a top job obtain a top job themselves in adulthood, compared to only 26.0% (n=2389/9186) of cohort members with parents reporting non-top jobs. Firstly, this demonstrates that there is clear evidence of upward mobility into top jobs (for 21.4% of the sample), indicating that many top jobs are accessed by individuals whose families do not have first-hand experience of these careers. In fact, over two thirds (71.0%) of cohort members who access top jobs (n=2389/3366), originate from 'non-top job families'. Secondly, however, these figures also show that despite there being some upward mobility into top jobs, there is a clear advantage to having parents with experience of these careers. This immobility with respect to top jobs and the related transmission mechanisms of this advantage is the focus of the analysis in this paper.

Relationship between parent and cohort member top job status, by gender

There is a clear relationship between gender and access to top jobs: 34.3% of males (n=1944/5672) access a top job in adulthood compared to 25.9% (n=1422/5482) of females (Table 2). When factoring in parental occupation, males also demonstrate greater immobility than females with respect to top job status (Table 3). Specifically, 10% of males access a top job and have parents who reported a top job, compared to 7.4% of females. Expressed alternatively, of the males with parents in top jobs, 56.9% (n=569/999) access a top job themselves in adulthood, compared to 42.0% (n=408/969) of similar females. Therefore even when the cohort members have a parent in a top job, their own outcomes in adulthood still vary by gender, with a considerable advantage for males.

Table 3 indicates that rates of upward and downward mobility also vary by gender, again particularly favouring males. Males appear to be more likely to be upwardly mobile than females, as 24.2% of males have parents in non-top jobs and access a

top job in adulthood, compared to 18.5% of females. Females also appear to be more likely to be downwardly mobile than males. 10.2% of females and 7.6% of males have parents with a top job, yet do not access a top job themselves in adulthood.

These gender effects cannot be explained by the percentage of parents in top jobs varying by the gender of the cohort member, as for both males and females 18% of parents report a top job (females 969/5482, males 999/5672). It is possible that these gender effects could either relate to different careers preferences by gender (Nikolaou, 2012) or be due to specific barriers to top jobs related to gender.

Due to these clear differences by gender in access to top jobs and immobility rates for top jobs, this paper will also present the later analysis by gender.

Table 2 – Parental and cohort member top job status as percentage of sample

(A)		Cohort member - all		
		Non-top job	Top job	Total
Parent	Non-top job	6797	2389	9186
		60.9%	21.4%	82.4%
	Top job	991	977	1968
		8.9%	8.8%	17.6%
	Total	7788	3366	11154
		69.8%	30.2%	100.0%
(B)		Cohort member - males		
		Non-top job	Top job	Total
Parent	Non-top job	3298	1375	4673
		58.1%	24.2%	82.4%
	Top job	430	569	999
		7.6%	10.0%	17.6%
	Total	3728	1944	5672
		65.7%	34.3%	100.0%
(C)		Cohort member - females		
		Non-top job	Top job	Total
Parent	Non-top job	3499	1014	4513
		63.8%	18.5%	82.3%
	Top job	561	408	969
		10.2%	7.4%	17.7%
	Total	4060	1422	5482
		74.1%	25.9%	100.0%

Table 3 – Absolute mobility rates (summarised from above)

	Mobility			Immobility		
	Downward	Upward	Total	Non top job	Top job	Total
All	8.9%	21.4%	30.3%	60.9%	8.8%	69.7%
Male	7.6%	24.2%	31.8%	58.1%	10.0%	68.2%
Female	10.2%	18.5%	28.7%	63.8%	7.4%	71.3%

(4.2) Childhood skills, aspirations and educational attainment

A range of childhood measures of cognitive skill, non-cognitive skill, job aspirations and later educational attainment are constructed in order to analyse their respective contributions to the intergenerational transmission of top job status.

Non cognitive skills

Seven non cognitive measures are included in this paper and are self reported by cohort members at age 10. They cover the broad concepts of self perception and awareness (represented by locus of control, self esteem and academic self concept); self control and regulation (represented by externalising behaviour and application); social skills and emotional health. These measures were selected following the literature review as they cover a broad range of skills and it is also possible to construct these measures using data captured in the BCS.

As each non-cognitive measure outlined below is a composite of several other sub-items, any missing responses for a sub-item have the potential to bias aggregate scores downwards (as zero points would be awarded for missing responses to sub-items). To avoid this bias, the sub-items have been aggregated as the mean of the non-missing responses, essentially creating an average score per item answered.

Self perception and self awareness

Self perception relates to an individual's own beliefs about whether or not they can accomplish a task, including self-concept of own ability and self-efficacy in the future (Gutman and Schoon, 2013) and self awareness relates to knowing, valuing and understanding oneself (Humphrey et al, 2010). Using the data available within BCS, these concepts are represented by three measures in this paper: locus of control, self esteem and academic self concept.

- *Locus of Control*

Locus of control captures a child's perception of control over their own achievement and is measured in BCS70 using the CARALOC questionnaire (Gammage, 1975). This measure has been widely used to assess the impact of childhood skills on adult outcomes (Conti, Heckman and Urzua 2010, Feinstein 2000, Prevoo and ter Weel 2013, Blanden, Gregg and Macmillan 2007, Macmillan 2013). The CARALOC questionnaire comprises 20 items (of which five are distractors) for which the responses 'yes', 'no' or 'don't know' are awarded points and aggregated (per Centre for Longitudinal Studies online guidance). The final locus of control measure therefore aggregates 15 items including 'do you think studying for tests is a waste of time?' and 'are you the kind of person who believes that planning ahead makes things turn out better'. A higher score represents a greater internal locus of control, indicating that the child's perceives they have a higher level of influence over their own outcomes.

- *Self-esteem*

Self esteem is captured in BCS70 by the Lawrence Self-Esteem Questionnaire (Lawrence, 1981) which is also widely used in similar research (Feinstein 2000, Prevoo and ter Weel 2013, Blanden, Gregg and Macmillan 2007, Macmillan 2013). This 'LAWSEQ' questionnaire contains 16 questions (of which four are distractors) for which the responses 'yes', 'no' or 'don't know' are awarded points and aggregated per scoring guidance in Lawrence (1981). The final self esteem measure therefore comprises 12 items including 'are there lots of things about yourself you would like to change' and 'do you think that other children often say nasty things about you?'. A higher score represents greater self esteem.

- *Academic Self-concept*

The academic self concept measure captures whether the child considers themselves to 'be good at' or 'do well in' a range of six academic school subjects – maths, spelling, creative writing, art and craft, and topics/projects. The binary responses for each subject are aggregated such that a higher total score represents a higher level of self confidence in the child's academic ability.

Self control and regulation

Self control and self regulation are widely used terms which are often used interchangeably and broadly relate to the ability to forgo short-term temptations, appetites and impulses in order to prioritise a higher pursuit (Gutman and Schoon, 2013) and managing how feelings are expressed (Humphrey et al, 2010). A review of related literature revealed numerous ways of defining and measuring self control and regulation. Specifically, a range of studies focus on definitions based on conscientiousness (as one personality component of 'OCEAN') or hyperactivity and conduct issues (often measured using the Rutter externalising behaviour metric), or some combination of these two approaches (Layard et al 2013, Prevoo and ter Weel 2013, O'Reilly et al 2014, Moffitt et al 2011, Duckworth & Seligman 2005, Blanden, Gregg and Macmillan 2007). However, there is substantial overlap between conscientiousness and externalising behaviour as measured using BCS70 data. As such, the analysis in this paper includes a traditional measure of Rutter externalising behaviour and includes an additional measure, termed 'application', which contains a range of conscientiousness related characteristics which do not overlap with externalising behaviour.

- *Externalising behaviour*

An externalising behaviour score for each child is created as a combination of ten conduct and hyperactivity characteristics contained within the mother-reported behaviour questionnaire in BCS70 (each item on a scale of 0-100) and originally outlined by Rutter (1970). The conduct subscale represents anti-social behaviour and captures whether the child exhibits a tendency to fight, steal, lie, bully, be destructive and be disobedient. The hyperactivity subscale represents behaviour related to 'motor' characteristics, specifically whether the child is restless, is fidgety, twitches or can't settle. A high score represents high externalising behaviour i.e. the child exhibits more severe behavioural issues related to conduct and hyperactivity.

- *Application*

An application score for each child is created as a combination of nine characteristics contained within the teacher reported Child Development Behaviour Questionnaire (each item is on a scale of 1-47). These characteristics are initially identified from a principle component analysis of this questionnaire included within BCS70 user guides (Butler et al, 1980). This proposes a 'disorganised activity' metric of 11 items which has since been used elsewhere as a measure of conscientiousness (O'Reilly et al 2014, Macmillan 2013) and, after factoring in 4 further variables, has also been used as a measure of application (Blanden, Gregg and Macmillan, 2007). Items which overlap with the externalising behaviour measure are then removed, leaving the final measure of application to capture whether the child daydreams, becomes bored, is easily confused, is forgetful, works independently, is lethargic, shows perseverance (if, and how much) and accepts the school curriculum. Items are coded and combined such that a higher score represents higher levels of application.

Social Skills

Social skills relate to the ability to build and maintain relationships (Gutman and Schoon, 2013). A measure of the ability of the child to generate such relationships with their peers is captured as a combination of six items from BCS70, specifically whether the child is popular with peers, has many friends, shows bold rather than shy behaviour, is cooperative with peers, is not liked and is solitary. These items are graded on a scale of 1-47 (teacher reported), except the latter two which are on a 1-100 scale (mother reported) but are adjusted onto a comparable scale and reverse coded where required such that a high aggregate score represents better social skills.

Emotional health

A measure of emotional behaviour is created using the definition of internalising or neurotic behaviour suggested in Rutter (1970). This is measured by aggregating six items from the mother reported child behaviour questionnaire in BCS70 (each on a scale of 0-100), capturing the extent to which the child is worried, miserable, fearful, fussy, sullen or sulky, or cries for little cause. A high score represents a high level of emotionality.

Cognitive skills

Cognitive ability in childhood is measured using five cognitive tests included in the age 10 survey. Firstly, these include a reading test assessing vocabulary, syntax, sequencing, comprehension and retention; a maths test assessing arithmetic, number skills, fractions, algebra, geometry and statistics; and the British Ability Scale, a proxy for IQ, containing two verbal subscales (word definitions and word similarities) and two non-verbal subscales (digit recall and matrices). These three tests have been used extensively in related research as measures of early cognitive ability and intellectual development (Feinstein 2000 and 2003b, Brown & Sullivan 2013, Macmillan 2013, Blanden, Gregg and Macmillan 2007, Layard 2013). Test scores from the pictorial language comprehension test are also included which capture a child's ability to match pictures to words, sentences and phrases explaining sequences of events (used in Feinstein 2003b). Finally, scores from a 'dictation task' are also included capturing writing and spelling ability (Prevo and ter Weel 2013, Brown and Sullivan 2013).

Job aspirations

A range of job aspirations are included in the age 16 BCS survey capturing the characteristics which matter to cohort members in their future career, with responses to each item being 'matters very much', 'matters somewhat' and 'does not matter'. Five of these aspirations have been selected for inclusion in this analysis due to their particular relevance to top jobs, specifically, to what extent they value a high wage, promotion, challenge, long term security and being trained for a trade or profession.

Educational attainment

As the key outcome variable analysed in this paper is access to top jobs during adulthood, defined as age 26-42, all explanatory variables should relate to years prior to age 26. However, the age 26 sweep suffers from a much poorer response rate of 55.2% than the age 30 survey of 70.4% (Ketende et al, 2010). This is due to the age 26 survey being a postal survey with a gap of 10 years since cohort members were last contacted and being the first time the cohort members had to opt into the survey themselves. The age 26 sweep also contains less detailed educational attainment than at age 30. These four measures of educational attainment applied in this paper are therefore created from the age 30 survey: number of GCSEs (and equivalents) at grade A-C, number of A-levels (and equivalents) at grade A-C, whether the individual has an undergraduate degree, and whether they have a higher degree (masters or

PhD). The latter two variables are then adjusted to ensure only undergraduate and higher degrees obtained by age 26 are included. This adjustment has not been made for GCSE and A-level grades due to the much smaller proportion of cohort members affected (less than 0.05% of all cohort members).

(4.3) Descriptive statistics

Descriptive statistics for the final estimation sample (n=11154) are included in the appendix (Table A2) for all non cognitive skills, cognitive skills, aspirations and educational attainment. The scores for non cognitive, cognitive and aspiration variables have been standardised across the population for whom these variables are reported to mean of zero and standard deviation of one, allowing a comparison of the characteristics of the estimation sample versus the BCS70 population. Individuals in the final estimation sample have slightly better non-cognitive and cognitive ability at age 10 than the mean of all cohort members in the BCS, and slightly higher aspiration scores at age 16.

Individuals in the sample also demonstrate slightly higher educational attainment than the population for whom educational attainment is reported. The sample possesses an average of 3.5 GCSEs at grades A-C (or equivalent) and 0.5 A-levels at grade A-C, compared to 3.3 and 0.4 respectively for the population. In the sample 17.4% of individuals hold an undergraduate degree and 2.2% hold a postgraduate degree compared to 16.1% and 2.0% for the population.

(5) Results

The intergenerational coefficient of top job status is presented in Table 4 (relates to equation 1) and represents an association between parental and childhood top job status rather than a causal relationship. Individuals with parents employed in a top job are 22.8ppts⁹ more likely to access a top job in adulthood than individuals with parents who are employed in a non top job. This intergenerational coefficient will now be decomposed in stages.

Table 4: Intergenerational coefficient of top job status.

	Access to a top job (age 26-42)		
Parental top job status	0.228	(0.011)	***
R-squared	0.041		
N	11154		
Standard error in parentheses. *** 99% confidence **95% confidence * 90% confidence			
Controls included for parental age and age squared			

Stage 1: Association between parental top job status and childhood skills

Table 5 presents the results from regressions of each individual skill on parental top job status, conditional on parental age and age squared (i.e. 21 different regressions; one for each skill as formalised in equations 2, 5, 6 and 7). Results are presented as the association between having a parent in a top job (versus a non-top job) and standard deviations of skill levels (for non cognitive, cognitive and aspirations); the additional number of GCSEs and A-levels obtained (for education up to age 18); and the percentage point chances of obtaining a degree or higher degree (for educational attainment post-18).

With the exception of having aspirations to earn a high wage or train for a trade or profession, all the variables (non-cognitive, cognitive, aspirations and educational attainment) are significantly associated with parental top job status. Individuals with parents who have first-hand experience of top jobs have better non cognitive skills at age 10. In particular, they have a higher internal locus of control (0.368 standard deviations) and higher levels of application (0.283 standard deviations). In addition to locus of control, the other two measures of self perception are also strongly related to parental top job status, with individuals having higher levels of self esteem (0.186 standard deviations) and academic self concept (0.146 standard deviations). Individuals with parents employed in top jobs also exhibit better peer relationships (0.143 standard deviations). Having a parent employed in a top job is negatively associated with externalising behaviour and emotionality (-0.238 and -0.127 standard deviations respectively).

⁹ The raw coefficient is 23.6% which reflects the descriptive data presented in Table 2 showing 49.6% (n=977/1968) of cohort members with a parent in a top job obtain a top job themselves in adulthood, compared to only 26.0% (n=2389/9186) of cohort members with parents reporting non-top jobs. This 23.6% coefficient reduces to 22.8% with the inclusion of controls for parental age and age squared.

Individuals with parents employed in top jobs also have higher cognitive ability at age 10, as parental top job status appears more strongly associated with cognitive skills than non cognitive skills (except for locus of control). Indeed, all five cognitive tests at age 10 show a strong relationship with parental top job status. In order of strength, these are reading (0.436 standard deviations), language comprehension (0.432 standard deviations), maths (0.407 standard deviations), British Ability Scale (0.371 standard deviations) and writing and spelling (0.291 standard deviations).

The results for aspirations at age 16 indicate a weaker association with parental top job status than for non-cognitive and cognitive skills at age 10. Having a parent employed in a top job is particularly associated with individuals valuing the opportunity for promotion and challenge in their future career, and to a lesser extent valuing job security. However, there appears to be no association between parental top job status and aspiring for a high wage or training for a trade or profession. This latter result may be due to conflating aspirations to train for trades and professions into one group, when these occupations may span both top job and non top job categories.

As might be expected from the findings for cognitive skills, parental top job status is also strongly associated with educational attainment at age 16, age 18 and in higher education. On average, individuals with parents employed in top jobs obtain an extra 2 GCSEs at grade A-C and an extra 0.5 A-levels at grade A-C than individuals with parents in non-top jobs. These individuals are also 21.7 percentage points more likely to obtain an undergraduate degree and 3 percentage points more likely to obtain a higher degree.

Stage 1 of this analysis therefore demonstrates that having a parent employed in a top job are significantly associated with childhood non-cognitive skills, cognitive skills, educational attainment and some types of aspirations. In order for these characteristics to make a substantial contribution to the intergenerational transmission of top job status, they must also be valuable in the labour market i.e. there must also be an association between these childhood characteristics and the chances of the individual obtaining a top job themselves in adulthood. This latter relationship is explored in the second stage of the decomposition.

Table 5: Association between parental top job status and childhood skills, job aspirations and educational attainment (stage 1)

	Coefficient on parental top job status		
<u>Non-cognitive skills – age 10</u>			
Locus of Control	0.368	(0.022)	***
Self esteem	0.186	(0.023)	***
Academic self concept	0.146	(0.023)	***
Rutter externalising	-0.238	(0.023)	***
Application	0.283	(0.022)	***
Peer relationships	0.143	(0.023)	***
Emotional	-0.127	(0.024)	***
<u>Cognitive skills – age 10</u>			
Edinburgh reading test	0.436	(0.021)	***
Friendly maths test	0.407	(0.021)	***
British ability scale	0.371	(0.021)	***
Pictorial language comprehension	0.432	(0.022)	***
Dictation test - writing and spelling	0.291	(0.022)	***
<u>Job aspirations - age 16</u>			
High wage	-0.017	(0.016)	
Promotion	0.090	(0.010)	***
Challenge	0.107	(0.016)	***
Security	0.037	(0.016)	**
Train for trade or profession	-0.007	(0.016)	
<u>Educational attainment - up to 16</u>			
Number of GCSEs grade A-C (and equivalents)	2.144	(0.078)	***
<u>Educational attainment – 16 to 18</u>			
Number of A-levels grade A-C (and equivalents)	0.544	(0.022)	***
<u>Educational attainment – post 18</u>			
Undergraduate degree	0.217	(0.008)	***
Higher degree	0.031	(0.003)	***
N = 11154 for each regression. Controls included for parental age and age squared. Standard errors in parentheses. *** 99% confidence **95% confidence * 90% confidence			

Stage 2: Association between childhood skills and top job status in adulthood

Table 6 presents associations (rather than causal relationships) between childhood characteristics and the chances of accessing a top job in adulthood, conditional on parental top job status (from equation 8). The models are built sequentially, adding non cognitive skills, cognitive skills, job aspirations and educational attainment each in turn. This not only shows the associations between all these characteristics and access to top jobs, but also indicates if associations between childhood non cognitive and cognitive skills and top job access may be operating through later aspirations and educational attainment.

Models 1 to 3 show the change in the percentage point chances of obtaining a top job in adulthood which is associated with a one standard deviation change in each skill. Model 1 and 2 firstly compare the influence of non cognitive skills and cognitive skills at age 10 when each are included separately. Of the non cognitive skills (model 1), application and locus of control are the most predictive of access to top jobs in adulthood, with each standard deviation of greater skill providing a 5.3ppt and 4.7ppt advantage respectively in accessing top jobs. Externalising and emotional behaviour show a small negative relationship with access to top jobs. Of the cognitive skills (model 2) ability in maths, language comprehension and reading are most strongly predictive of access to a top job, with each standard deviation in skill providing a 7.4ppt, 3.9ppt and 2.7ppt advantage respectively. The predictive power of these first two models is similar with an R-squared of 0.08 for non cognitive variables and 0.09 for cognitive variables. When added together (model 3), the predictive power of these variables only increases slightly (R-squared 0.10) indicating that these age 10 skills are predicting much of the same variation in top job status between cohort members. This interrelationship between cognitive and non cognitive ability at age 10 can be seen particularly in the changes of effect sizes for the most influential variables in Model 3. For example, the effect of a one standard deviation in application and locus of control reduces to 2.3ppt and 1.9ppt respectively, while effect sizes for maths, language comprehension and reading reduce to 6.4ppt, 3.4ppt and 1.7ppt respectively.

Models 4-6 incorporate job aspirations and educational attainment at age 16, first separately (models 4 and 5) and then together (model 6). Incorporating different types of job aspirations at age 16 (model 4) has very little influence on the effect sizes of the age 10 variables, suggesting that an individual's cognitive or non cognitive skill level at age 10 is not statistically related to the particular type of job aspirations they hold at age 16. This lack of a relationship between age 10 skills and age 16 aspirations relates specifically to the question posed in BCS as 'how much does it matter to you to' have a high wage, get promoted, have long term security etc, however there may well be relationships with non cognitive and cognitive skill and other types of aspirations, such as occupational type which are not explored in this analysis. Incorporating academic attainment at age 16 (model 5) shows a strong association between the number of GCSE grades at A-C and the chances of accessing a top job, and also demonstrates that the association of

earlier cognitive and non cognitive skills with top job status is partly operating through education attainment channels (shown by reductions in the effect sizes of the age 10 variables from model 3 to model 5). In model 6, of the various types of aspirations included, seeking promotion, challenge and job security are the most influential predictors of accessing a top job, with each standard deviation providing a 2.7ppt, 1.8ppt, 1.1ppt advantage in the chances of accessing a top job respectively. Aspiring to earn a high wage and training for a trade or profession appear to be unrelated to top job access. Each additional GCSE at grade A-C also improves the chances of accessing a top job by 2.8ppt.

Models 7-9 sequentially incorporate educational attainment at age 18, undergraduate level and postgraduate level to explore to what extent the associations between earlier non cognitive and cognitive skills and top job status operate through later education attainment. In model 9, the advantage for access to a top job is 2.9ppt for each A level (or equivalent) at grade A-C, 14.9ppt for an undergraduate degree and 8.7ppt for a postgraduate degree. Therefore this model suggests that an individual with 3 A levels (at grade A-C), an undergraduate degree and a postgraduate degree would be 32.3ppts more likely to access a top job than an individual who left school at age 16 (with the same skills and attainment up to that point). Even when these numerous later measures of educational attainment are included, several childhood variables remain significantly associated with access to top jobs in their own right. In particular, maths ability and language comprehension at age 10 remain particularly significant with each standard deviation in ability conferring a 4.5ppt and 2.5ppt advantage respectively in accessing a top job in adulthood. Locus of control and peer relationships also provide a 1ppt and 1.5ppt advantage per standard deviation. Aspirations at age 16 for promotion, challenge and job security also remain predictors of top job access, with aspirations of promotion alone offering almost the same advantage (2.7ppt) as one extra A-level at grade A-C.

Stage 2 of this analysis therefore highlights the significant associations between non cognitive skills (in particular locus of control and application) and cognitive skills (maths, language comprehension and reading) and the chances of accessing a top job, and that these associations largely operate through educational attainment at age 16 which itself is a significant predictor of top job access. Good peer relationships and low emotionality also appear predictive of top job status, even after the inclusion of aspirations and educational attainment. Given the elite nature of many top jobs, post-16 educational attainment is also highly related to securing a top job, with undergraduate degrees being particularly valuable.

Table 6: Association between childhood skills, job aspirations and educational attainment and top job status in adulthood (stage 2)

	Age 10 only			+ Age 16			+ Post 16		
	Model 1 Coeff.	Model 2 Coeff.	Model 3 Coeff.	Model 4 Coeff.	Model 5 Coeff.	Model 6 Coeff.	Model 7 Coeff.	Model 8 Coeff.	Model 9 Coeff.
<u>Non-cognitive skills – age 10</u>									
Locus of Control	0.047 *** (0.005)		0.019 *** (0.006)	0.019 *** (0.006)	0.013 ** (0.006)	0.013 ** (0.006)	0.012 ** (0.006)	0.010 * (0.006)	0.010 * (0.006)
Self esteem	0.009 * (0.005)		0.008 (0.005)	0.009 * (0.005)	0.007 (0.005)	0.007 (0.005)	0.006 (0.005)	0.007 (0.005)	0.007 (0.005)
Academic self concept	0.012 ** (0.005)		0.010 ** (0.005)	0.010 * (0.005)	0.007 (0.005)	0.007 (0.005)	0.007 (0.005)	0.006 (0.005)	0.006 (0.005)
Rutter externalising	-0.013 *** (0.005)		-0.010 ** (0.005)	-0.009 * (0.005)	-0.002 (0.005)	-0.002 (0.005)	-0.002 (0.005)	0.000 (0.005)	0.000 (0.005)
Application	0.053 *** (0.006)		0.023 *** (0.006)	0.020 *** (0.006)	0.010 * (0.006)	0.010 * (0.006)	0.009 (0.006)	0.008 (0.006)	0.008 (0.006)
Peer relationships	0.006 (0.005)		0.010 ** (0.005)	0.011 ** (0.005)	0.014 *** (0.005)	0.015 *** (0.005)	0.016 *** (0.005)	0.015 *** (0.005)	0.015 *** (0.005)
Emotional	-0.010 ** (0.005)		-0.006 (0.005)	-0.006 (0.005)	-0.009 * (0.005)	-0.008 * (0.005)	-0.008 (0.005)	-0.009 * (0.005)	-0.009 * (0.005)
<u>Cognitive skills – age 10</u>									
Edinburgh reading test		0.027 *** (0.008)	0.017 ** (0.008)	0.015 ** (0.008)	0.008 (0.008)	0.007 (0.008)	0.007 (0.008)	0.005 (0.008)	0.005 (0.008)
Friendly maths test		0.074 *** (0.008)	0.064 *** (0.008)	0.063 *** (0.008)	0.051 *** (0.008)	0.051 *** (0.008)	0.050 *** (0.007)	0.045 *** (0.007)	0.045 *** (0.007)
British ability scale		0.010 (0.007)	0.007 (0.007)	0.006 (0.007)	0.001 (0.006)	0.001 (0.006)	0.000 (0.006)	-0.001 (0.006)	-0.001 (0.006)
Pictorial language comprehension		0.039 *** (0.006)	0.034 *** (0.006)	0.033 *** (0.006)	0.027 *** (0.006)	0.026 *** (0.006)	0.024 *** (0.006)	0.024 *** (0.006)	0.024 *** (0.006)
Dictation test - writing and spelling		-0.005 (0.006)	-0.017 *** (0.006)	-0.017 *** (0.006)	-0.019 *** (0.006)	-0.019 *** (0.006)	-0.018 *** (0.006)	-0.018 *** (0.006)	-0.017 *** (0.006)
<u>Job aspirations - age 16</u>									
High wage				0.010 (0.007)		0.011 * (0.007)	0.010 (0.007)	0.009 (0.006)	0.009 (0.006)
Promotion				0.032 *** (0.007)		0.027 *** (0.007)	0.028 *** (0.007)	0.027 *** (0.007)	0.027 *** (0.007)
Challenge				0.026 *** (0.007)		0.018 *** (0.007)	0.013 ** (0.007)	0.011 * (0.006)	0.011 * (0.006)
Security				0.011 * (0.007)		0.011 * (0.007)	0.012 * (0.007)	0.012 * (0.007)	0.012 * (0.007)
Train for trade or profession				-0.007 (0.007)		-0.004 (0.006)	-0.004 (0.006)	-0.005 (0.006)	-0.005 (0.006)
<u>Educational attainment - up to 16</u>									
Number of GCSEs grade A-C (and equivalents)					0.029 *** (0.001)	0.028 *** (0.001)	0.018 *** (0.002)	0.015 *** (0.002)	0.015 *** (0.002)
<u>Educational attainment – 16 to 18</u>									
Number of A-levels grade A-C (and equivalents)							0.060 *** (0.006)	0.032 *** (0.006)	0.029 *** (0.006)
<u>Educational attainment – post 18</u>									
Undergraduate degree								0.155 *** (0.015)	0.149 *** (0.016)
Higher degree									0.087 *** (0.031)
N	11154	11154	11154	11154	11154	11154	11154	11154	11154
R sq.	0.080	0.094	0.101	0.109	0.132	0.137	0.146	0.166	0.167

Standard errors in parentheses. *** 99% confidence **95% confidence * 90% confidence. Controls included for parental top job status, parental age and parental age squared.

Stage 3 – Accounting for the intergenerational coefficient of top job status

Table 7 decomposes the overall intergenerational coefficient of top job status (0.228). This shows the contributions of each characteristic (non cognitive, cognitive, aspirations and educational attainment) to the intergenerational transmission of top job status. These contributions are calculated by multiplying the association between parental top job status and each characteristic (the coefficients from Stage 1 in Table 5) by the association between the characteristics and the cohort members' chances of obtaining a top job in adulthood (the coefficients from Stage 2 in table 6). Therefore for a skill, aspiration or aspect of attainment to account for a substantial part of the intergenerational coefficient, it must demonstrate a substantial association in both stage 1 and stage 2 models, otherwise it cannot attempt to explain the transmission of top job status between generations. These contributions are then summarised as the 'proportion explained' and 'proportion unexplained' of the intergenerational coefficient of top job status. The 'proportion unexplained' refers to the remaining direct relationship between parental and cohort member top job status which is not explained by the various characteristics included in the model.

Models 1 and 2 indicate that non cognitive skills alone account for 0.04 (18.1%) of the intergenerational coefficient, while cognitive skills account for 0.06 (26.9%). This is largely driven by the influence of locus of control, application and ability in maths, language comprehension and reading, all of which are shown to be particularly associated with top job status in stage 2. However, due to likely interrelationships between cognitive and non-cognitive skills at age 10 it is more meaningful to consider them together in model 3. As such, this set of childhood skills explains 29.5% of the total persistence, specifically non-cognitive skills explain 9.3% and cognitive skills explain 20.2%.

Aspirations at age 16 (in model 4) also partly explain the transmission of top job status, but make a smaller contribution (2.6%) than the age 10 skills. It appears that the children of parents in top jobs are more likely to have attitudes towards seeking promotion and challenge, characteristics which are sought after in the 'top job' labour market. The results also suggest that having aspirations for high wages is neither statistically related to parental top job status nor to accessing a top job in adulthood.

Overall, once education attainment from age 16 onwards is included sequentially (models 5-9), the decomposition explains over half (54.4%) the intergenerational transmission of top job status. The majority of this persistence can be accounted for by educational attainment from age 16 onwards (36.6%), particularly highlighting the importance of obtaining good GCSEs (14.2%) and an undergraduate degree (14.2%) for accessing top jobs. Even after including various measures of educational attainment, non cognitive and cognitive skills at age 10 remain key transmission mechanisms for top job status in their own right, contributing 4.9% and 11.1% of the persistence respectively. This effect is notably in addition to

associations between these skills and educational attainment (particularly shown here at age 16), therefore demonstrating the importance of early childhood skills in the intergenerational transmission of top job status. If a causal relationship could be proven, this would suggest that interventions to improve these early skills may generate benefits for an individual's educational attainment and their chances of accessing a competitive top job. Furthermore, if these interventions were particularly targeted in non-professional families, this may contribute to levelling the playing field in terms of access to top jobs.

The results also suggest that children with parents in top jobs largely obtain their significant advantage in the top job labour market through obtaining an undergraduate degree, rather than through obtaining a higher degree. Although postgraduate study is a significant predictor of top job status in adulthood (8.7ppts advantage, stage 2, Table 6), it appears to only have a small (although significant) association with parental top job status (stage 1, Table 5) and therefore obtaining a higher degree only accounts for 1.2% of the overall persistence in top job status, after controlling for prior educational attainment including obtaining a first degree.

This decomposition therefore explains over the half (54.4%) the intergenerational transmission of top job status through childhood skills, job aspirations and educational attainment. This is largely in line with a similar decomposition of intergenerational transmission of earnings (Blanden et al, 2007) in which a similar range of skills and characteristics account for 53.7% using BCS data, although there are some differences in the sample (they include fathers and sons only) and some additional skills analysed (some age 5 skills and unemployment in adulthood are included). However, this decomposition leaves the remaining half of the persistence in top job status unexplained. This requires further exploration to identify which other key transmission mechanisms may be providing an advantage in the labour market for children with parents employed in top jobs, such as access to professional networks and work experience opportunities.

Table 7: Accounting for the intergenerational coefficient of top job status (stage 3)

	Age 10 only			+ Age 16			+ Post 16											
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9									
<u>Non-cognitive skills – age 10</u>																		
Locus of Control	0.017	7.6%	0.007	3.1%	0.007	3.0%	0.005	2.2%	0.005	2.1%	0.005	2.0%	0.004	1.6%	0.004	1.5%		
Self esteem	0.002	0.8%	0.002	0.7%	0.002	0.7%	0.001	0.6%	0.001	0.6%	0.001	0.5%	0.001	0.6%	0.001	0.6%		
Academic self concept	0.002	0.8%	0.001	0.6%	0.001	0.6%	0.001	0.5%	0.001	0.4%	0.001	0.5%	0.001	0.4%	0.001	0.4%		
Rutter externalising	0.003	1.4%	0.002	1.1%	0.002	0.9%	0.001	0.2%	0.001	0.2%	0.001	0.2%	0.000	0.1%	0.000	0.0%		
Application	0.015	6.6%	0.006	2.8%	0.006	2.5%	0.003	1.3%	0.003	1.2%	0.003	1.2%	0.002	0.9%	0.002	1.0%		
Peer relationships	0.001	0.4%	0.001	0.6%	0.002	0.7%	0.002	0.9%	0.002	0.9%	0.002	1.0%	0.002	0.9%	0.002	0.9%		
Emotional	0.001	0.6%	0.001	0.3%	0.001	0.3%	0.001	0.5%	0.001	0.4%	0.001	0.4%	0.001	0.5%	0.001	0.5%		
Total non cognitive skills, age 10	0.041	18.1%	0.021	9.3%	0.020	8.8%	0.014	6.1%	0.014	5.9%	0.013	5.8%	0.011	4.9%	0.011	4.9%		
<u>Cognitive skills – age 10</u>																		
Edinburgh reading test		0.012	5.1%	0.008	3.3%	0.007	2.9%	0.003	1.5%	0.003	1.3%	0.003	1.3%	0.002	1.0%	0.002	1.0%	
Friendly maths test		0.030	13.2%	0.026	11.4%	0.026	11.2%	0.021	9.2%	0.021	9.1%	0.020	8.8%	0.018	8.1%	0.018	8.0%	
British ability scale		0.004	1.7%	0.002	1.1%	0.002	1.0%	0.000	0.1%	0.000	0.1%	0.000	0.0%	0.000	-0.1%	0.000	-0.2%	
Pictorial language comprehension		0.017	7.4%	0.015	6.5%	0.014	6.2%	0.012	5.2%	0.011	5.0%	0.010	4.6%	0.010	4.5%	0.010	4.5%	
Dictation - writing and spelling		-0.001	-0.6%	-0.005	-2.1%	-0.005	-2.1%	-0.006	-2.5%	-0.006	-2.5%	-0.005	-2.4%	-0.005	-2.2%	-0.005	-2.2%	
Total cognitive skills, age 10		0.061	26.9%	0.046	20.2%	0.044	19.2%	0.031	13.5%	0.030	13.1%	0.028	12.4%	0.025	11.2%	0.025	11.1%	
<u>Job aspirations - age 16</u>																		
High wage						0.000	-0.1%			0.000	-0.1%	0.000	-0.1%	0.000	-0.1%	0.000	-0.1%	
Promotion						0.003	1.3%			0.002	1.1%	0.003	1.1%	0.002	1.1%	0.002	1.1%	
Challenge						0.003	1.2%			0.002	0.8%	0.001	0.6%	0.001	0.5%	0.001	0.5%	
Security						0.000	0.2%			0.000	0.2%	0.000	0.2%	0.000	0.2%	0.000	0.2%	
Train for trade or profession						0.000	0.0%			0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.0%	
Total aspirations, age 16						0.006	2.6%			0.005	2.0%	0.004	1.9%	0.004	1.7%	0.004	1.7%	
<u>Educational attainment</u>																		
Number of GCSE grade A-C (and equivalents)								0.061	26.9%	0.059	25.9%	0.039	16.9%	0.032	14.2%	0.032	14.2%	
Number of Alevel grade A-C (and equivalents)												0.033	14.3%	0.017	7.6%	0.016	7.0%	
Undergraduate degree												0.034	14.8%	0.032	14.2%			
Higher degree														0.003	1.2%			
Total educational attainment								0.061	26.9%	0.059	25.9%	0.071	31.2%	0.083	36.5%	0.083	36.6%	
Proportion Explained	0.041	18.1%	0.061	26.9%	0.067	29.5%	0.070	30.7%	0.106	46.4%	0.107	46.9%	0.117	51.3%	0.124	54.4%	0.124	54.4%
Proportion Unexplained	0.186	81.9%	0.167	73.1%	0.161	70.5%	0.158	69.3%	0.122	53.6%	0.121	53.1%	0.111	48.7%	0.104	45.6%	0.104	45.6%
Total persistence	0.228		0.228		0.228		0.228		0.228		0.228		0.228		0.228		0.228	
Proportion unexplained consists of:																		
- Parental top job status	0.186		0.167		0.161		0.154		0.122		0.119		0.109		0.097		0.097	
- Missing dummies	0.000		0.000		0.000		0.004		0.000		0.002		0.002		0.007		0.007	

Intergenerational coefficient of top job status by gender

A similar decomposition of the intergenerational coefficient of top job status was carried out separately for male and female cohort members, with results for each stage presented in the appendix (Tables A3 to A5 for males and Tables A6 to A8 for females).

The intergenerational coefficient of top job status for all males and females contained within the estimation sample is shown in Table 8. Males with parents employed in top jobs are 26.7ppts more likely to access a top job in adulthood than males with parents employed in non-top jobs. This is higher than the comparable figure for females of 18.7ppts. The advantage to having a parent employed in a top job is therefore greater for males as males demonstrate greater immobility with respect to their parents top job status (as previously shown in Table 3)

Table 8: Intergenerational coefficient of top job status, by gender.

	Access to a top job (age 26-42)				
	Males			Females	
Parental top job status	0.267	(0.016)	***	0.187	(0.015) ***
R-squared	0.051			0.033	
N	5672			5482	
Standard error in parentheses. *** 99% confidence **95% confidence * 90% confidence					

The decomposition subsequently highlights that having a parent employed in a top job provides a greater benefit for females than males across a range of non-cognitive skills (stage 1). This relates particularly to self perception (locus of control, self esteem and academic self concept), peer relationships and emotional behaviour. It was also found that locus of control and application skills are particularly associated with accessing a top job for both genders, however peer relationships are also significant for females and low externalising behaviour is significant for males (stage 2, model 3). Overall, the decomposition (stage 3) explains slightly more of the intergenerational coefficient of top job status for females (57.6%) than for males (51.8%), although largely the same overall trends are observed for both genders as for the full estimation sample. This includes strong associations between cognitive and non cognitive skills at age 10 and top job status in adulthood, and that these associations appear to operate through educational attainment (especially at age 16). It also highlights the dominant role of educational attainment overall in the transmission of top job status.

(6) Discussion and conclusions

This paper estimates the intergenerational persistence in top job status and decomposes this relationship to assess the relative importance of four key transmission mechanisms of this advantage: non-cognitive skills, cognitive skills, job aspirations and educational attainment. The results show that parental employment in a top job is significantly associated with a child's chances of obtaining access to similar jobs in adulthood. Specifically, individuals with parents employed in a top job are 22.8ppts more likely to access a top job in adulthood than individuals with parents who are employed in a non top job. The effect was found to be stronger for males (26.7%) than for females (18.7%), showing that males are more immobile 'at the top'.

The decomposition of this relationship reveals an important role for childhood cognitive skills in the transmission of this advantage, accounting for 20.2% of the persistence in top job status, while non cognitive skills (especially locus of control and application) are also important characteristics accounting for 9.3%. Once job aspirations and educational attainment are also added to the model, these four transmission mechanisms together explain over the half (54.4%) the intergenerational persistence in top job status, largely driven by the substantial role of educational attainment as might be expected for accessing top occupations. It also appears that the contribution of cognitive and non cognitive skills to the transmission of top job status operates to a large extent through educational attainment from age 16 onwards.

The methodology applied in this paper has sought to improve on previous analyses where possible, for example by including individuals who are often excluded from social mobility research (mothers, daughters, self employed and individuals who are unemployed but looking for work). The top job status for cohort members is also based on occupational data across five BCS waves (including using the most recently available age 42 data) to provide a more representative measure of access to these occupations across adulthood and reduce the life cycle bias inherent in selecting any one particular wave. This approach also reduces the proportion of missing data in the top job metric and additionally allows females a more equal chance of reporting their top job status. Nonetheless, the approach is also subject to several limitations, most notably that the results presented describe associations between the characteristics of interest, rather than causal relationships. This limits the extent to which the findings can be used to directly support policy interventions to improve childhood skills with the aim of influencing social mobility. However, the results do highlight potential avenues for conducting robust evaluations of interventions to improve childhood cognitive and non cognitive skills with the aim of influencing access to top jobs either directly or through the influence of skills on education attainment. A further limitation is that the method applied does not allow conclusions to be drawn on role of genetics or parental resources in the transmission of top job status. In addition, the remaining half of the persistence in top job status remains unexplained. This requires further exploration to identify which other key transmission mechanisms may be providing an advantage in the labour market for children with parents employed in top jobs.

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Appendices

Table A1: Creation of the estimation sample

		Cohort member*				
		Non top job	Top job	Valid	Missing	Total
Parent*	Non top job	6797	2389	9186	2501	11687
	Top job	991	977	1968	301	2269
	Valid	7788	3366	11154	2802	13956
	Missing	1151	361	1512	3272	4784
	Total	8939	3727	12666	6074	18740
*Parent top job status when the cohort member is aged 10 and/or 16						
*Cohort member top job status between ages 26 and 42						

Of the 18740 cohort members who have ever appeared in the BCS data, 11154 individuals (59.5%) have data available for both their parent's top job status (at age 10 and/or 16) and their own top job status (from age 26-42). As both these measures are required to calculate the intergenerational coefficient of top job status, these 11154 individuals form the estimation sample.

The majority of the missing occupational data is due to a large percentage of the entire BCS cohort of 18740 individuals not responding at all to the survey in adulthood waves. For example (see Table 1 earlier in this paper), for the five adulthood waves (age 26 to 42) the number of survey respondents ranges from a minimum of 9003 (age 26) to a maximum of 11261 (age 30). Of these, approximately 1200 to 1800 individuals in each wave do not provide their own occupational data even though they respond to the survey, leaving valid top job data available for a minimum of 7277 (age 26) and a maximum of 9496 individuals (age 30).

However, the approach in this paper is to combine adulthood waves in order to capture whether an individual has accessed a top job at least once from age 26 to 42. This approach therefore has the added benefit of reducing the amount of missing data in the top job variable used as some individuals who are missing from one wave are present in other adulthood waves. This allows a top job status from age 26-42 to be created for 12,666 individuals which is substantially higher than is possible when using only one wave of data. Once individuals who are missing data for parental top job status are removed from this figure, the final estimation sample becomes 11154 individuals.

Table A2: Sample descriptive statistics

	Total (n=11154)				Males (n=5672)				Females (n=5482)			
	Mean	Standard deviation	Min	Max	Mean	Standard deviation	Min	Max	Mean	Standard deviation	Min	Max
<u>Top job status</u>												
Parental top job status	0.176	0.381	0	1	0.176	0.381	0	1	0.177	0.382	0	1
Cohort member top job status	0.302	0.459	0	1	0.343	0.475	0	1	0.259	0.438	0	1
<u>Non cognitive skills – age 10</u>												
Locus of Control	0.073	0.905	-3.008	1.844	0.076	0.897	-3.008	1.844	0.070	0.914	-3.008	1.844
Self esteem	0.038	0.911	-3.596	1.669	0.123	0.875	-3.157	1.669	-0.049	0.940	-3.596	1.669
Academic self concept	0.024	0.906	-2.670	1.386	0.039	0.891	-2.670	1.386	0.008	0.921	-2.670	1.386
Rutter externalising	-0.067	0.918	-1.534	5.881	0.072	0.983	-1.534	5.483	-0.210	0.822	-1.534	5.881
Application	0.091	0.893	-3.068	1.808	-0.040	0.929	-2.960	1.808	0.226	0.832	-3.068	1.808
Peer relationships	0.074	0.941	-4.254	2.103	0.057	0.963	-4.254	2.103	0.090	0.916	-4.190	2.103
Emotional	-0.026	0.953	-1.544	4.528	-0.068	0.924	-1.544	4.528	0.018	0.981	-1.544	4.344
<u>Cognitive skills – age 10</u>												
Edinburgh reading test	0.112	0.857	-2.574	1.896	0.056	0.886	-2.574	1.896	0.169	0.823	-2.574	1.896
Friendly maths test	0.114	0.849	-3.491	2.308	0.152	0.883	-3.491	2.308	0.075	0.811	-3.491	2.308
British ability scale	0.105	0.854	-4.329	2.971	0.082	0.857	-3.655	2.701	0.129	0.850	-4.329	2.971
Pictorial language comprehension	0.107	0.900	-5.390	3.727	0.162	0.911	-5.390	3.727	0.051	0.884	-5.390	3.727
Dictation - writing and spelling	0.078	0.876	-3.511	1.451	-0.033	0.908	-3.511	1.451	0.193	0.825	-3.157	1.451
<u>Job aspirations</u>												
High wage	-0.014	0.645	-2.374	1.047	0.044	0.583	-2.374	1.047	-0.074	0.697	-2.374	1.047
Promotion	0.010	0.642	-2.018	0.910	0.031	0.580	-2.018	0.910	-0.012	0.700	-2.018	0.910
Challenge	0.013	0.644	-1.774	1.128	0.003	0.588	-1.774	1.128	0.024	0.697	-1.774	1.128
Security	0.023	0.640	-2.281	0.810	0.060	0.571	-2.281	0.810	-0.016	0.702	-2.281	0.810
Train for trade or profession	0.008	0.643	-2.100	0.846	0.007	0.602	-2.100	0.846	0.008	0.684	-2.100	0.846
<u>Educational attainment</u>												
Number of GCSE grade A-C (and equivalents)	3.549	3.229	0	20	3.381	3.186	0	20	3.724	3.264	0	19
Number of Alevel grade A-C (and equivalents)	0.470	0.901	0	10	0.463	0.907	0	10	0.477	0.895	0	6
Undergraduate degree	0.174	0.350	0	1	0.178	0.349	0	1	0.170	0.351	0	1
Higher degree	0.022	0.135	0	1	0.025	0.144	0	1	0.018	0.124	0	1

Table A3: Stage 1 results (Male only) –Association between parental top job status and childhood skills, job aspirations and educational attainment

	Coefficient on parental top job status		
<u>Non-cognitive skills – age 10</u>			
Locus of Control	0.356	(0.031)	***
Self esteem	0.156	(0.031)	***
Academic self concept	0.109	(0.031)	***
Rutter externalising	-0.258	(0.034)	***
Application	0.305	(0.032)	***
Peer relationships	0.115	(0.034)	***
Emotional	-0.086	(0.032)	***
<u>Cognitive skills – age 10</u>			
Edinburgh reading test	0.444	(0.030)	***
Friendly maths test	0.428	(0.030)	***
British ability scale	0.372	(0.030)	***
Pictorial language comprehension	0.450	(0.031)	***
Dictation test - writing and spelling	0.300	(0.032)	***
<u>Job aspirations - age 16</u>			
High wage	-0.013	(0.020)	
Promotion	0.085	(0.020)	***
Challenge	0.077	(0.021)	***
Security	0.030	(0.020)	
Train for trade or profession	-0.034	(0.021)	
<u>Educational attainment - up to 16</u>			
Number of GCSEs grade A-C (and equivalents)	2.195	(0.108)	***
<u>Educational attainment – 16 to 18</u>			
Number of A-levels grade A-C (and equivalents)	0.538	(0.031)	***
<u>Educational attainment – post 18</u>			
Undergraduate degree	0.212	(0.012)	***
Higher degree	0.041	(0.005)	***
N = 5672 for each regression. Controls included for parental age and age squared. Standard errors in parentheses. *** 99% confidence **95% confidence * 90% confidence			

Table A4: Stage 2 results (Male only) – Association between childhood skills, job aspirations and educational attainment and top job status in adulthood

	Age 10 only			+ Age 16			+ Post 16		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
<u>Non-cognitive skills – age 10</u>									
Locus of Control	0.054 *** (0.008)		0.027 *** (0.008)	0.027 *** (0.008)	0.019 ** (0.008)	0.020 ** (0.008)	0.020 ** (0.008)	0.016 ** (0.008)	0.015 ** (0.008)
Self esteem	0.002 (0.008)		0.001 (0.007)	0.001 (0.007)	-0.001 (0.007)	-0.001 (0.007)	-0.002 (0.007)	-0.001 (0.007)	-0.001 (0.007)
Academic self concept	0.009 (0.007)		0.007 (0.007)	0.006 (0.007)	0.003 (0.007)	0.002 (0.007)	0.002 (0.007)	0.001 (0.007)	0.001 (0.007)
Rutter externalising	-0.029 *** (0.007)		-0.023 *** (0.007)	-0.023 *** (0.007)	-0.015 ** (0.007)	-0.015 ** (0.007)	-0.015 ** (0.007)	-0.010 (0.007)	-0.010 (0.007)
Application	0.073 *** (0.008)		0.040 *** (0.008)	0.037 *** (0.008)	0.027 *** (0.008)	0.026 *** (0.008)	0.025 *** (0.008)	0.020 ** (0.008)	0.020 ** (0.008)
Peer relationships	-0.004 (0.007)		0.002 (0.007)	0.004 (0.007)	0.008 (0.007)	0.008 (0.007)	0.010 (0.007)	0.010 (0.007)	0.010 (0.007)
Emotional	-0.003 (0.007)		0.000 (0.007)	0.001 (0.007)	-0.002 (0.007)	-0.001 (0.007)	-0.001 (0.007)	-0.003 (0.007)	-0.003 (0.007)
<u>Cognitive skills – age 10</u>									
Edinburgh reading test		0.053 *** (0.012)	0.041 *** (0.012)	0.038 *** (0.012)	0.031 *** (0.012)	0.030 *** (0.012)	0.029 *** (0.012)	0.027 ** (0.012)	0.027 ** (0.012)
Friendly maths test		0.063 *** (0.011)	0.047 *** (0.011)	0.046 *** (0.011)	0.032 *** (0.011)	0.032 *** (0.011)	0.030 *** (0.011)	0.026 ** (0.011)	0.026 ** (0.011)
British ability scale		0.014 (0.009)	0.009 (0.009)	0.008 (0.009)	0.004 (0.009)	0.003 (0.009)	0.003 (0.009)	0.001 (0.009)	0.001 (0.009)
Pictorial language comprehension		0.031 *** (0.008)	0.025 *** (0.008)	0.023 *** (0.008)	0.017 ** (0.008)	0.016 * (0.008)	0.014 * (0.008)	0.014 * (0.008)	0.014 * (0.008)
Dictation - writing and spelling		-0.005 (0.009)	-0.020 ** (0.009)	-0.019 ** (0.009)	-0.022 ** (0.009)	-0.021 ** (0.009)	-0.020 ** (0.009)	-0.017 ** (0.009)	-0.017 ** (0.009)
<u>Job aspirations - age 16</u>									
High wage				0.003 (0.011)		0.006 (0.010)	0.005 (0.010)	0.005 (0.010)	0.005 (0.010)
Promotion				0.037 *** (0.011)		0.031 *** (0.011)	0.034 *** (0.011)	0.032 *** (0.011)	0.032 *** (0.011)
Challenge				0.031 *** (0.010)		0.024 ** (0.010)	0.019 * (0.010)	0.016 (0.010)	0.016 (0.010)
Security				0.011 (0.011)		0.010 (0.011)	0.008 (0.011)	0.007 (0.011)	0.007 (0.011)
Train for trade or profession				-0.017 * (0.010)		-0.009 (0.010)	-0.008 (0.010)	-0.007 (0.010)	-0.008 (0.010)
<u>Educational attainment - up to 16</u>									
Number of GCSE grade A-C (and equivalents)					0.033 *** (0.002)	0.032 *** (0.002)	0.022 *** (0.002)	0.018 *** (0.003)	0.018 *** (0.003)
<u>Educational attainment – 16 to 18</u>									
Number of Alevel grade A-C (and equivalents)							0.061 *** (0.008)	0.029 *** (0.009)	0.026 *** (0.009)
<u>Educational attainment – post 18</u>									
Undergraduate degree								0.183 *** (0.022)	0.179 *** (0.023)
Higher degree									0.056 (0.042)
N	5672	5672	5672	5672	5672	5672	5672	5672	5672
R sq.	0.1035	0.1123	0.1239	0.132	0.1618	0.1666	0.1763	0.2054	0.2057

Standard errors in parentheses. *** 99% confidence **95% confidence * 90% confidence. Controls included for parental top job status, parental age and parental age squared.

Table A5: Stage 3 results (Male only) - Accounting for the intergenerational coefficient of top job status

	Age 10 only						+ Age 16						+ Post 16					
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9	
Non-cognitive skills – age 10																		
Locus of Control	0.019	7.2%			0.010	3.6%	0.009	3.5%	0.007	2.6%	0.007	2.6%	0.007	2.6%	0.006	2.1%	0.006	2.1%
Self esteem	0.000	0.1%			0.000	0.0%	0.000	0.1%	0.000	-0.1%	0.000	-0.1%	0.000	-0.1%	0.000	-0.1%	0.000	-0.1%
Academic self concept	0.001	0.4%			0.001	0.3%	0.001	0.2%	0.000	0.1%	0.000	0.1%	0.000	0.1%	0.000	0.0%	0.000	0.0%
Rutter externalising	0.007	2.8%			0.006	2.2%	0.006	2.2%	0.004	1.5%	0.004	1.5%	0.004	1.5%	0.003	1.0%	0.003	1.0%
Application	0.022	8.4%			0.012	4.6%	0.011	4.3%	0.008	3.1%	0.008	3.0%	0.008	2.9%	0.006	2.3%	0.006	2.3%
Peer relationships	0.000	-0.2%			0.000	0.1%	0.000	0.2%	0.001	0.3%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%
Emotional	0.000	0.1%			0.000	0.0%	0.000	0.0%	0.000	0.1%	0.000	0.0%	0.000	0.0%	0.000	0.1%	0.000	0.1%
Total non cognitive skills, age 10	0.050	18.7%			0.029	10.8%	0.028	10.4%	0.020	7.6%	0.020	7.5%	0.020	7.3%	0.016	5.9%	0.016	5.9%
Cognitive skills – age 10																		
Edinburgh reading test			0.023	8.8%	0.018	6.7%	0.017	6.3%	0.014	5.2%	0.013	4.9%	0.013	4.9%	0.012	4.5%	0.012	4.5%
Friendly maths test			0.027	10.1%	0.020	7.6%	0.020	7.3%	0.014	5.2%	0.014	5.1%	0.013	4.9%	0.011	4.2%	0.011	4.1%
British ability scale			0.005	1.9%	0.003	1.2%	0.003	1.1%	0.001	0.5%	0.001	0.4%	0.001	0.4%	0.000	0.2%	0.000	0.1%
Pictorial language comprehension			0.014	5.2%	0.011	4.2%	0.010	3.9%	0.007	2.8%	0.007	2.6%	0.006	2.3%	0.006	2.4%	0.006	2.4%
Dictation - writing and spelling			-0.001	-0.5%	-0.006	-2.2%	-0.006	-2.1%	-0.007	-2.4%	-0.006	-2.4%	-0.006	-2.2%	-0.005	-2.0%	-0.005	-1.9%
Total cognitive skills, age 10			0.068	25.4%	0.047	17.5%	0.044	16.5%	0.030	11.2%	0.029	10.7%	0.027	10.2%	0.025	9.2%	0.025	9.2%
Job aspirations - age 16																		
High wage							0.000	0.0%			0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.0%
Promotion							0.003	1.2%			0.003	1.0%	0.003	1.1%	0.003	1.0%	0.003	1.0%
Challenge							0.002	0.9%			0.002	0.7%	0.001	0.5%	0.001	0.5%	0.001	0.5%
Security							0.000	0.1%			0.000	0.1%	0.000	0.1%	0.000	0.1%	0.000	0.1%
Train for trade or profession							0.001	0.2%			0.000	0.1%	0.000	0.1%	0.000	0.1%	0.000	0.1%
Total aspirations, age 16							0.006	2.4%			0.005	1.9%	0.005	1.8%	0.004	1.6%	0.004	1.7%
Educational attainment																		
Number of GCSE grade A-C (and equivalents)									0.073	27.3%	0.070	26.4%	0.047	17.7%	0.039	14.7%	0.040	14.8%
Number of Alevel grade A-C (and equivalents)													0.033	12.3%	0.015	5.8%	0.014	5.3%
Undergraduate degree														0.039	14.5%	0.038	14.2%	
Higher degree																0.002	0.8%	
Total educational attainment									0.073	27.3%	0.070	26.4%	0.080	30.0%	0.093	34.9%	0.094	35.1%
Proportion Explained	0.050	18.7%	0.068	25.4%	0.076	28.3%	0.078	29.3%	0.123	46.0%	0.124	46.4%	0.132	49.4%	0.138	51.7%	0.139	51.8%
Proportion Unexplained	0.217	81.3%	0.199	74.6%	0.192	71.7%	0.189	70.7%	0.144	54.0%	0.143	53.6%	0.135	50.6%	0.129	48.3%	0.129	48.2%
Total persistence	0.267		0.267		0.267		0.267		0.267		0.267		0.267		0.267		0.267	
Proportion unexplained consists of:																		
- Parental top job status	0.217		0.199		0.192		0.183		0.145		0.140		0.132		0.119		0.119	
- Missing dummies	0.000		0.000		0.000		0.006		0.000		0.003		0.003		0.010		0.010	

Table A6: Stage 1 results (Female only) – Association between parental top job status and childhood skills, job aspirations and educational attainment

	<u>Coefficient on parental top job status</u>		
<u>Non-cognitive skills – age 10</u>			
Locus of Control	0.381	(0.032)	***
Self esteem	0.219	(0.033)	***
Academic self concept	0.184	(0.033)	***
Rutter externalising	-0.213	(0.029)	***
Application	0.258	(0.029)	***
Peer relationships	0.171	(0.033)	***
Emotional	-0.170	(0.035)	***
<u>Cognitive skills – age 10</u>			
Edinburgh reading test	0.426	(0.029)	***
Friendly maths test	0.388	(0.028)	***
British ability scale	0.372	(0.030)	***
Pictorial language comprehension	0.416	(0.031)	***
Dictation test - writing and spelling	0.281	(0.029)	***
<u>Job aspirations - age 16</u>			
High wage	-0.025	(0.025)	
Promotion	0.093	(0.025)	***
Challenge	0.139	(0.025)	***
Security	0.040	(0.025)	
Train for trade or profession	0.020	(0.024)	
<u>Educational attainment - up to 16</u>			
Number of GCSEs grade A-C (and equivalents)	2.086	(0.112)	***
<u>Educational attainment – 16 to 18</u>			
equivalents)	0.549	(0.031)	***
<u>Educational attainment – post 18</u>			
Undergraduate degree	0.223	(0.012)	***
Higher degree	0.021	(0.004)	***
N = 5482 for each regression. Controls included for parental age and age squared. Standard errors in parentheses. *** 99% confidence **95% confidence * 90% confidence			

Table A7: Stage 2 results (Female only) – Association between childhood skills, job aspirations and educational attainment and top job status in adulthood

	Age 10 only			+ Age 16			+ Post 16		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Non-cognitive skills – age 10									
Locus of Control	0.038 *** (0.007)		0.014 * (0.008)	0.013 (0.008)	0.009 (0.008)	0.009 (0.008)	0.007 (0.008)	0.006 (0.008)	0.006 (0.008)
Self esteem	0.003 (0.007)		0.005 (0.007)	0.005 (0.007)	0.003 (0.007)	0.003 (0.007)	0.002 (0.007)	0.003 (0.007)	0.003 (0.007)
Academic self concept	0.013 * (0.007)		0.009 (0.007)	0.009 (0.007)	0.008 (0.007)	0.007 (0.007)	0.009 (0.007)	0.007 (0.007)	0.007 (0.007)
Rutter externalising	-0.017 ** (0.008)		-0.013 (0.008)	-0.011 (0.008)	-0.006 (0.008)	-0.005 (0.008)	-0.005 (0.008)	-0.006 (0.008)	-0.006 (0.008)
Application	0.050 *** (0.008)		0.018 ** (0.009)	0.016 * (0.009)	0.007 (0.009)	0.006 (0.009)	0.006 (0.009)	0.007 (0.009)	0.007 (0.009)
Peer relationships	0.015 ** (0.007)		0.017 ** (0.007)	0.018 ** (0.007)	0.020 *** (0.007)	0.021 *** (0.007)	0.021 *** (0.007)	0.020 *** (0.007)	0.020 *** (0.007)
Emotional	-0.006 (0.007)		-0.004 (0.007)	-0.004 (0.007)	-0.006 (0.007)	-0.005 (0.007)	-0.005 (0.007)	-0.005 (0.007)	-0.005 (0.007)
Cognitive skills – age 10									
Edinburgh reading test		0.013 (0.011)	0.006 (0.011)	0.002 (0.011)	-0.004 (0.011)	-0.006 (0.011)	-0.006 (0.011)	-0.007 (0.011)	-0.007 (0.011)
Friendly maths test		0.064 *** (0.011)	0.054 *** (0.011)	0.052 *** (0.011)	0.042 *** (0.011)	0.041 *** (0.011)	0.040 *** (0.011)	0.037 *** (0.011)	0.037 *** (0.011)
British ability scale		0.013 (0.009)	0.009 (0.009)	0.009 (0.009)	0.003 (0.009)	0.004 (0.009)	0.003 (0.009)	0.002 (0.009)	0.002 (0.009)
Pictorial language comprehension		0.036 *** (0.008)	0.031 *** (0.008)	0.030 *** (0.008)	0.024 *** (0.008)	0.024 *** (0.008)	0.021 *** (0.008)	0.020 *** (0.008)	0.020 ** (0.008)
Dictation - writing and spelling		0.011 (0.009)	0.001 (0.009)	0.001 (0.009)	-0.001 (0.009)	-0.001 (0.009)	-0.001 (0.009)	-0.001 (0.009)	-0.001 (0.009)
Job aspirations - age 16									
High wage				0.003 (0.009)		0.003 (0.008)	0.001 (0.008)	0.001 (0.008)	0.001 (0.008)
Promotion				0.027 *** (0.009)		0.023 *** (0.009)	0.023 *** (0.009)	0.022 *** (0.009)	0.022 *** (0.009)
Challenge				0.028 *** (0.009)		0.020 ** (0.008)	0.016 * (0.008)	0.014 * (0.008)	0.014 * (0.008)
Security				0.005 (0.008)		0.004 (0.008)	0.007 (0.008)	0.007 (0.008)	0.007 (0.008)
Train for trade or profession				0.004 (0.009)		0.004 (0.008)	0.003 (0.008)	0.002 (0.008)	0.002 (0.008)
Educational attainment - up to 16									
Number of GCSEs grade A-C (and equivalents)					0.025 *** (0.002)	0.024 *** (0.002)	0.016 *** (0.002)	0.014 *** (0.002)	0.014 *** (0.002)
Educational attainment – 16 to 18									
Number of Alevels grade A-C (and equivalents)							0.055 *** (0.008)	0.036 *** (0.009)	0.034 *** (0.009)
Educational attainment – post 18									
Undergraduate degree								0.104 *** (0.021)	0.099 *** (0.022)
Higher degree									0.092 ** (0.046)
N	5482	5482	5482	5482	5482	5482	5482	5482	5482
R sq.	0.067	0.077	0.085	0.094	0.112	0.118	0.126	0.137	0.138

Standard errors in parentheses. *** 99% confidence **95% confidence * 90% confidence. Controls included for parental top job status, parental age and parental age squared.

Table A8: Stage 3 results (Female only): Accounting for the intergenerational coefficient of top job status

	Age 10 only			+ Age 16			+ Post 16		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Non-cognitive skills – age 10									
Locus of Control	0.015 7.8%		0.005 2.8%	0.005 2.6%	0.004 1.9%	0.003 1.7%	0.003 1.5%	0.002 1.2%	0.002 1.2%
Self esteem	0.001 0.3%		0.001 0.6%	0.001 0.5%	0.001 0.4%	0.001 0.4%	0.000 0.2%	0.001 0.3%	0.001 0.4%
Academic self concept	0.002 1.3%		0.002 0.9%	0.002 0.9%	0.001 0.8%	0.001 0.7%	0.002 0.8%	0.001 0.7%	0.001 0.7%
Rutter externalising	0.004 1.9%		0.003 1.5%	0.002 1.3%	0.001 0.7%	0.001 0.6%	0.001 0.6%	0.001 0.7%	0.001 0.7%
Application	0.013 6.8%		0.005 2.5%	0.004 2.2%	0.002 1.0%	0.002 0.8%	0.002 0.9%	0.002 0.9%	0.002 0.9%
Peer relationships	0.003 1.4%		0.003 1.6%	0.003 1.7%	0.003 1.8%	0.004 1.9%	0.004 2.0%	0.003 1.8%	0.003 1.8%
Emotional	0.001 0.6%		0.001 0.3%	0.001 0.3%	0.001 0.5%	0.001 0.5%	0.001 0.5%	0.001 0.5%	0.001 0.5%
Total non cognitive skills, age 10	0.038 20.0%		0.019 10.2%	0.018 9.5%	0.013 7.0%	0.012 6.6%	0.012 6.5%	0.012 6.2%	0.012 6.2%
Cognitive skills – age 10									
Edinburgh reading test		0.006 3.0%	0.002 1.3%	0.001 0.5%	-0.002 -0.8%	-0.002 -1.3%	-0.002 -1.3%	-0.003 -1.6%	-0.003 -1.6%
Friendly maths test		0.025 13.2%	0.021 11.3%	0.020 10.8%	0.016 8.7%	0.016 8.5%	0.016 8.3%	0.014 7.7%	0.014 7.6%
British ability scale		0.005 2.5%	0.004 1.9%	0.003 1.8%	0.001 0.7%	0.001 0.7%	0.001 0.5%	0.001 0.4%	0.001 0.4%
Pictorial language comprehension		0.015 8.1%	0.013 7.0%	0.012 6.6%	0.010 5.4%	0.010 5.3%	0.009 4.7%	0.008 4.5%	0.008 4.5%
Dictation - writing and spelling		0.003 1.7%	0.000 0.1%	0.000 0.2%	0.000 -0.2%	0.000 -0.1%	0.000 -0.1%	0.000 -0.2%	0.000 -0.2%
Total cognitive skills, age 10		0.053 28.5%	0.040 21.5%	0.037 19.9%	0.026 13.8%	0.024 13.1%	0.023 12.1%	0.020 10.9%	0.020 10.8%
Job aspirations - age 16									
High wage				0.000 0.0%		0.000 0.0%	0.000 0.0%	0.000 0.0%	0.000 0.0%
Promotion				0.003 1.3%		0.002 1.1%	0.002 1.1%	0.002 1.1%	0.002 1.1%
Challenge				0.004 2.1%		0.003 1.5%	0.002 1.2%	0.002 1.0%	0.002 1.1%
Security				0.000 0.1%		0.000 0.1%	0.000 0.1%	0.000 0.1%	0.000 0.1%
Train for trade or profession				0.000 0.0%		0.000 0.0%	0.000 0.0%	0.000 0.0%	0.000 0.0%
Total aspirations, age 16				0.007 3.5%		0.005 2.7%	0.005 2.5%	0.004 2.3%	0.004 2.3%
Educational attainment									
Number of GCSE grade A-C (and equivalents)					0.053 28.1%	0.050 26.6%	0.033 17.6%	0.029 15.6%	0.029 15.5%
Number of Alevel grade A-C (and equivalents)							0.030 16.0%	0.020 10.4%	0.019 10.0%
Undergraduate degree							0.023 12.5%	0.022 11.8%	
Higher degree								0.002 1.0%	
Total educational attainment					0.053 28.1%	0.050 26.6%	0.063 33.7%	0.072 38.5%	0.072 38.3%
Proportion Explained	0.038 20.0%	0.053 28.5%	0.059 31.7%	0.062 32.9%	0.091 48.9%	0.092 49.0%	0.103 54.7%	0.108 57.8%	0.108 57.6%
Proportion Unexplained	0.150 80.0%	0.134 71.5%	0.128 68.3%	0.126 67.1%	0.096 51.1%	0.095 51.0%	0.085 45.3%	0.079 42.2%	0.079 42.4%
Total persistence	0.187	0.187	0.187	0.187	0.187	0.187	0.187	0.187	0.187
Proportion unexplained consists of:									
- Parental top job status	0.150	0.134	0.129	0.121	0.097	0.092	0.081	0.072	0.072
- Missing dummies	-0.001	0.000	-0.001	0.005	-0.001	0.003	0.004	0.007	0.007