

Literature review

# 'Non-cognitive' skills: What are they and how can they be measured in the British cohort studies?

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**‘Non-cognitive’ skills:  
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measured in the British cohort studies?  
A literature review**

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## **Abstract**

This paper is a serendipitous interdisciplinary review of literature prepared as background to work on NCDS and BCS70 on social mobility. The first part reviews literature on the definition, sources and labour market rewards to non-cognitive ('soft') skills or personality traits. It is generally agreed that these factors play a role over and above cognitive skills, but through complex pathways. The second part of the paper reviews the ways in which the notion of non-cognitive skill has been operationalized by researchers using the British Cohort Studies, particularly NCDS and BCS70, as part of the study of the inter-generational transmission of social advantage.

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## Introduction

Skills or capabilities help determine the pathway from one's childhood origin to one's adult destination in the labour market. This is partly because they contribute to educational achievement and partly because they can be rewarded in the labour market over and above the capabilities acquired, revealed or crystallised by formal education. They may feed into education and other adult attainments independently of any transmission from the parental generation, but to the extent that they are correlated from parent to offspring, or with the parents' social or economic standing, the 'inheritance' of 'non-cognitive' as well as cognitive capabilities may contribute to or mediate the process of reproducing social inequalities, i.e. social immobility. Although 'non-cognitive' skills are sometimes thought of as personality traits, implying fixity over time, there is also the idea that they are malleable, at least in childhood, and should be taken into account in interventions to improve the life chances of disadvantaged children.

The first part of this paper reviews some of the conceptual literature. There is a growing body of work in psychological economics, occupying much of the first part of the paper. There are also some examples of the extensive literature in applied psychology that recognizes differences by socio-economic status in parenting practices and child development, both cognitive and behavioural (Bradley and Bornstein 2002). Many of these use fairly small samples, and often apply structural equation modelling (SEM). The second part of this paper focuses on the attempts that have been made by other researchers on British national birth cohort studies to operationalize the idea of non-cognitive skills, in relating them to adult outcomes, family background and intergenerational transmission of social advantage and of the 'skills' themselves.

## Part 1 The Notion of the 'Non-cognitive'

### Cognitive and 'non-cognitive' skills

'Achievement related skills' (O'Connell and Shaikh, 2008) can be divided into cognitive and 'non-cognitive' abilities. Cognitive skills have been recognized for longer as contributing to success in life, or at least in education and the labour market. They are in themselves multi-faceted, although there is the common notion of 'intelligence', or IQ, as an underlying component of the multi-fold manifestation of skills in reasoning, memory and other cognitive abilities. These talents may be to some extent innate, or be cultivated by appropriate training, incentives and challenges. Their measurement can focus on fluid or crystallised intelligence, the latter being closer to academic attainment, and related to a myriad of specific skills and aptitudes such as music, language, mathematics, draughtsmanship etc. The idea that achievement also requires 'soft', or 'non-cognitive' skills, was originally advanced by Harris (1940), and elaborated by Bowles and Gintis (1976, 2000, 2002), Jencks (1979) and Goldsmith et al (1997). It has been taken up in a number of papers in psychological economics, notably by James Heckman and his colleagues, since around 2000 (including Heckman 2000, 2011; Borhans et al 2008, 2011; Carneiro et al 2003; Cunha and Heckman 2007, 2008, 2009; Cunha, Heckman, Lochner and Masterov, 2006; Heckman, Urzua & Sixtrud 2006; Heckman and Raut 2013; and Almlund et al 2011), usefully summarized by Heckman and Kautz (2012), and renamed as 'character skills' by Heckman

and Kautz(2013). The argument is that the formation of human capital requires, or is at least helped by, personal characteristics such as motivation, self-discipline, communication skill, energy, impulse control, perseverance, sociability, confidence, self-esteem, decisiveness, grit. One could go on adding any characteristic that is rewarded in the labour market. A case can be made for including health (Goodman, Joyce and Smith, 2011), beauty (Hammermesh and Biddle, 1994) or even sexual activity (Drydakis 2013), but the literature is generally more focussed on characteristics that are more clearly 'skills' within the wider, indeed almost limitless universe of the 'non-cognitive'. Values, attitude, ambition, temperament, culture and preferences, have also been mentioned for example. The literature review for the Department for Business Innovation & Skills(BIS) by the Institute for Fiscal Studies defines 'non-cognitive' skills as ' a multiplicity of skills from time management to teamwork and leadership skills, self- awareness and self-control'(Crawford, Johnson, Machin and Vignoles, 2011). While formal education clearly plays a role in nurturing cognitive skills, parenting may also be of importance in the children's cognitive and 'non-cognitive' development (Masten and Shaffer, 2006; Sylva et al, 2004; Ermisch, 2008). Such development is also thought to be particularly malleable in early years, responsive to either good or bad environments (Heckman and Kautz, 2012).

## **Personality**

Many authors have adopted the terminology of 'personality trait' for attributes. This has been defined as 'the relatively enduring patterns of thoughts, feelings, and behaviours that reflect the tendency to respond in certain ways under certain circumstances; (Roberts 2009). Almlund, Duckworth, Heckman and Kautz (2011) describe personality traits as stable and reliable indicators of individual differences in response to life situations, providing measures of 'non-cognitive' skills (see also Costa and McCrae, 1997; McRae and Cost, 1997; Judge et al, 1999). This is useful for allowing for the measurement of a multi-faceted phenomenon at any given time, and makes use of the psychologists' framework of the 'Big Five', which offers an organization of a number of facets, or descriptions, based on principal components analysis into Five main domains (Digman 1990). Thus, personality is condensed into the five elements that any one individual has in a mixture of degrees. A current version of the Five Factor model (FFM) is known by its acronym OCEAN, standing for Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism. The facets that weigh into each factor are shown in Table 1. The Neuroticism factor is sometimes known as Emotional Stability (i.e. lack thereof). The 'Openness' factor is shown first in order to preserve its position in the acronym, but it has not been as well validated as the other four, and is sometimes replaced by a factor representing 'intellect', or alternatively 'culture', though not identical to IQ (De Raad, 1994), and is often not included in empirical studies of labour market or other outcomes. As can be seen from Table 1 (taken from Heckman 2011 in its entirety) sets out the personality schema and shows some related psychological traits that are not directly contributing to its definition.

**Table 1: The Big Five Domains and Their Facets**

<b>Big Five Personality Factor</b>	<b>APA Dictionary</b>	<b>Facets (correlated trait adjective)</b>	<b>Related Traits</b>	<b>Childhood Traits</b>
<b>Openness to Experience</b>	“the tendency to be open to new aesthetic, cultural, or intellectual experiences”	Fantasy (imaginative) Aesthetic (artistic) Feelings (excitable) Actions (wide interests) Ideas (curious) Values (unconventional)	—	Sensory sensitivity Pleasure in low intensity activities Curiosity
<b>Conscientiousness</b>	“the tendency to be organized, responsible, and hardworking”	Competence (efficient) Order (organized) Dutifulness (not careless) Achievement striving (ambitious) Self-discipline (not lazy) Deliberation (not impulsive)	Grit Perseverance Delay of gratification Impulse control Achievement striving Ambition Work ethic	Attention/(lack of) distractibility Effortful control Impulse control/delay of gratification Persistence Activity*
<b>Extraversion</b>	“an orientation of one’s interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability”	Warmth (friendly) Gregariousness (sociable) Assertiveness (self confident) Activity (energetic) Excitement seeking (adventurous) Positive emotions (enthusiastic)	—	Surgency Social dominance Social vitality Sensation seeking Shyness* Activity* Positive emotionality Sociability/affiliation
<b>Agreeableness</b>	“the tendency to act in a cooperative, unselfish manner”	Trust (forgiving) Straight-forwardness (not demanding) Altruism (warm) Compliance (not stubborn) Modesty (not show-off) Tender-mindedness (sympathetic)	Empathy Perspective taking Cooperation Competitiveness	Irritability* Aggressiveness Willfulness



<b>Neuroticism/ Emotional Stability</b>	Emotional stability is “predictability and consistency in emotional reactions, with absence of rapid mood changes.” Neuroticism is “a chronic level of emotional instability and proneness to psychological distress”	Anxiety (worrying) Hostility (irritable) Depression (not contented) Self-consciousness (shy) Impulsiveness (moody) Vulnerability to stress (not self-confident)	Internal vs. External Locus of control Core self-evaluation Self-esteem Self-efficacy Optimism Axis I psychopathologies (mental disorders) inc depression and anxiety disorders	Fearfulness/behavioural inhibition Shyness* Irritability* Frustration (Lack of) soothability Sadness
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Notes: Facets specified by the NEO-PI-R personality inventory (Costa and McCrae [1992]). Trait adjectives in parentheses from the Adjective Check List (Gough and Heilbrun 1983). \*These temperament traits may be related to two Big Five factors. Source;~Heckman© 2011, Integrating Personality Psychology into Economics, NBER WP 17378, adapted from John and Srivastava (1999).

Some authors take these related traits directly as further indicators of Non Cognitive attributes. These include, for example impulse control and ambition, which are shown as 'related' to conscientiousness but not directly contributing to its measurement. Locus of Control, Self-esteem and Self-efficacy are listed as traits related to the Neuroticism factor, but again not directly contributing to its measurement. In the analysis of young people aged 14-22 at the start of NLSY79<sub>2</sub>, reported by Heckman and Kautz (2012 their Table 2), the terms bundled as 'Personality' are actually Rosenbergs's self-esteem (a ten-item scale), Rotter's Locus of Control (a 4-item scale) measuring of how much control an individual believes they have over their life, and self-reports by the young people on their risky or anti-social behaviour (Rosenberg, 1965, Rotter, 1966).

The idea of linking these Big Five factors to 'traits' is that they are thought to be reasonable stable over time, emerging in early adulthood, and normally changing only slowly. They are not well defined in young children, and they start to appear in adolescents. Table 1 shows the sorts of temperament traits that tend to be measured in children, relating them to analogous features of adult personality, but this should not imply that children with these sorts of temperament are necessarily on track for the adjacent adult characteristics. There are some childhood traits which span more than one adult category (e.g. Shyness- Lack of Extraversion, Neuroticism; Irritability – Lack of Agreeableness and Neuroticism; Activity appears in Conscientiousness and Extraversion. Some studies use the 'Locus of Control' and 'Self Esteem' as proxies for 'personality', while others look at a range of adult behaviours as determinants of earnings (Bowles Gintis and Osborne, 2001,).

There is a hypothesis that behaviour problems in *children* lead to a deficit of 'non-cognitive' skills in adulthood (Ermisch 2008). The assumption that that they affect adult outcomes indirectly through education is certainly plausible. Child behaviour scores are often factor analysed into Externalizing and Internalizing dimensions. While others alternatively or additionally, attempt to organize the evidence collected about child behaviour into the dimensions of the Personality schema. Lundberg (2013) correctly points out that behaviour is not a 'skill', but is the outcome of personality and other factors. Nevertheless, where there is no evidence on more positive capabilities, a rationale for using evidence on behaviour problems would be that in general the absence of behaviour problems might be more auspicious for progress in school and later career, than their presence.

## **The origin and production of 'non-cognitive' skills**

Whether either cognitive or 'non-cognitive' skills are 'gifts', specific to the individual, an 'endowment', stable over time, or something which is conditioned by the constraints and incentives of the environment, or a mixture, is open to debate. Roberts, Kuncel et al (2007) assert that personality traits are 'extremely stable over the adult lifetime'. This should perhaps be qualified by the consideration that conscientiousness and emotional stability tend to increase during young adulthood (Roberts, Walton and Viechtbauer, 2006). Other authors report that there are mutual influences of personality and career success, but only in early adult years (Sutin, Costa et al, 2009) Srivastava and colleagues (2003) argue that there is some flexibility in measured characteristics further into the adult years. Others propose that the development of self-directed personal skills is encouraged by the complexity of tasks at hand, not only in school but into the working career (Kohn and Schooler, 1983,). Conversely,

unstimulating, discouraging settings can let skill atrophy (see also Bowles, Gintis and Osbourne, 2001)

Do personality traits extend back before adulthood? Caspi and colleagues (2003) use the Dunedin cohort to trace adult personality back to temperament at age three, but although this is cited, e.g. by Lundberg (2013), as evidence of continuity, the correlations between age 3 and age 26, though significant and positive, are not large. They are smaller with age 18, suggesting adolescence is a particularly unstable period, as far as personality traits are concerned (at least!).

A related literature points to lifetime continuities in mental health problems from childhood into adulthood. For a limited set of available examples of such continuity, from longitudinal studies in Finland, New Zealand and the USA, see Pulkkinen and Pitkanen (1993); Kim-Cohen, Caspi et al(2003), and Merikangas, et al. (2010). But there are discontinuities as well as continuities (Kim-Cohen and Maughan, 2005, Moffit, 1993). Within these continuities there is also resilience to consider, i.e. differential resistance to adversity or disadvantage, Rutter (2006), Sameroff and Rosenblum (2006), Schoon and Bynner, (2003). Examples of long-term patterns of mental health in the British cohort studies are discussed below (Goodman, Joyce and Smith, 2011, Johnstone, Shurer and Shields, 2013).

There are thought to be substantial heritable elements in both cognitive and personality traits, perhaps around 50% based on the study of twins (Bouchard and Loehlin, 2001 Nettle, 2005, Devlin et al 1997), but there is growing consensus that the purely genetic component is not dominant once the interaction of genes and environment (Suomi, 2004), the inter-uterine environment and early training are also recognised. Sacerdote (2011) challenges the interpretation of conventional estimates of heritability from twin studies, which may understate the contribution of a shared environment, and be affected by the endogeneity of the family environment. Ermisch (2008), along with Sacerdote, points out that genetic elements vary more between individuals within groups than across groups, and that the degree of heritability of IQ has been found to be smaller within lower socio-economic groups (Rowe et al, 1999; Turkheimer, 2003). Jerrim, Vignoles et al (2014) report on an innovative investigation with actual data on genes and a cognitive score from the ALSPAC cohort. They find that three candidate genes thought to be related to reading ability only accounted for two percent of the variance in children's reading scores, which tends to suggest that the genetic component of cognitive ability is minor. They do however point out that there may be many other genes whose influence on reading is yet to be identified. Another intriguing cross-disciplinary study adding to evidence on a biological facet to labour market outcomes is provided by Böckerman, Bryson et al (2104). They take a cohort in Finland to study a biomarker (creatine, an energy- producing organic acid) collected prior to labour market entry (from urine samples). This marker seems to predict labour market success over and above the effect of schooling. The authors suggest that the extra energy levels of those with high creatine could be producing the effort, persistence and high commitment that are commonly equated with the notion of 'non-cognitive' skills.

It is not necessarily possible to identify separate contributions of 'soft' and 'hard' skills to the explanation of attainment, since they may produce one another. As pointed out by Heckman and Kautz (2012), soft skills contribute to the process of learning cognitive skills. This is not so easy for a child who is easily distracted and fidgety, for example. In work on the

determinants of child behaviour problems, cognitive abilities appear as contributing to well-adjusted behaviour, or at least as a buffer to the impact of social disadvantages on behavioural difficulties (Flouri, 2007, Flouri, , Mavroveli, and Tzavidis, 2012, Flouri, Midouhas and Joshi, 2014) . The latter study also found beneficial effects of self-regulation on both internalizing and externalising behaviour over ages three to seven. The penalties of low self-regulation were greater for children in poor families, so that good self-regulation was particularly protective for them. This is one example of how 'non-cognitive' traits or skills may produce resilience to adversity (Rutter 2006). Not only may cognitive skills interact with these other personal skills to produce successful and less successful outcomes, accumulating over time, there may be non-linearities such that there can be too much of an otherwise healthy attribute, expressed in someone being over enthusiastic, or over anxious for example, which may depend on circumstances. Equally, some characteristics such as ruthlessness may be turned to general advantage in when the circumstances call for decisive leadership. It is also important to note that the learning or elaboration of any skill is affected by the incentives in place to make the effort, which will be affected by the family, school and social environment, indeed social (possibly gender-specific) pressures, sanctions and rewards are part of a very complex process. Oreopoulos and Salvanes (2009) make the point that schooling can impart or improve 'non-cognitive' skills, as does Heckman in his examples of high school dropouts gaining equivalent qualifications but not equal labour market success to high school graduates, or his findings of the long-term benefits of the Perry Pre-school project (Heckman and Kautz 2012, among other places).

The idea that the 'non-cognitive' psychological characteristics are not set in stone, or even plaster (Srivastava et al 2003), and are(at least in part) the outcome of adjustment to childhood circumstances has encouraged the idea that early intervention to nurture 'non-cognitive' skills would be a cost-effective way to raise lifetime achievements. Apart from the many papers by Heckman, see also Bowles, Gintis and Osborne (2001). This leads to the related notion that the 'soft skills' of parenting could themselves have an important role in such policies (Heckman and Kautz, 2012 p6) as has been taken up in recent attention to policy for the early years in UK (Field, 2010, Allen 2011). O'Connell and Sheikh (2008) make the further point that interventions which seek to 'modify people's 'non-cognitive abilities' are much more likely to pay dividends among those with lower cognitive ability'. Early intervention is recommended not only by economists, but also by psychologists, see for example Caspi et al (2003), because of, rather than in spite of underlying biological continuities.

## **The outcomes of 'non-cognitive' attributes**

Heckman argues that cognitive and 'personality' terms should be considered jointly in the prediction of an individual's outcomes such as education, earnings, marital or social status. Without evidence on 'non-cognitive' traits, the 'returns' to cognitive abilities are overstated, and likewise if returns to personal qualities are inferred without information on cognitive skills. Jointly they can account for more of the variance in the outcome than singly (Heckman and Kautz 2012).

Not all the dimensions of OCEAN have proved equally predictive of academic and labour market achievement. In the example of years of schooling for males, in the German Socio

Economic Panel (Almlund et al 2011), Conscientiousness is most strongly connected even after adjustment for cognition, followed by estimates about one quarter of its absolute size for Emotional Stability (+) and Extraversion (-) and small negative estimates for Agreeableness and Openness. Nyhus and Pons (2005), using the CentER Saving Study in the Netherlands found more marked gender differences: a negative impact on men's earnings of Agreeableness, and a positive earnings return for women to emotional stability. It was somewhat disappointing to learn that Eysenck (1967) characterized a sample of 'successful businessmen' as nothing more exotic than 'on the whole stable introverts'. In her study of fathers and sons in the NLSY, Osborne Groves (2004) finds that a 'non-cognitive' indicator in the form of the Rotter's locus of control accounts independently for about 25% of the intergeneration transmission of earnings. In a more recent study, of the US Ad-Health dataset, Lundberg (2013) finds a complex pattern of eventual educational outcomes by adolescent personality types. Conscientiousness is an asset for the offspring of advantaged parents, with whose resources this trait is seen as complementary. However for adolescents from less advantaged homes, conscientiousness is not enough (or indeed significantly valuable itself) rather it is openness (to new ideas) which helps the young people make educational progress; it works as a substitute for parental resources. Although men and women are analysed separately have somewhat different estimated coefficients, gender differences are not striking. Another US study which finds a socially differentiated return to personality traits, contrasted a group of young people in Minnesota who were going through college, with a group of young truck drivers who had to get through an initial year of training (Burks et al 2014). The novelty in this study was its decomposition of Conscientiousness into a proactive, industrious, achievement-oriented aspect and a cautious, inhibitive and orderly aspect. The proactive strand was significantly predictive of success in the academic arena, the cautious one for the truckers. A powerful predictor for both groups was an indicator of the ability to 'think backwards' from the future to inform decisions, which is presumably more of a cognitive than a 'non-cognitive' skill.

The story so far is non-cognitive/ personality/ character attributes do appear to contribute, in at least a modest degree to labour market success, independently of cognitive ability or schooling, witness the studies surveyed by Bowles, Gintis and Osborne, 2001, and by Heckman and Kautz, 2012 at least in the USA. The former report a range of standardized regression coefficients for earnings on various indicators of 'non-cognitive' attributes ranging from 0.05 to 0.25, holding constant cognitive ability, schooling and family background. The development of these skills may well have been helped by a favourable endowment from the family of origin, but exactly how – genes, parenting, aspirations, health or social capital, to name but some possible pathways is not clear. The mechanism is likely to be complex, and socially differentiated.

## Part 2 Operationalization of ‘non-cognitive’ variables in the analysis of British cohort studies

At this point we turn to some of the operationalization of these ideas that have already been done in the British cohort studies of 1958, National Child Development Study, NCDS and 1970 (BCD70) , with brief mention of some work on the Millennium Cohort. Our search in the metadata MRC National Survey of Health and Development (NSHD) of the 1946 cohort found no suitable variables for strict comparison. Such instruments were neither developed nor collected in an era that precedes this literature. Even in the case of the later cohorts, analyses are limited by the nature of psychological variables it was possible to collect in multi-purpose surveys, and given the evolving state of the science.

### Analyses of NCDS

O’Connell, M. and Sheikh, H. (2011) argue that Conscientiousness is more important for achievements for students within higher education than for the population at large, and for earnings. Controlling for measures of cognitive ability they find Openness is the strongest predictor of academic attainment in a population cross-section (NCDS at 50), followed by emotional stability, which is twice as strong for women than men. The associations of Big Five personality terms with earnings (weekly) after controlling for education are positive for Openness, Extroversion, Emotional stability, Conscientiousness and, with a negative impact of Agreeableness for men only ( reminiscent of the findings by Nyhus and Pons 2005). The set of analyses suggest that ‘openness exerts its influence on earnings partially via educational attainment’ and that extraversion is penalized in the educational system but rewarded in the labour market. O’Connell and Shaikh (2011) find little gender difference in educational attainment at 50, apart from a positive interaction with emotional stability and negative one with a cognition test of perceptual speed. In the analysis of log earnings, there is a huge main effect of gender, exaggerated presumably by the use of weekly rather than hourly earnings. The omission of hours of work may well affect the conclusions, but at least females are not excluded from the picture. A limitation of this analysis is that age 50 is the first time the Big Five were explicitly measured in NCDS<sup>1</sup>. Attainments and Personality are effectively treated as a contemporaneous cross section.

Other authors have used the NCDS 2008 personality data as if it could ‘predict’ some outcomes before age 50, such as educational attainment as well as earnings at that age, presumably relying on the alleged stability of personality ‘traits’ over time. Furnham and Cheng (2013) also found different elements of the OCEAN personality scheme had modest but gender-specific influences on earnings: conscientiousness for men and intellect (openness) and emotional stability for women. Other analyses of the British Cohort studies have made use of other information to construct ‘non-cognitive’ or ‘personality’ variables. In their 2008 paper, O’Connell and Sheikh (2008) use a variety of attitudinal variables reported at age 16 in NCDS<sup>2</sup> to trace the contribution of ‘achievement related attitudes’ earnings at

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<sup>11</sup> Personality was assessed using the 50-item International Personality Item Pool (IPIP, Goldberg et al., 2006) representation of Costa and McCrae & John, 1992. Big Five dimensions Extraversion, Agreeableness, Conscientiousness, Emotional Stability (the reverse of neuroticism), and Openness

age 33, distinguishing a sub sample at risk of adult poverty, for whom the attitude variables appeared more important. The models were estimated separately for males and females, but gender differences were not discussed. This paper is more remarkable for its contribution to notions of 'non-cognitive' factors producing 'resilience'.

One of the major sources of evidence on behaviour, and potentially 'non-cognitive' 'skills' in the childhood of the 1958 cohort is the Bristol Social Adjustment Scale (BSAG), the for the battery of 146 questions put to teachers at age 7 and 11. So far, the results are only available in a reduction of the original items into 12 domains or syndromes<sup>3</sup>, emphasising problem behaviour, rather than the more positive responses that could be, and were given, but which were not coded at the time.

Michelle Jackson (2006) uses principal components analysis on the (as do other authors) to construct two indices of social adjustment, labelled 'aggression' and 'withdrawal'. She shows that these two different childhood 'personality traits' have different effects on men's entry to different occupations in the salariat, reflecting the usefulness in some jobs on not being withdrawn, while for others (higher technicians) not being an aggressive type appears to be attractive to employers. Mary Silles (2010) also used the BSAG to generate scales for aggression (partitioned into active and passive elements) and withdrawal, which were used alongside family background and cognitive score to predict earnings at 23. She concludes that 'social maladjustment scores are strongly associated with success and failure in education and the labour market.

Carneiro, Crawford and Goodman (2007) also base an analysis of a number of labour market and social outcomes to age 42 in NCDS on the BSAG material for age 11. They create a uni-dimensional score of 'social skill' ('non-cognitive' ability) and use the twelve indicators of its component domains. They look at both the consequences and determinants of cognitive and 'non-cognitive' (social) skills at age 11, documenting the importance of these skills for schooling attainment, labour market outcomes and social behaviours at various ages up to age 42. They also analyse the role of family background and the home learning environment in the formation of these skills.

Goodman, Joyce and Smith (2011) use NCDS data from birth to 50 to investigate the 'long shadow of ill-health in childhood'. They add to familiar models of age 50 attainments in terms

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<sup>2</sup> The Academic Motivation scale and Self assessed Truancy

<sup>3</sup> Domain 1: Anxiety for acceptance by children

Domain 2: Hostility towards children

Domain 3: Hostility towards adults

Domain 4: Writing off adults and standards

Domain 5: Withdrawal

Domain 6: Unforthcomingness

Domain 7: Depression

Domain 8: Anxiety for acceptance by adults

Domain 9: Restlessness

Domain 10: Inconsequential behaviour

Domain 11: Miscellaneous symptoms

Domain 12: Miscellaneous nervous symptoms

of cognitive skill and educational attainment, summaries of physical and mental health problems in childhood. Surprisingly they do not use the teacher reports from the BSAG or parent reports of behaviour problems<sup>4</sup> to assess child mental health problems, but use reports from the school medical officer and from parents about whether the child had ever been referred to a professional for psychological or behaviour problems. The age 50 assessment of Personality is treated, not as a predictor of career success, but as one of the outcomes to be explained at the half-century mark. Three of the 'Big Five' dimensions do turn out to be significantly associated with good childhood mental health (Agreeableness, Conscientiousness and Emotional Stability, each to the tune of about 1.6 standard deviations). There was no effect on Extraversion or Intellect/Openness.

Groves (2005) compares women in NCDS at age 33 with counterparts in USA. For NCDS she also creates a two-factor 'personality' model from the BSAG, from age 11, again labelled Aggression and Withdrawal. Aggression is negatively related to wage at 33 in a suspiciously small sample. In the American sample, the 'non-cognitive' indicator is Rotter's Locus of Control, perceived control over one's life, and it is associated with higher wages.

None of the aforementioned studies of NCDS make use of the mother-reports of behaviour problems at age 7 or 11. It may be thought that behaviour problems are not the right information, but that is all that is coded from the teacher reports. Teachers also tend to give different answers from parents. These are arguably more reliable. Although the parent may have more contact with a given child, teachers have contact with more children, and may therefore be thought to give information that is more generalizable. It cannot however be assumed that even the teacher reports in this nation-wide operation are of the same quality as the information on children's psychology that may be gained in intensive small scale studies with more specialized interviewers. Nevertheless, the raw BSAG data could yield more valuable information if it were more completely coded to record positive aspects of the child's behaviour as well as the problems. Even original data on the problems could yield alternative summaries of problem behaviour to those which have been constrained by the 12 syndromes.

## NCDS-BCS comparisons

Breen and Goldthorpe (1999) seek evidence of 'effort' as an element of 'merit' over and above 'ability', especially as exerted in early life at school. They use the Academic Merit Scale from NCDS at age 16 (8x 5-point Likert scales<sup>5</sup>). There may also be some evidence at age 7 and 11 were the teacher assessments of BSAG to be coded for positive as well as

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<sup>4</sup> Although they are doing so in subsequent work, currently in progress.

<sup>5</sup> I feel like school is largely a waste of time\*

I am quiet in the classroom and get on with my work

I think homework is a bore

I find it difficult to keep my mind on my work\*

I never take work seriously

I don't like school

I think there is no point in planning for the future; you should take things as they come

I am always willing to help the teacher



problematic behaviour. The nearest equivalent Breen and Goldthorpe found in BCS70 was taken as the 20-item locus of control scale (CARALOC) administered at age 10<sup>6</sup>. They also considered a measure of self-esteem (LAWSEC) at age 10, but did not take it forward. Although they admit that the measures are not too comparable across cohorts, they are alike in that they contribute little to the prediction of social mobility in either cohort once ability and education are also taken into account.

Schoon (2008) also compares NCDS and BCS70 making use of the academic motivation scale as a –predictor of adult status attainment in Structural Equation Models. She finds the most important determinant for both cohorts is years of full-time education, and that the contributions of social background and cognitive ability are only partially mediated by (work through) academic motivation.

Blanden, Gregg and Macmillan (2007) provide another comparison of NCDS and BCS on the question of how far ‘non-cognitive’ variables help account for the (changing ) intergenerational correlation of fathers’ and sons’ incomes. They choose only a limited number of ‘non-cognitive’ variables that they feel as sufficiently comparable. These are two indicators of internalizing and externalizing behaviour problems, created by principal components analysis from the Rutter A questionnaires put to mothers at age 11 (NCDS) and age 10 (BCS70) and three scores, Restless, Withdrawn and Inconsequential, taken from teacher questionnaires, BSAG at age 11 for NCDS and the teacher-rated Child Development Scale for BCS70. The authors rejected a number of BSAG syndromes as being insufficiently comparable with BCS70. For this comparative exercise, the ‘non-cognitive’ variables were hardly significant for the NCDS regressions of son’s income, although the teacher-rated scores did appear to make a significant though small contribution to the intergenerational correlation for BCS 70. They suggest that rising returns to these particular ‘non-cognitive’ skills in the labour market partly explains the rise in wage inequality between the two

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<sup>6</sup> The locus of control refers to the degree to which an individual perceives himself/herself as able to decide over and manage his/her destiny (internal) rather than other forces (external)

- Do you feel that most of the time it’s not worth trying hard because things never turn out right anyway?
- Do you feel that wishing can make good things happen?
- Are people good to you no matter how you act towards them?
- Do you like taking part in plays or concerts?
- Do you usually feel that it’s almost useless to try in school because most children are cleverer than you?
- Is a high mark just a matter of “luck” for you?
- Qualified people more chance to get job
- Not what but who you know decide get job
- Possible to get job if really determined
- With unemployment, . chance if get job or not
- Full-time education only puts off unemployment
- Best leave school asap to get experience
- No good planning career -not enough jobs
- Take what job you can even if unsuitable
- Job experience more import. than qualifications

A similar set of items were included in the Age 16 survey of BCS70

cohorts. The authors also present another analysis of BCS70 making fuller use of other indicators of 'non-cognitive' variables, including child report of locus of control and self-esteem at age 10, and a larger sample. Taken on their own, the 'non-cognitive' terms jointly raised the log of son's incomes by 0.06, or 20% of the intergenerational regression coefficient of 0.32. The "non-cognitive" coefficient falls to 0.02, 7% of the intergenerational correlation, when cognitive score, educational attainment are included in the model, and falls further to 6% of the intergenerational correlation when labour market experience is also included. All of the 'non-cognitive' variables were significant in the BCS70 model that had no other regressors, apart from the 'Anxious at 10' scale. In the full model the following remained significant, though attenuated, predictors of son's income: Locus of control, Clumsy 10, Extravert 10 and Anxious 16. . This study found that a roughly similar proportion of social mobility is "explained" by cognitive skills as 'non-cognitive' skills, though somewhat more for cognitive skills. The authors conclude that 'non-cognitive' considerations are important but that most of the effects of the 'non-cognitive' terms work through educational attainment.

These British results can be compared with those of Mood, Jonsson and Bihagen (2012) from Sweden. They analyse Swedish records on fathers' and son's income and education in terms of measures of cognitive abilities and 'non-cognitive' traits assessed at age 18 for military service purposes. The 'non-cognitive' characteristics measured in the Swedish study (social maturity, intensity, mental energy and emotional stability) have a common element with OCEAN, but not a complete correspondence. This set of variables is more strongly related to the sons' income than their education. It accounts for around 12 % of the intergenerational correlation between fathers' and sons' income, a similar, but larger, finding to Blanden, Gregg and Macmillan (2007), and using better income data

## **Analyses of BCS70**

Feinstein (2000) analyses the effects of psychological and behavioural variables measured in BCS70 at age 10 on labour market outcomes at age twenty-six. The variables brought in to supplement home background and cognitive scores are locus of control, self-esteem<sup>7</sup>, anti-social attitudes, attentiveness to peer relations and extraversion at age ten (teacher-rated). Use is also made of teacher ratings of parenting. Among his findings are that conduct problems at 10 predict male adult unemployment particularly well, but it is self-esteem that predicts male earnings. For women the locus of control variable is particularly important.

Pensiero (2011) uses BCS70 to carry out an investigation into how socially differentiated parenting practices help contribute to two aspects of human capital at age 16, reading ability and locus of control. Both of these may be expected to lead to more successful labour market outcomes (see also Flouri 2006). He adopts (from Lareau, 2002, 2003) the concept of "concerted cultivation" vs "natural growth" approaches to parenting to tell the story of how socioeconomic differentials in child rearing practices generate unequal children's outcomes. Results of path analysis show that class-differentiated engagement in cognitively stimulating

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<sup>7</sup> Lawrence, 1981, defined self-esteem as "the child's affective evaluation of the sum total of his or her characteristics both mental and physical."

activities, rather than participation in organized activities, enhances children's reading ability and their locus of control at 16.

In an analysis of BCS 70 up to 2004, Johnstone, Schurer and Shields (2013) describe the intergenerational persistence of poor mental health, not only from the cohort's mothers to their index child, but to their grandchildren in the BCS second generation study. They find that the intergenerational correlation in mental health is about 0.2, and that the probability of feeling depressed is 63 percent higher for children whose mothers reported the same symptom 20 years earlier. Grandmother and grandchild mental health are strongly correlated, but this relationship appears to work fully through the mental health of the parent. They also establish negative effects on adult economic outcomes of the cohort members' poor mental health. The main measure of interest is the Rutter malaise score, supplemented for the children of the cohort assessed in 2004, by the Strengths and Difficulties Score (SDQ, Goodman 1997), fittingly a descendant of the Rutter child problem inventory used in the childhood surveys of NCDS and BCS70 themselves.

Lindsey Macmillan (2013) investigates the transmission of worklessness from father to son in BCS70. She uses the full battery of behavioural questions to mothers and teachers at age 5 and 10 to derive indicators to approximate four of the Big Five Personality traits (Agreeableness, Extroversion, Emotionality and Conscientiousness) plus an indicator of hyperactivity, and the children's responses on Self Esteem and Locus of Control. Only 12% of intergenerational transmission of worklessness is explained by model, but 'non-cognitive' skills and behaviour account for more than cognitive terms, in contrast to intergenerational transmission of male earnings. She finds that personal characteristics are more important in areas of high unemployment

Prevoo and ter Weel (2013) report an analysis of BCS70 up to age 34 that purports to show 'The Importance of early Conscientiousness for socio-economic outcomes'. The outcomes include wages, health, life satisfaction and crime. Conscientiousness, is broadly defined as the propensity to follow socially prescribed norms and rules; to be goal-directed, to be able to delay gratification, and to control impulses. Conscientious and three other constructs from the big Five, Agreeableness, Extraversion and Neuroticism, are generated by a cluster analysis of mother reports on behaviour at age 16. An Age 10 version is also used in checks on the specification. The latter three personality constructs have less explanatory power for a range of adult outcomes than Conscientiousness. The authors do not find significant gender differences. A summary apparently of the Rutter score, also a set of mother-reports, is introduced into the extended regressions (along with home background, cognitive ability, locus of control and self-esteem). In any case the effect sizes, though significant are not overwhelming – 'a one standard deviation increase in Conscientiousness increases hourly wages by 4.1 per cent'.

Although it is interesting to see that both Macmillan (2013) and Prevoo and ter Weel(2013) have constructed Personality variables from childhood behaviour scores in BCS70, Macmillan uses principal components analysis, so that despite the similar names, these variables are not the same. Within 18 items mentioned by both authors, six are assigned to different personality scores by the two exercises, although none of these inconsistent cases involves conscientiousness. This rather loose correspondence with the Big Five is in line

with the material set out in Table 1 indicating a rather loose correspondence of child temperament measures with adult personality

## **Analyses of Second Generation Studies and the Millennium Cohort**

The interpretation of behaviour scores as 'non-cognitive' skills is unavoidable in more recent data sets from the British cohort studies, where the main measures of socio-emotional development rely on Goodman's Strength and Difficulties Questionnaire and its precursors.

In the NCDS second generation study of one third of the cohort's children in 1991, children's emotional adjustment was assessed on the 28-item Behaviour Problems Index (BPI) if they were aged 4- 7 (Peterson & Zill, 1986, based on Achenbach and Edelbrock 1981 ), and the Rutter A Scale (18-items) ) asked of children aged 8-17 (Rutter, Tizard, & Whitmore, 1970). For each scale, the mother was asked if her child exhibited various elements of antisocial, anxious, headstrong, hyperactive or dependent behaviour. An exploratory factor analysis of these items (McCulloch et al., 2000), dichotomised the scales, labelled aggressive (externalised) and anxious (internalised) behaviour. The items included in the externalizing score mainly correspond with Agreeableness (or lack of it) and the internalizing score with Emotional problems/ Neuroticism. There is not much in the Rutter score that corresponds with Conscientiousness. There was little significant relationship between the child's anxiety/internalizing behaviour and the socio economic circumstances of the family, which were more apparent for externalized problems. There were significant gender differences, in opposite directions: boys more likely to have externalized problems and girls more likely to have internalized problems. There were also signs of differentials by presence of siblings, with high birth order reducing anxiety but increasing aggression. Verropoulou and Joshi (2009) included some intergenerational comparisons. Women in NCDS who had children old enough to be assessed in the 2<sup>nd</sup> Generation study provide a cross-generational comparison of internalised and externalized behaviour (Rutter score at 16 for mothers, BPI or Rutter score at 1991 for the second generation). *Ceteris paribus* there were some continuities. The child's aggression score shows a positive association with the mother's that is significant at the 10% level, but the only other significant estimate is a negative relationship between the mother's 'anxiety' and the child's maths.

Blanden and Machin (2008, 2010) use the behaviour problems reported in the second generation studies of NCDS in 1991, the BCS in 2004 and the Millennium Cohort in 2006 in their investigation of a possible time trend in the relationship between family income and child development. Child development is assessed on both a cognitive measure (vocabulary) and behavioural adjustment, taking the Total Difficulties score from the SDQ without differentiating between internalizing and externalizing problems (although five sub-scale are identified by Goodman, 1997). In both the cognitive and behaviour outcomes, there are significant relationships with parental income, apparently stable over time. Presumably the behavioural relationship rests primarily on the externalizing elements of behavioural difficulties.

Blanden, Katz and Redmond (2012) look at the trajectory of behavioural and cognitive scores between ages three and seven in the UK Millennium Cohort Study and four and nine in the Longitudinal Study of Australian Children, and its relation to parental education. These social differentials were more marked and persistent through childhood in UK than Australia,

applying to the behaviour score as well as the cognitive, though the latter showed somewhat great differentials particularly fanning out by age 7.

Ermisch (2008) attempts to disentangle the influence of parenting practices from material resources on four of child development, cognitive and non-cognitive, at age three in the MCS, which were strongly differentiated across income groups. He uses the peer problems score of the SDQ as a reference outcome and compares two cognitive scores (BAS Naming Vocabulary and Bracken School Readiness) and a behaviour problem score based on the externalizing scales of SDQ (hyperactivity and conduct disorder). The latter is also considered with and without a score for the parent-child relationship on the Pianta inventory, as parent-child relationships can be seen either as an input or an output or of 'what parents do'. He uses 3SLS and OLS estimates to put bounds on a correction for the possible endogeneity of parental behaviour. The inverted behaviour score shows a positive income gradient with income groups at either bound, though slightly less than the cognitive scores. Parenting behaviour is shown to make a partial contribution to the explanation of variation in all three development outcomes. Ermisch concludes that the parenting behaviours reinforce social immobility because the economically better off parents are more likely to adopt beneficial parenting practices. This does not mean that the disadvantages of having poor parents cannot be mitigated, or buffered, by good parenting, as shown for Internalizing and Externalizing behaviour of MCS children at ages 3, 5 and 7 by Flouri et al ( 2014). Schools (rather than neighbourhoods) also play an important role, in additions to parents, in promoting good behavioural outcomes of MCS children at these ages (Midouhas et al 2014)

## Conclusions

The first part of this literature review presents the concept, or 'notion' of 'non-cognitive' skills that may improve various outcomes over the life-course in addition to those acquired or cultivated in formal education. Assuming that there is in fact a reward to be reaped from such skills, they could in promote either social immobility or social mobility. On one hand, there is the transmission of advantage from better-off parents to their offspring. On the other economically disadvantaged families may be able to compensate for their lack of material resources by better parenting. Public intervention in the early years may also enhance the prospects of disadvantaged children There is literature to support the idea that children are not doomed to poor life chances by genetics or by the immutability of 'personality'.

The second part of the review summarizes evidence about how 'non-cognitive' factors have been operationalized in research on three British Cohort Studies. Despite limits to comparability, the picture that emerges is that, on various indicators, 'non-cognitive' skills play a positive, but not overwhelming, part in predicting a person's future success, over and above the impact on their education. Their role in propelling social mobility is minor at best. The variety of predictors used different by authors analysing the Cohort Studies affirms the multi-dimensionality of 'non-cognitive' skills and 'personality'.

The areas that this paper has not covered include cognitive skills, their measurement, source and impact. It would be convenient to assume that an underlying uni-dimensional intelligence quotient can be identified and is stable over time, or at least from mid-childhood (Deary et al 2011). The 'non-cognitive' literature raises the issue that the measurement of cognitive scores can be affected by the incentives offered at the time of the tests, let alone the family background and social circumstances (Borghans et al, 2008, 2011 and 2013). Other relevant topics which have barely been touched are aspirations and ambition in child and parent (Flouri and Panourgia, 2012, Goodman, Gregg and Washbrook, 2011, Guttman, Schoon and Sabates, 2012); neuroscience (e.g. Blakemore, 2010, Blakemore and Choudhury 2006); identity formation (Akerlof and Kranton, 2000. 2002, 2010), and social networks and peer relations (where the literature search has not even started).

It was disappointing not to be able to integrate the 1946 cohort into the review or plans for further cross-cohort analyses. NSHD does contain doctor and teacher ratings of behaviour, which may not have great validity because of the short questionnaires and the large number of people reporting, each of whom has their own standards. It may be possible at a later stage to make use of this sort of material to generate something like the cohort-specific indicators of poor parent- child relations used by Stewart-Brown et al (2005), or the childhood mental health index created by Goodman, Joyce and Smith (2011) for NCDS. The construction of a comparable set of variables for NCDS and BS70 is enough of a challenge for a first step.

There is a limit to the extent that multi-purpose social surveys can capture the full range of attributes that one might think of as imbuing a person with the right skills for leadership, teamwork, dealing with difficult people, or even self- discipline. There is also an issue of whether standard questions about child behavioural difficulties, whether internalizing or externalizing, while clearly non-cognitive, should be regarded indicating poor skills or as

harbingers of poorer adult capabilities. However, this does not mean that 'non-cognitive' skills can be totally ignored. There is enough evidence in this literature to suggest that what can be measured as 'soft skills' plays some part in the process of social mobility and immobility, over and above cognitive abilities crystallized by formal training into educational attainment. Recent studies of the cohorts since 1958 find independent contributions of various 'non-cognitive' indicators to both educational attainment, and later labour market outcomes that may feed into social mobility, although they perhaps do not matter as much as cognitive abilities. However the notions of these rather disparate 'skills' are heterogeneous and erratically measured, and it is difficult to make precise conclusions about inter-cohort comparisons. Indeed, Roxanne Connelly (2013) decided against attempting to incorporate 'non-cognitive' skills into her inter-cohort analysis of social mobility on the grounds that they are inconsistently measured across the British birth cohort studies and not as stable through the life-course as 'underlying' cognitive ability. Nevertheless, we need to take these variables seriously, given the policy interest in their alleged malleability in the early years (as stressed by Crawford et al 2011). They may also hold a clue to changing patterns of gender differentials that have not been fully explored in detail in this paper.

A lesson from the literature is to be wary of looking for a uni-dimensional, lifetime stable linear factor to be introduced into modelling progress from social origin to social destination. There is not only a range of 'skills' but also a variety of effects in different domains, and between males and females. It would be an over-simplification to treat the 'non-cognitive' as a single permanent trait. Parents, early education, schools, peer groups, and interactions with other people and (bitter) experience may all affect aspects of a person's character just as these may then affect their own fortunes and those of their children. Social dynamics are complex, with interactions between gender, stage of the life cycle, parental origin, education and position in the labour market. It is these complexities that should be investigated.

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