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The role of non-cognitive and cognitive skills, behavioural and educational outcomes in accounting for the intergenerational transmission of worklessness

Lindsey Macmillan[1]

Abstract

Previous work has shown that there is a significant intergenerational correlation of worklessness for the UK which varies across local labour markets (Macmillan, 2011). Using a decomposition from the intergenerational mobility literature (Blanden et. al, 2007), this research is the first to consider the drivers of this transmission. I consider the role of four sets of characteristics of the son in childhood; his non-cognitive skills, cognition, behavioural outcomes and educational attainment, to assess which characteristics are important predictors of later workless spells and whether those characteristics are associated with growing up with a workless father. The wide range of characteristics can only account for 12% of the intergenerational transmission, with the vast majority remaining unaccounted for. While cognition and education dominate the intergenerational transmission of incomes, non-cognitive skills and behavioural outcomes play a more important role in the intergenerational transmission of worklessness. Many of the characteristics considered become increasingly important predictors of future worklessness as the unemployment rate in the local labour market increases. This descriptive analysis suggests that there are benefits to improving the soft skills of the most disadvantaged children, alongside their attainment, to ensure a successful connection with the labour market in adulthood.

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1. Introduction

There has been very little research into the intergenerational transmission of worklessness in the UK despite increasing interest in the topic. Frequent references are made to the 'curse of intergenerational worklessness'[2] by politicians and this has been used to justify large-scale welfare reforms. Recent work by Macmillan (2011) found that in the UK, sons with workless fathers spent an average of 8 to 11% more time out of work from 16-23 than sons with employed fathers. This correlation varied considerably by the local labour market experience of the son. Sons with workless fathers in local labour markets with high unemployment spent over 25% more time out of work than sons with employed fathers in the same local labour market. In contrast, in low unemployment local labour markets, sons' workless experiences were not associated with their father's workless experiences. Gregg and Macmillan (2012) used a comparative study of the UK and the US to examine the role of intergenerational welfare dependency in this correlation. They found that the intergenerational relationships were identical in both settings despite the large differences in access to welfare in the two countries. The evidence suggests that intergenerational welfare dependency is therefore unlikely to be the main driver of this relationship. This research explores for the first time which childhood characteristics are important mechanisms in transmitting worklessness across generations using a methodology introduced in the intergenerational mobility literature by Blanden, Gregg and Macmillan (2007).

The model of Solon (2004) presents a theoretical framework for thinking about the intergenerational transmission. This model asserts that human capital is the principle transmitter of incomes across generations. In the context of worklessness, workless parents will have less money to invest in their child's human capital and may find it harder to get the same returns to these investments due to the strains of worklessness. This model, along with work on labour market discrimination, suggests that individuals may also invest less in education and skills if they perceive that they have less chance of being employed in adulthood (List and Rasul, 2010, Coates and Loury, 1993). While Gregg and Macmillan (2012) argue that there is unlikely to be a culture of dependency passed through the endowment of a taste for welfare, there may be scope for a genetic transmission of ability and other non-cognitive skills. There has been an increasing body of literature in the past decade, driven by the work of Nobel Laureate James Heckman, into the role of not only cognition but

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[2] http://www.dwp.gov.uk/newsroom/press-releases/2010/may-2010/dwp070-10-270510.shtml (accessed 15th May 2012).

also non-cognitive skills and behaviours in predicting later life outcomes for individuals. This research builds on this work by exploring the role of non-cognitive and cognitive skills and later behavioural and educational outcomes in accounting for the intergenerational transmission of worklessness using the British Cohort Study (BCS). This work does not attempt to decipher between the role of genetics, resources and capabilities in the transmission, focusing solely on the characteristics of the son.

I implement a two-stage decomposition introduced by Blanden et. al. (2007) to assess the role of the four sets of characteristics in driving the intergenerational transmission of worklessness. For potential mediators to play a role in this transmission they must not only predict the future work experiences of individuals but also be related to growing up with a workless father. There is value in considering both stages of this relationship. In the current climate of rising youth unemployment it is important to understand the important childhood predictors of later unemployment. Unlike in the standard returns to schooling literature, there has been very little work that focuses on which characteristics may be important in this context. In terms of understanding why people are more at risk of experiencing youth unemployment, this is a first step in this process while recognising that this is not a causal analysis. For the other stage of the decomposition, estimating the association between fathers' worklessness and the sons' characteristics, there has been little work to date that considers whether the characteristics that are important in predicting future workless spells are associated with having a workless father in childhood. Schoon et. al. (2012) found strong associations between parental worklessness and early cognitive, academic and behavioural development in the Millennium Cohort Study (MCS).

When these two stages are combined, the decomposition provides a tool to assess how much of the observed intergenerational correlation can be accounted for by the observable characteristics of the child. Understanding the mechanisms that underpin the intergenerational relationship is important for informing future policy debates. Heckman, Stixrud and Urzuac (2006) illustrated the relative importance of non-cognitive skills and behaviours for predicting future work experience compared to cognition and education in the US. As in Heckman et. al. (2006) and Blanden et. al. (2007), the model is built sequentially, based on the timing of earlier skills and later outcomes, to gain a picture of both the importance of early non-cognitive and cognitive skills alone and their role in feeding into later behavioural and educational outcomes. There is a great deal of heterogeneity in the transmission of worklessness with much of the intergenerational correlation remaining unaccounted for (88%). Non-cognitive skills along with behavioural outcomes dominate

cognition and educational attainment in accounting for this transmission. These characteristics also play a more important role in the transmission of worklessness across generations than they do in the corresponding literature on the transmission of incomes.

Given the earlier finding that the intergenerational correlation varies considerably by local labour market conditions (Macmillan, 2011), this research also asks which of the characteristics are important in driving this increasing intergenerational correlation as unemployment rates increases. It may be the case that this trend is driven by more disadvantaged workers with a lower skill set being the last in and first out of jobs as labour market conditions change, as is found in the US and the UK in the case of minority groups (Wilson, 2009, Freeman and Rodgers, 2000, Li, 2012, List and Rasul, 2010). If this were the case, we would expect to see the characteristics of the son that predict future labour market participation also varying by the local labour market conditions. There is suggestive evidence of these skills mattering more as unemployment rises.

The next section reviews the recent literature on intergenerational worklessness and related literatures that motivates the characteristics considered here. Sections 3 and 4 present the methodology and data while the results are discussed in 5. I end with some brief conclusions.

2. Related literature

To date, there are only a handful of studies that estimate the intergenerational correlation of workless spells: three from the UK (Johnson and Reed,1996, O'Neill and Sweetman,1998, and Macmillan, 2011), one from Norway (Ekhaugen, 2009) and one comparison of the US and the UK (Gregg and Macmillan, 2012). All studies find very similar magnitudes of intergenerational worklessness of around 0.10. In the related intergenerational welfare dependency literature, Corak et. al. (2000) find a similar sized correlation in unemployment insurance claims of fathers and sons for Sweden and Canada. This paper presents the first research into the drivers of this intergenerational relationship.

Previous work by Blanden et. al. (2007) within the intergenerational mobility literature introduced a decomposition based on the model from Solon (2004). By combining the association between family income and childhood characteristics and the returns to these characteristics in the labour market in adulthood, the role of these childhood characteristics could be assessed in the context of the transmission of income persistence across generations.

More recently work by Mood et. al. (2010) and Hirvonen (2010) have replicated this analysis using Swedish data. These papers find important roles for not only cognition and educational attainment but also non-cognitive traits in the intergenerational transmission of incomes across generations although these are mostly contributing through the total educational attainment that the individual obtains.

The role of cognition and educational attainment in intergenerational transmissions is explicitly brought out in the model of Becker and Tomes (1986) and Solon (2004). There is a vast amount of research detailing educational inequalities by family background (Gregg and Macmillan, 2009) and the differential returns that each education level buys you in the labour market (Oreopolus et. al., 2006, Meghir and Palme, 2005, Dickson, 2011). The model of Solon (2004) predicts that sons with workless fathers are likely to have lower cognition and educational attainment for a variety of reasons such as poorer genetic endowments, limited resources, lower potential returns to schooling and less capabilities of turning investments (or inputs) into outputs. These sons will also send weaker signals on the job market to potential employers. Signalling theory highlights the importance of this attainment in hiring decisions (Spence, 1973).

More recently, the important role of non-cognitive traits alongside cognitive traits in predicting later life outcomes has been examined, predominantly in research by James Heckman. Heckman, Hsse And Rubinstein (2002) presents evidence to suggest that whilst those who select into taking a General Education Development (GED) qualification in the US have higher cognitive ability than other High School Dropouts, they also have lower non-cognitive abilities that make them far less employable in later life. This accounts for GED recipients' lower levels of labour force participation and higher turnover rates. Similarly, work by Bowles and Gintis (1976) and Edwards (1976), demonstrates that job stability and dependability are the traits most valued by employers in the work place. Heckman, Stixrud and Urzuac (2006) find that non-cognitive traits play a more important role in predicting future employability and work experience than cognitive traits. Carneiro and Heckman (2003) and Cuhna, Heckman, Lochner and Masterov (2006) establish the importance of parents in the formation of these skills. Schoon et. al. (2012) recently produced a report considering the impact of parental worklessness on children's cognitive ability, education, behaviours and attitudes and aspirations using two young cohorts from Britain and England. They found significant penalties from parental worklessness on a range of characteristics and early measures of employability.

This research combines these strands of literature, considering both the association between the workless experiences of fathers and childhood characteristics, and the importance of these childhood characteristics in predicting later life workless experiences.

3. Methodology

The intergenerational correlation[3] of worklessness is the estimated coefficient $\hat{\beta}$ from equation (1) where w_i^{father} captures the workless experience of the 1st generation and w_i^{son} captures the workless experience of the 2nd generation[4].

$$w_i^{son} = \alpha + \beta w_i^{father} + e_i \qquad (1)$$

i) Decomposing intergenerational worklessness

To assess the relative contribution of child characteristics in the intergenerational transmission, following the decomposition originally presented by Blanden, Gregg and Macmillan (2007), the intergenerational relationship can be thought of in two stages. The first stage is the relationship between having a workless father, w_i^{father}, and the characteristic of interest, using the example of cognition, cog_i^{son}, in equation (2). $\hat{\pi}$ is the association between growing up in a family where the father is workless and the specific characteristic of the son. The second stage is the relationship between this characteristic, cog_i^{son}, and the sons' future work experience, w_i^{son}, conditional on the work experience of the father, w_i^{father}, shown in (3)[5]. This is similar to a returns to schooling model but instead considers the characteristics that are important in predicting future workless spells. This can provide a valuable description of the key characteristics that might matter in terms of future employability[6].

$$cog_i^{son} = \alpha_1 + \pi w_i^{father} + u_i \qquad (2)$$

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[3] This research frequently refers to an intergenerational correlation, as is standard across the intergenerational literature, rather than an intergenerational coefficient.

[4] Age controls of the father are included to control for age effects although they are suppressed here to keep the notation simple. Age controls for the son are not required as the sons are all the same age in the analysis. Macmillan (2011) suggests that life-cycle bias is only an issue if the workless measures focus only on a period either very early or late in working life. The workless measure here covers the period 16-29 and therefore should not be affected by this bias.

[5] The Linear Probability Model is used as the dependent variable is spending a year or more in concurrent spells out of work. Predicted probabilities fall within the 0,1 bounds throughout. This decomposition requires the use of linear models.

[6] Note that age controls are included in all estimation but ignored here for notational simplicity.

$$w_i^{son} = \alpha_2 + \gamma cog_i^{son} + \delta w_i^{father} + \varepsilon_i \tag{3}$$

Assuming that $Cov(\varepsilon_i, u_i) = 0$[7], (2) can be substituted into (3) as shown in (4) and then rearranged to obtain (5).

$$w_i^{son} = \alpha_2 + \gamma(\alpha_1 + \pi w_i^{father}) + \delta w_i^{father} + \varepsilon_i \tag{4}$$

$$w_i^{son} = (\alpha_2 + \gamma\alpha_1) + (\gamma\pi + \delta)w_i^{father} + \varepsilon_i \tag{5}$$

Taking marginal effects, the total intergenerational correlation, β, can be decomposed into the part accounted for by the characteristic cog_i^{son}, $\gamma\pi$ and the direct effect of fathers' workless spells on sons' workless spells, δ as shown in (6).

$$\frac{\partial w_i^{son}}{\partial w_i^{father}} = \gamma\pi + \delta = \beta \tag{6}$$

In this model the characteristics are included in four blocks. The separation of early non-cognitive skills from behavioural outcomes and cognition from educational outcomes is motivated by research by Heckman et. al. (2006). While non-cognitive and cognitive skills are early characteristics (determined by genetics, resources and parental capabilities to change inputs into outputs) later behavioural and educational outcomes are decisions or actions of the son that, in part, the earlier skills feed into. However in part these later outcomes measures are also capturing some unobserved differences in the sons that affects development as individuals age. In this statistical framework the earlier skills can either directly impact the individuals' future work experiences or transmit through later decisions and actions in predicting workless spells. To allow for this, the later behavioural and educational outcomes can be added into the model sequentially, after non-cognitive skills and cognition. Equation (7) through (9) illustrates this ordering for cognition and educational outcomes.

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[7] The consequences of this assumption and some further robustness analysis are discussed in the appendix

$$cog_i^{son} = \alpha_1 + \pi w_i^{father} + u_{1i} \tag{7}$$

$$ed_i^{son} = \alpha_2 + \theta w_i^{father} + u_{2i} \tag{8}$$

$$w_i^{son} = \alpha_3 + \tau cog_i^{son} + \rho ed_i^{son} + \delta w_i^{father} + \varepsilon_{2i} \tag{9}$$

Equations (7) and (8) estimate separately the association between fathers' worklessness and each characteristic. Subbing these into (9) assuming $Cov(\varepsilon_{2i}, u_{1i}) = 0$ and $Cov(\varepsilon_{2i}, u_{2i}) = 0$, and rearranging gives

$$w_i^{son} = (\alpha_3 + \gamma\alpha_1 + \tau\alpha_2) + (\tau\theta + \gamma\pi + \delta)w_i^{father} + \varepsilon_{2i} \tag{10}$$

$$\frac{\partial w_i^{son}}{\partial w_i^{father}} = \rho\theta + \tau\pi + \delta = \beta \tag{11}$$

The direct effect of cognition will be captured by $\tau\pi$ from equation (11) while the effect of cognition that feeds into educational outcomes will be captured by the difference between $\gamma\pi$ from (6) and $\tau\pi$ from (11). The total accounted for by educational outcomes is captured by $\rho\theta$ while the direct effect of workless spells in the 1st generation is δ. This simple decomposition therefore allows us to both assess the two important stages independently: i) the association between the sons' characteristics and the workless experience of the father and ii) the importance of these characteristics in predicting later youth unemployment. It also allows us to combine these effects to get a sense of which characteristics are important in the overall intergenerational transmission.

ii)   *Local labour market variation*

As shown in Macmillan (2011), the intergenerational correlation in workless spells varies by the unemployment rate in the local labour market that the son experiences. Gregg and Macmillan (2012) found that this relationship is very similar in both the UK and the US despite the differences in geographical mobility within the two countries. As discussed, one potential reason for this variation in the intergenerational correlation by local labour market conditions is that the skills associated with employment become more important as

unemployment, and therefore the supply of labour that employers can choose from, increases. I assess whether the association between characteristics and future employability varies by local labour market conditions. This would support the idea that this variation across local labour markets in the intergenerational correlation is driven, in part at least, by the varying characteristics of individuals with workless fathers.

To examine this, equation (9) (suppressing cognition for this example for notational simplicity) can be extended to include the county level unemployment rate, u_{rt} and interactions between *each* of the characteristics of interest and the unemployment rate across the period, $ed_{ir}^{son} * u_{rt}$. In this example education is the only characteristics listed to keep the notation simple. An interaction between fathers' workless experience and the unemployment rate, $w_{ir}^{f} * u_{rt}$ is also included as illustrated in equation (12). These interaction effects indicate which of the characteristics' association with future workless experiences change across different levels of unemployment.

$$w_{irt}^{son} = \alpha + \rho ed_{ir}^{son} + \varphi ed_{ir}^{son} * u_{rt} + \beta w_{ir}^{father} + \theta w_{ir}^{f} * u_{rt} + \tau u_{rt} + e_{irt} \quad (12)$$

As within-county unemployment rates range from 2% to 24% across time and local labour markets within the sample of interest, (12) can be estimated across this range of values, assessing the impact of characteristics on future worklessness at both the average unemployment rate, $\bar{u}$, and across different values of the unemployment rate $u = [2, 3 \ldots .24]$, resulting in a range of different coefficients for each characteristic of the son, $\rho_k = \omega_k - \varphi(u_k)$ for $k = 2 \ldots 24$ and father's workless experience, $\beta_k = \pi_k - \theta(u_k)$

$$w_{irt}^{son} = \alpha + \omega_k ed_{ir}^{son} + \varphi ed_{ir}^{son} * (u_{rt} - u_k) + \pi_k w_{ir}^{father} + \theta w_{ir}^{f} * (u_{rt} - u_k) + \tau u_{rt} + e_{irt} \quad (13)$$

The relationships between the characteristics and future workless experiences can therefore be plotted by each unemployment rate to get a sense of whether some characteristics that may not appear important at the mean level of unemployment matter more in labour markets with particularly low or high levels of unemployment. Note that the simple bivariate relationship between fathers' workless experiences and the sons' characteristics (as in (2) and (8)) is not

of interest for this analysis as this interaction between child characteristics and later local labour market experiences is focused on the 2nd generations' experiences.

4. Data

This research uses the vast amount of information available on the cohort members of the British Cohort Study (BCS), a longitudinal survey of all individuals born in one week in April, 1970 in Great Britain. Despite the more recent British Household Panel Survey (BHPS) providing more information on the workless experience of fathers there is very limited information available on the characteristics of the sons. The BCS is therefore the most recent survey available in the UK for measuring the drivers of the intergenerational correlation in its entirety. Information is available in the BCS for two generations of workless experiences: the 1st generation (fathers) when their son is aged 10 and 16 and the 2nd generation (sons - the cohort members), for every month from age 16 to 29. There is also detailed information on the non-cognitive skills, cognition, behavioural outcomes and educational attainment of the sons throughout their childhood.

Workless measures are constructed by combining information from the two observations of the employment status of the father when the son is 10 and 16 to create a measure of 1st generation worklessness equal to 1 if the father is only observed as workless and 0 otherwise. This measure of worklessness is therefore designed to measure a persistent experience of worklessness. Table 1 illustrates that 4.4% of the final sample of sons had workless fathers in childhood. Macmillan (2011) explores the implications of measurement error from only observing two snapshots of employment history for the father rather than a longer window of work history. Using a longer window (8 years) in the BHPS data, the research shows that measurement error has only a limited impact on the estimates of the intergenerational correlation, reducing the estimate by 11%.

The workless measure for the 2nd generation is constructed using the monthly work history data from the BCS (Galindo-Rueda, 2002). For each month, sons are assigned as not workless if they are in employment or full-time education and workless otherwise. The monthly information is combined to create a measure of whether the son spent a year or more in concurrent spells out of work from 16-29. Table 1 indicates that 13.9% of the sample spent a year or more in concurrent spells out of work across the period. The analysis is restricted to sons only to avoid differences in participation decisions across gender. I restrict the sample to those sons with work history information and at least one observation of fathers' employment

status. The focus is therefore on coupled households[8]. Macmillan (2011) illustrates that based on observable characteristics, the final sample are from families with slightly higher social class and education than the nationally representative sample at birth in the BCS.

Measures of the characteristics of the sons are split into four main categories: non-cognitive skills, cognition, behavioural outcomes and educational outcomes. Research from psychology on the big five personality traits (Digman, 1990) was utilised to create non-cognitive measures of the son from a number of mother and teacher-reported behavioural scales from the BCS at ages 5 and 10. From the non-cognitive scales available, four of the big five personality measures can be constructed (the fifth, intelligence is measured in the cognition grouping). User guides from the Centre for Longitudinal Surveys point to factor constructs for agreeableness, emotionality, extroversion and conscientiousness (Butler et. al., 1980). Agreeableness is a measure of how well the child socialises with others while emotionality captures their emotional stability or neuroticism. Measures of extroversion capture self-confidence and assertiveness while conscientiousness is designed to measure control, attentiveness and constraint. In addition to these measures, a measure of hyperactivity is included given the interest in attention deficit hyperactivity disorder (ADHD). To minimise any impact of measurement error in the separate scales, averages are taken across the scales reported at 5 and 10 by the mother and at age 10 by the teacher to create early childhood measures of each non-cognitive scale[9]. Appendix Table A1 provides information on the specific questions asked within each measure. In addition to the mother and teacher-reported scales, the BCS also contains self-reported scales at age 10 of the son's self-esteem and locus of control (self efficacy). Similar measures are used by Heckman et. al. (2006). All scores, with the exception of hyperactivity, are positively coded so that higher scores are typically associated with better outcomes and are standardised to mean 0, standard deviation 1 at the population level to impose some form of comparable scale across measures.

Cognition is measured using three different cognitive test scores from the BCS. The British Ability Scale (BAS) is measured when the child is aged 10 and is used as a proxy for IQ, the fifth of the big five personality measures, as in previous studies (Galindo-Rueda and Vignoles, 2005, Blanden et. al., 2007). There are two additional test scores available at age 5, a copying test and early picture and vocabulary test, that are included as cognition as they are

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[8] Lone parents are considered Gregg and Macmillan (2012). They find similar intergenerational correlations when estimating intergenerational correlations for head-of-household – son pairs.

[9] With the exception of conscientiousness which is only measured in the teacher reported scale at age 10 and hyperactivity which is measured in the mother and teacher scale at age 10 but not at age 5.

measured early in life and are therefore thought of as a proxy for early cognition. Each of the cognitive test scores are standardised to mean 0, standard deviation 1.

The behavioural outcomes are whether the son has a part time job whilst at school capturing early connection to the labour market and observed attitudes to capture the son's connection to school. These include whether the son likes school at age 16, whether he views school as a waste of time at 16 and whether he truants at age 10. These outcomes are distinct from the non-cognitive skills listed above as they are observed choices made by the teenage son during adolescence. These outcomes will be determined to some degree by the earlier non-cognitive and cognitive skills but may also capture additional differences across sons, given prior test scores.

In a similar vein, educational outcomes are viewed as distinct from measures of cognition, recognising the difference between early ability and later attainment. Educational attainment variables include a reading and maths tests at age 10 (standardised mean 0, standard deviation 1) and the number of GCSEs that the son obtained at grade A-C at 16. The separation of educational attainment from cognition is less obvious than separating early non-cognitive skills from behavioural choices as it could be argued that reading and maths tests at age 10 are still measuring cognition, or conversely, all measures of cognition are measuring educational attainment to some degree. The choice to include maths and reading at age 10 as a later attainment (but not the IQ test at the same age) is based on the fact that by construction IQ tests are not as easily 'taught to' compared to maths and reading tests. I argue therefore that while the reading and maths tests at age 10 will be measuring the sons' attainment during primary school, the IQ test will still measure early cognition. The GCSEs measure is more obviously a measure of attainment based on the progress made by the son throughout school.

Table 1 presents sample level summary statistics from each group of characteristics of the son. The standardised variables, the non-cognitive scales and cognition measures plus reading and maths, were standardised to mean 0 and standard deviation 1 at the population level so this information also gives some sense of differences between the final sample and the population level data. As was found in Macmillan (2011), the final sample seem to have slightly higher scores than the average population-level score in most scales (with the exception of the conscientiousness score). 17% of sons reported not liking school at 16 while 4% thought school was a waste of time. Less than 1% truanted at age 10. The majority, 62% of sons, had worked in a part-time job while still at school. On average, sons achieved 4 GCSEs at grade A-C.

When looking at the differential effect of characteristics across different levels of unemployment the dependent variable of interest is the proportion of time spent workless every year from 1986-1998. This allows the use of cross-sectional and time-series variation to estimate the impact of unemployment rates on worklessness (see Macmillan, 2011). Information from the BCS 1986 data on the local educational authority (LEA) of the cohort member is matched with annual county-level unemployment rates from the Employment Gazette from 1986 until 1998. There is a further sample restriction for this analysis that the family's LEA of residence must be observed in 1986[10]. This information enables us to assess any variation in the impact of each characteristic on the workless experience of the son by the local labour market conditions experienced across the period. This is based on the implicit assumption that individuals remain in the same county that they are observed to live in 1986. Later county level data from 2000 suggests that 80% of the sample reside in the same county in 2000 that they were observed to live in 1986.

5. Results

The intergenerational correlation of worklessness is reported in Table 2. Sons with workless fathers in childhood are 25% more likely to experience a year or more in concurrent spells out of work from 16-29 than sons with employed fathers[11]. This is the intergenerational correlation that will now be decomposed.

i) *Child characteristics and later workless experiences*

Table 3 presents the results from estimating equation (3), the relationship between characteristics of the son and their future workless experiences, conditional on the fathers' worklessness. The regressions are built up in stages to allow us to assess which of the non-cognitive and cognitive skills are important predictors of workless spells in their own right before assessing which are working through later behavioural and educational outcomes. Non-cognitive and cognitive skills are included separately in columns 1 and 2 and then

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[10] This decreases the sample by just under 1,000 observations. The intergenerational correlation is slightly lower for this sub-sample suggesting that those who do not have information on their LEA of residence in 1986 have a higher intergenerational correlation than the remaining sample.

[11] This estimate is larger than in Macmillan (2011) as the window considered is 16-29 rather than 16-23. This illustrates there is some life-cycle bias in measuring the intergenerational correlation too early.

together in column 3. Behavioural and educational outcomes are added separately in columns 4 and 5 and then all characteristics are included in column 6.

The first column indicates that a number of non-cognitive traits are significantly associated with future workless experiences. Extroversion, hyperactivity and conscientiousness are important predictors of future spells out of work with a standard deviation higher score in conscientiousness reducing the chance of spending a year or more out of work by 2.7%. Having more internal locus of control (believing you are in control of your own choices) is significantly negatively associated with spending a year or more out of work in adulthood although this appears to be mediated through later behaviours. The early cognition test scores dominate the British Ability Scale IQ measure at 10 in predicting the likelihood of sustained worklessness in adulthood but around half of the initial effect works through later educational outcomes for the copying test. The early picture and vocabulary test remains a strong predictor of future worklessness in the full model. The behavioural outcomes are independently associated with future worklessness[12] with those observed truanting at age 10 being 18% more likely to spend a year or more out of work in adulthood than those not observed truanting at age 10. Those sons who do some part-time work while at school are 5.8% less likely to spend a year or more out of work than those that do not. Having negative attitudes to school also remains a strong predictor of later worklessness, even with the inclusion of educational attainment measures, with those who report not liking school 6.3% more likely to be out of work for a year or more from 16-29 than those who like school, regardless of their final GCSE attainment. Scoring higher in the age 10 maths test and obtaining more GCSEs grade A-C are both negatively associated with future workless experiences although the reading test is significantly positively associated with future worklessness.

Overall, these characteristics account for 7% of the variation in the workless experience of the son from 16-29. The Adjusted R-squared when using a similar set of characteristics in a regression of earnings at 30 is 0.17 (Blanden et. al., 2007). There is therefore more variation unaccounted for in the workless measure compared to earnings, although earnings is a more continuous measure and so this may not be entirely surprising. Typical Mincer wage equations can predict more variation by including later education measures, experience and tenure as predictors of earnings but the set of characteristics used

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[12] The addition of these variables has little impact on the effect sizes of the early non-cognitive and cognitive scales

here is restricted to those that occur during compulsory schooling, before the outcome measure begins (at age 16).

ii) *Fathers' worklessness and child characteristics*

To move on to consider whether each of the characteristics are associated with coming from a family with a workless father at 10 and 16 (the other part of the intergenerational story) Table 4 presents the bivariate regression coefficients from estimating equation (2) for each separate characteristic. As found by Schoon et. al. (2012), many of the non-cognitive skills are strongly associated with having a workless father in childhood. Agreeableness, self-esteem and locus of control have the strongest effects out of all of the non-cognitive traits with sons with workless fathers scoring 0.3 of a standard deviation lower on these scales on average than sons with employed fathers. Conscientiousness and extroversion all have a slightly lower association of 0.2 of a standard deviation. Hyperactivity is positively associated with coming from a home with a workless father with sons with workless fathers scoring 0.01 of a standard deviation higher on average than sons with employed fathers. The emotionality scale is the only personality trait not associated with having a workless father.

Cognition and educational outcomes are more strongly associated with coming from a home with a workless father than non-cognitive skills. Sons with workless fathers scored on average 0.3 to 0.4 of a standard deviation less on early cognitive tests than sons with employed fathers. They are also likely to obtain 1.14 fewer GCSE grades A-C on average. By contrast, the behavioural outcomes are only weakly associated with having a workless father in childhood. Sons with workless fathers are 1.5% more likely to report that they think that school is a waste of time but the other school attitude variable and truanting at age 10 are not associated with fathers' worklessness. Sons with workless fathers are 4.6% less likely on average to work in a part-time job whilst at school than sons with employed fathers.

This evidence suggests that having a workless father is associated with significant penalties in terms of both non-cognitive and cognitive skills. Interestingly, although educational attainment is strongly related to the workless experiences of the father, the behavioural outcomes are less related to having a workless father. Therefore although these are independent predictors of the sons' workless experience, negative outcomes across some of the measures are just as likely to be observed in sons with employed fathers as sons with workless fathers.

iii)   Accounting for the intergenerational correlation

Table 5 presents the combined decomposition of the intergenerational correlation. Each cell gives the product of the relationship between fathers' worklessness and the characteristic from Table 4 and the characteristics' association with future worklessness from Tables 3. This is equivalent to $\gamma\pi$, from equation (6) in Section 3i). The direct effect of fathers' worklessness on sons' worklessness, δ, is reported as 'Not accounted for' through the characteristics. The bottom rows of each table present summary statistics of the total amount accounted for and the contribution of each group.

The total accounted for by all characteristics included in the model is just 12%. 88% of the intergenerational transmission of worklessness remains unaccounted for in this model despite the inclusion of a broad range of non-cognitive skills, cognition, behavioural and educational outcomes. Similar characteristics in the intergenerational mobility literature can account for up to 40% of the intergenerational transmission of income (Blanden et. al., 2007). There appears to be a great deal more heterogeneity in intergenerational worklessness than intergenerational income mobility.

Non-cognitive skills alone account for 0.022 or 8.6% of the intergenerational correlation whilst cognition alone accounts for 0.024 or 9.5% of the total correlation. When these are included together, the contribution of non-cognitive skills only diminishes slightly, to 7.5% or 0.019 of the total correlation, while around one third of the impact of cognition is removed reducing the total accounted for by cognition to 0.014. The addition of behavioural and educational outcomes add around 2% each to the model when included separately with behaviour dominating education when the two are included together in the full model (2% through behaviour compared to 1% through education). Non-cognitive skills appear to dominate the role of cognition in accounting for worklessness across generations. From the total 11.9% accounted for in the full model in column 6, 5.7% (48% of the total accounted for) is transmitted through the measured non-cognitive skills over and above the impact of cognition, educational attainment and later behavioural outcomes.

There appears to be something quite distinct about the role of non-cognitive skill and behaviours in the intergenerational transmission of worklessness compared to the intergenerational transmission of incomes. Non-cognitive skills and behavioural outcomes appear to be more important predictors of intergenerational worklessness than they are of intergenerational income persistence. They also appear to matter more than cognition or

educational attainment. This is in line with the findings of Heckman et. al. (2006) who find that non-cognitive skills are stronger predictors of future employability than cognitive skills.

iv)   *Differential effects by local labour markets*

Given that the characteristics play some role in accounting for the intergenerational transmission and this intergenerational transmission varies substantially by local labour market conditions (Macmillan, 2011), I move on to consider whether any of the characteristics are important in driving this variation by unemployment rates. If this variation in the intergenerational correlation is a result of those sons with lower skills being first in and last out of jobs as unemployment rises, we would expect to see the characteristics of the son that predict future labour market participation to matter more as unemployment increases. Table 6 presents the coefficients, $\hat{\rho}_k$, from estimating equation (13), evaluated at three different unemployment rates; low unemployment (3%), the mean unemployment rate across the sample (9%) and high unemployment (16%). The dependent variable is the proportion of time spent workless each year from 1986-1998 with the full set of characteristics included in the model. The coefficient for the workless father variable illustrates the increasing intergenerational correlation as unemployment increases as seen in Macmillan (2011).

While the interaction effects tend to be small across the majority of characteristics, it is clear from this table that there is some variation in the association between some key characteristics and future worklessness by unemployment rates. At a low level of unemployment, very few of the characteristics have a significant impact on future worklessness. Extroversion, conscientiousness and thinking that school is a waste of time are the only significant predictors when evaluating the effects at an unemployment rate of 3%. At the average unemployment rate, early picture and vocabulary tests, working in a part time job, the maths test score at age 10 and GCSE results all become significant predictors of worklessness. At a high level of unemployment, conscientiousness and thinking that school is a waste of time are no longer significant predictors of worklessness whereas working in a part time job and the maths test are increasingly strong predictors of future worklessness as unemployment rises. The impact of extroversion is significant across unemployment rates.

Figures 1 and 2 illustrate the impact of working part time and the maths test score at age 10 across the range of unemployment rates observed in the sample across the period. Working part-time is a protective factor against future worklessness in high unemployment local labour markets with sons who work in a part-time job while still at school increasingly

spending less time workless compared to those who did not work part-time as unemployment increases. As the unemployment rate rises above 20%, sons who work part time while still at school spend over 4% less time workless from 16-29 than sons who do not work part time, in the same local labour markets. This suggests that employers may favour those with previous work experience in looser labour markets. Similarly for the maths test scores at age 10, sons who score a standard deviation higher on their maths test scores at age 10 in high unemployment local labour markets spend 2-3% less time workless than equivalent sons in the same local labour market. In both cases, there is no effect of these characteristics on future workless experiences in low unemployment labour markets. This is also true for emotionality, early picture and vocabulary test scores and the number of GCSEs grade A-C achieved. These skills all become increasingly significant predictors of later worklessness as the supply of labour increases.

6. Conclusions

These results offer a new insight into the drivers of the intergenerational transmission of worklessness. While there has been much research into the predictors of later life earnings, there has been little focus on the attributes that predict future employability and whether these characteristics are related to having a workless father in childhood. Four groups of characteristics are considered. Non-cognitive skills play an important role in predicting future workless spells. Cognition also plays a significant role although the IQ measure from this data source does not predict later worklessness. The inclusion of behavioural outcomes adds additional information about the difference between sons with workless fathers compared to sons with employed fathers with similar non-cognitive and cognitive skills, in contrast to educational attainment which appears to be capturing a lot of differences in cognition from the earlier measures used. In addition to having negative consequences for future employability, the evidence here suggests that for non-cognitive skills, cognition and educational attainment, sons with workless fathers consistently score worse than sons with employed fathers, exhibiting lower skills in these domains. Carneiro and Heckman (2003) and Cuhna, et. al. (2006) document the important role of parents in the formation of these skills.

It is difficult to account for much of the overall intergenerational transmission of worklessness in the UK despite using a wide variety of characteristics from the son's childhood that account for over 40% of the intergenerational transmission of income in the

same data source. 12% of the intergenerational correlation is accounted for by measures of non-cognitive skills, cognition, behavioural outcomes and educational attainment with the remaining 88% unaccounted for. Of the part that can be accounted for, non-cognitive skills and behaviours appear to play a more substantial role in the story of the intergenerational transmission of worklessness than they do in the intergenerational transmission of incomes. Non-cognitive skills and behaviours also play a dominant role compared to cognition and educational attainment.

When considering the role of these characteristics in different local labour market settings, there is a clear pattern of a range of characteristics becoming increasingly important predictors of future worklessness as the unemployment rate increases. While in local labour markets with low unemployment very few of the characteristics significantly predict future worklessness, in local labour markets with higher unemployment rates, emotionality, early picture and vocabulary tests, working part time while still at school, maths tests and GCSE attainment are all increasingly associated with future workless spells. This suggests that these skills are more important as the supply of labour increases with employers placing additional value on skills when making hiring decisions from a larger pool of workers.

These findings suggest that investments to improve life chances should focus not only on the cognition and educational attainment but perhaps more importantly the soft skills of children as these may be vital in influencing their experiences in the labour market in adulthood. In particular, efforts should be made to increase the skills of those already facing greater barriers to employment through their fathers being out of work. In addition, the evidence across local labour market experiences suggests that improving the wider skill set of these children is particularly important in local labour markets with high unemployment rates and at times of recession.

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Table 1: Descriptive statistics of the workless measures and the 2nd generation's (son) non-cognitive skills, cognition, behavioural outcomes and educational attainment

1st generation measure	Sample average	Sample standard Deviation
Father workless at 10 & 16	0.044	0.206
Sons spent a year or more out of work	0.139	0.346
Agreeableness	0.158	0.762
Emotionality	0.189	0.835
Extroversion	0.082	0.920
Hyperactivity	0.177	0.975
Conscientiousness	-0.078	0.927
Self Esteem	0.127	0.878
Locus of Control	0.074	0.921
Copying test	0.067	0.927
Early picture and vocabulary	0.157	0.893
Ability Scale	0.101	0.866
Don't like school	0.174	0.241
School a waste of time	0.037	0.125
Early truant	0.004	0.059
Part-time job at school	0.623	0.307
Maths test	0.130	0.889
Reading test	0.039	0.889
No. of GCSE grade A-C	4.058	3.120

Table 2: Estimating intergenerational worklessness in the BCS

2nd generation measure 16 - 29	A year or more workless
Father workless at 10 and 16	0.2511 (.034)***
R-squared	0.0269
N	4646

Robust standard errors in parenthesis. * 90% confidence, ** 95% confidence, *** 99% confidence

Table 3: Estimating the association between sons' non-cognitive skills, cognition, behavioural and educational outcomes and spending a year or more in concurrent spells out of work from age 16-29

2nd generation measure 16 – 29 - **a year or more out of work**	Non-cognitive skills	Cognition	Non-cognitive skills and cognition	Adding behavioural outcomes	Adding educational outcomes	Adding behavioural and educational outcomes
Agreeableness	-0.0160 (.023)		-0.0159 (.013)	-0.0136 (.013)	-0.0090 (.013)	-0.0085 (.013)
Emotionality	0.0150 (.009)*		0.0136 (.009)	0.0115 (.009)	0.0102 (.009)	0.0092 (.009)
Extroversion	-0.0236 (.008)***		-0.0222 (.008)***	-0.0217 (.009)***	-0.0237 (.008)***	-0.0226 (.008)***
Hyperactivity	0.0171 (.006)***		0.0163 (.006)***	0.0155 (.006)**	0.0149 (.006)**	0.0142 (.006)**
Conscientiousness	-0.0265 (.006)***		-0.0227 (.006)***	-0.0201 (.006)***	-0.0180 (.007)***	-0.0171 (.007)***
Self Esteem	-0.0098 (.006)		-0.0093 (.006)	-0.0080 (.006)	-0.0091 (.006)	-0.0080 (.006)
Locus of Control	-0.0157 (.006)**		-0.0110 (.006)*	-0.0097 (.006)	-0.0069 (.007)	-0.0067 (.007)
Copying test		-0.0278 (.006)***	-0.0214 (.006)***	-0.0194 (.006)***	-0.0148 (.006)**	-0.0141 (.006)**
Early picture and vocab test		-0.0251 (.006)***	-0.0211 (.006)***	-0.0195 (.006)***	-0.0184 (.006)***	-0.0179 (.006)***
Ability Scale		-0.0115 (.006)*	0.0057 (.007)	0.0087 (.007)	0.0117 (.007)	0.0125 (.008)
Don't like school				0.0699 (.022)***		0.0634 (.022)***
School a waste of time				0.0758 (.042)*		0.0659 (.042)
Early truant				0.1784 (.084)**		0.1751 (.084)**
Part-time job at school				-0.0583 (.016)***		-0.0592 (.016)***
Maths test					-0.0214 (.009)**	-0.0213 (.009)**
Reading test					0.0200 (.009)**	0.0218 (.009)**
No. of GCSE grade A-C					-0.0037 (.002)*	-0.0030 (.002)*
Workless father	0.2304 (.024)***	0.2284 (.004)***	0.2202 (.024)***	0.2192 (.024)***	0.2101 (.024)***	0.2102 (.024)***
Adj. R-squared	0.0507	0.0406	0.0571	0.0671	0.0662	0.0737
N	4646	4646	4646	4646	4646	4646

Robust standard errors in parenthesis. * 90% confidence, ** 95% confidence, *** 99% confidence

Table 4: Estimating bivariate associations between sons' non-cognitive skills, cognition, behavioural and educational outcomes and the workless experience of their father

1st generation measure	Only observed as workless at 10/16
Agreeableness	-0.2854 (.043)***
Emotionality	-0.1434 (.052)
Extroversion	-0.1932 (.066)***
Hyperactivity	0.0109 (.068)**
Conscientiousness	-0.2458 (.067)***
Self Esteem	-0.2784 (.062)***
Locus of Control	-0.3272 (.066)***
Copying test	-0.3503 (.066)***
Early picture and vocabulary	-0.3920 (.063)***
Ability Scale	-0.3390 (.062)***
Don't like school	0.0037 (.017)
School a waste of time	0.0148 (.009)*
Early truant	0.0063 (.042)
Part-time job at school	-0.0459 (.022)**
Maths test	-0.3369 (.064)***
Reading test	-0.3667 (.064)***
No. of GCSE grade A-C	-1.1423 (.224)***

Robust standard errors in parenthesis. * 90% confidence, ** 95% confidence, *** 99% confidence. Coefficients from separate univariate regressions of sons' characteristic on fathers' workless status and quadratic fathers' age controls. N=4646

Table 5: Accounting for the intergenerational relationship in spending a year or more in concurrent spells out of work of the sons with their non-cognitive skills, cognition, behavioural and educational outcomes in childhood

A year or more concurrent spells out of work	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Agreeableness	0.005		0.005	0.004	0.003	0.002
Emotionality	-0.002		-0.002	-0.002	-0.001	-0.001
Extroversion	0.005		0.004	0.004	0.005	0.004
Hyperactivity	0.000		0.000	0.000	0.000	0.000
Conscientiousness	0.007		0.006	0.005	0.004	0.004
Self Esteem	0.003		0.003	0.002	0.003	0.002
Locus of Control	0.005		0.004	0.003	0.002	0.002
Total personality traits	**0.022**		**0.019**	**0.017**	**0.015**	**0.014**
Copying test		0.010	0.008	0.007	0.005	0.005
Early picture and vocab test		0.010	0.008	0.008	0.007	0.007
Ability Scale		0.004	-0.002	-0.003	-0.004	-0.004
Total cognition		**0.024**	**0.014**	**0.012**	**0.009**	**0.008**
Don't like school				0.000		0.000
School a waste of time				0.001		0.001
Early truant				0.001		0.001
Part-time job at school				0.003		0.003
Total behavioural outcomes				**0.005**		**0.005**
Maths test					0.007	0.007
Reading test					-0.007	-0.008
No. of GCSE grade A-C					0.004	0.003
Total educational attainment					**0.004**	**0.003**
Total accounted for	**0.0215**	**0.0238**	**0.0328**	**0.0338**	**0.0277**	**0.0298**
Not accounted for	**0.2296**	**0.2274**	**0.2183**	**0.2174**	**0.2234**	**0.2213**
Total	**0.2511**	**0.2511**	**0.2511**	**0.2511**	**0.2511**	**0.2511**
% through non-cognitive	**8.57**		**7.49**	**6.74**	**5.98**	**5.68**
% through cognition		**9.46**	**5.58**	**4.64**	**3.42**	**3.13**
% through beh. outcomes				**2.06**		**2.00**
% through ed. outcomes					**1.63**	**1.06**
% of total	**8.57**	**9.46**	**13.07**	**13.44**	**11.03**	**11.87**

Each cell represents the product of table 3 and table 4, $\gamma\pi$, from equation (6) in Section 3i). N=4646

Table 6: Estimating the association between sons' non-cognitive skills, cognition, behavioural and educational outcomes and the proportion of time spent workless each year from 16-29 at different local labour market levels of unemployment

2nd generation measure 16 – 29 - **proportion of time spent out of work each year**	Low unemployment (u=3%)	Average unemployment (u=9%)	High unemployment (u=16%)
Agreeableness	0.0024 (.010)	-0.0035 (.006)	-0.0095 (.010)
Emotionality	-0.0062 (.008)	0.0066 (.004)	0.0194 (.008)**
Extroversion	-0.0187 (.007)***	-0.0148 (.004)***	-0.0111 (.006)*
Hyperactivity	0.0059 (.005)	0.0030 (.003)	0.0001 (.005)
Conscientiousness	-0.0131 (.005)***	-0.0063 (.003)**	0.0004 (.006)
Self Esteem	-0.0044 (.005)	-0.0018 (.003)	0.0008 (.006)
Locus of Control	0.0081 (.005)	0.0043 (.003)	0.0005 (.006)
Copying test	-0.0013 (.005)	-0.0038 (.003)	-0.0088 (.006)
Early picture and vocab test	0.0001 (.006)	-0.0063 (.003)**	-0.0127 (.006)**
Ability Scale	0.0048 (.005)	0.0045 (.003)	0.0042 (.007)
Don't like school	0.0035 (.015)	0.0125 (.008)	0.0214 (.017)
School a waste of time	0.0729 (.045)*	0.0414 (.024)*	0.0100 (.043)
Early truant	0.0051 (.103)	0.0734 (.060)	0.1412 (.119)
Part-time job at school	-0.0103 (.010)	-0.0239 (.006)***	-0.0374 (.012)***
Maths test	0.0007 (.007)	-0.0092 (.004)**	-0.0191 (.009)**
Reading test	-0.0021 (.007)	0.0023 (.004)	0.0067 (.008)
No. of GCSE grade A-C	-0.0015 (.001)	-0.0017 (.001)**	-0.0019 (.001)**
Workless father	0.0097 (.031)	0.0790 (.010)***	0.1566 (.041)***
Adj. R-squared N	0.0626 3672	0.0626 3672	0.0626 3672

Figure 1: Estimating effect of working part time while at school on later worklessness by local labour market unemployment rates
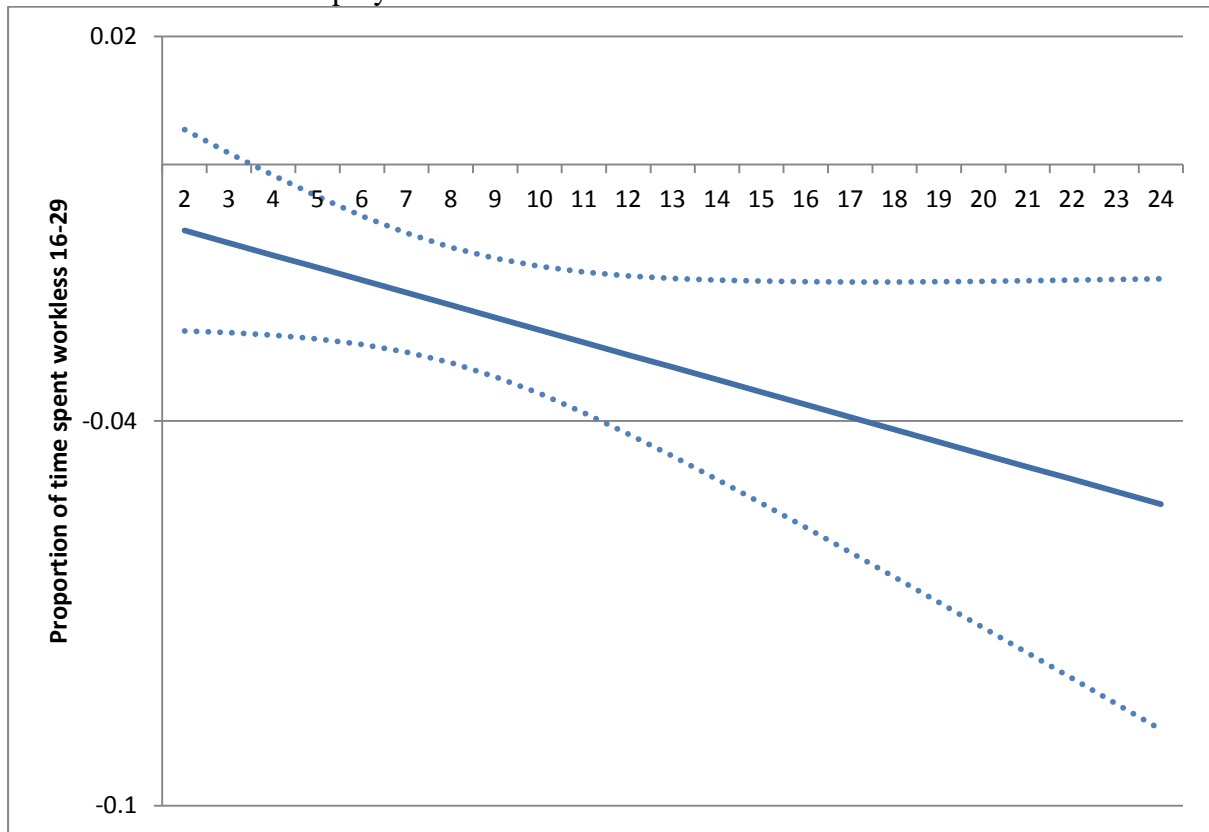
Figure 2: Estimating effect of a standard deviation increase in maths test scores at age 10 on later worklessness by local labour market unemployment rates
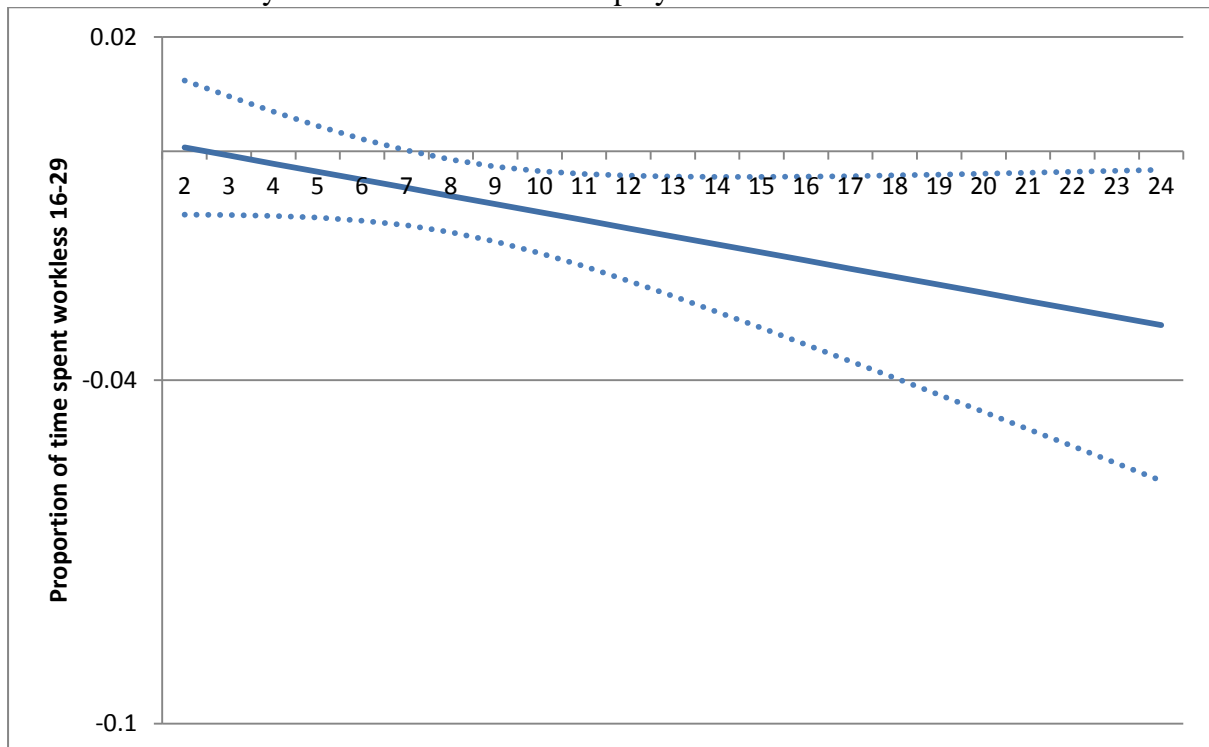
Appendix

Table A1: Examples of the scales used in the Principle Components Analysis to create the personality trait measures in the BCS

Non-cognitive scale	Examples of the scales and statements	How scored?
Agreeableness	Moody, Temper, Interferes, Bullies, Lies, Fights, Destructive, Takes Things, Disliked	Mother and Teacher choose a place on the scale to score the child (1-100)
Emotionality	Fussy, Fears New Things, Worried	
Extroversion	Excitable, Sullen, Solitary	
Hyperactivity	Hums, Taps, Restless, Twitches, Squirmy	
Conscientiousness	Concentrates, Bored, Perseveres, Confused, Listless, Fails Complete Tasks, Distracted	
Self Esteem	Lonely at school, People think foolish, People think nasty, Would like to change self	Child directly responds positively or negatively to statements
Locus of Control	Why try, Wishing Helps, Bad things happen, Nice things are luck, People are good	

Robustness test of the decomposition

The decomposition used in this analysis requires a strong assumption to hold, namely from equations (2) and (3) that $Cov(\varepsilon_i, u_i) = 0$. There are two problems with this assumption. First, the classic omitted variable bias problem where there is likely to be some important determinants of both the sons' characteristics and the sons' workless spells that are not included in the estimation of either (2) or (3). This will lead to a correlation between the two error terms and result in us overstating the contribution of cognition, in this example, in the transmission of intergenerational worklessness. To some degree, the inclusion of later educational attainment and behavioural outcomes helps reduce this bias as these later outcomes will add more information about the unobserved differences between sons. Secondly, if the correlation between the errors in (7) and (9) is stronger than the errors between (8) and (9), the overall contribution of each set of characteristics may be misleading.

To attempt to minimise any likely bias in this decomposition, a robustness test can be run that will reduce the impact of omitted variable bias. To do this the sample of workless fathers are matched to the sample of employed fathers based on a propensity score from their predicted likelihood of being workless given a vector of

family background controls, X_i by running a probit regression as seen in equation (A1). The family background controls are carefully chosen so that they are pre-determined and exogenous. To control for observable differences across families, information on parental education, father's social class when the son is aged 10, the region the family live in at 10 and housing tenure at 10 are all available. The model explicitly attempts to control for any selection into worklessness rather than any potential causal mechanisms. No potential causal mechanisms are included as background controls. The class of the father when the son is aged 10, for example, is included to capture a long term indicator of the socio-economic status of the father (workless fathers can and do still report a 'typical occupation'). In contrast, the family income in childhood is not included as this is a measure of resources which will be directly affected by the father's workless status.

$$w_i^{father} = \alpha + \sigma X_i + \varepsilon_i \tag{A1}$$

The workless fathers (treated) are matched to employed fathers (control) based on their nearest-neighbour, the member of the control group with the most similar propensity score to the treated individual. Replacement is allowed so that the same control group individual can be matched to numerous treated fathers. Given that the treatment group (206) make up a small proportion of the total sample, the 3 nearest neighbours are found for each treatment group member to ensure that the sample sizes are sufficient. The control group consists of 618 fathers. The aim of this matching is to balance the sample so that the likelihood of being workless is the same for employed and workless fathers, minimising any differences between the two groups. This will reduce any covariance in the error terms of the two stage regressions towards zero. Figure A1 plots the distribution of propensity scores for the treatment and control groups for the sample of matched fathers. Using three control group members for every one treated father leads to some imprecision in the matching of the propensity scores, particularly in the right tail of the distribution. The 1st matched nearest neighbour in the control group exhibit very similar propensity scores to the treated group but there are slightly less 2nd and 3rd matched fathers at the top end of the propensity score distribution.

Note that the intergenerational effect that will be decomposed based on this matched sample is the average treatment effect on the treated (ATT), which is likely to be reduced by this procedure by the extent to which the relationship is spuriously driven by observable differences in opportunities available to the son brought about by workless fathers' different backgrounds compared to employed fathers. Although this procedure can say nothing about unobserved differences across families, the extent to which differences exist which are observable will reduce any $Cov(\varepsilon_i, u_i)$ bringing this term closer to zero. This process, although similar, is preferred to controlling for observable differences in backgrounds as the simple inclusion of background controls may lead to correlations between these and the sons' characteristics in the decomposition. It is still likely that $Cov(\varepsilon_i, u_i) \neq 0$ using this technique. However, by comparing the results from the original decomposition to the matched decomposition, the likely biases arising from a larger $Cov(\varepsilon_i, u_i)$ can be assessed.

Table A2 presents the coefficients from equation (1), the basic intergenerational correlations for the original sample and the matched sample. As expected, the matched estimates are lower than the estimates from the unconditional correlation in the full sample, driven by observed differences in the background characteristics of employed and workless fathers. Note that this technique does not imply that these estimates are causal as heterogeneity will remain across groups as we can do nothing about unobservable differences across fathers. Some covariance between the error terms is therefore likely to remain although the hope is that it will be reduced using this technique. Table A2 also presents the results from conditional correlations to illustrate that this technique does not vary much from simply using conditional estimates. Matching is preferred here to remove the possibility of correlations between background controls and child characteristics which may bias the effect of the child characteristics that we are interested in.

Tables A3 presents the regression results from regressing spending a year or more workless from 16-29 on the various sons' characteristics for the matched sample. While hyperactivity remains a significant predictor of future worklessness, many of the other non-cognitive skills are not significantly associated with later workless spells. The point estimates are actually larger for many of the characteristics in this sample but so too are the standard errors. This is also true for the behavioural

outcomes although working part time is an increasingly important predictor of later worklessness. For the cognitive test scores and the educational outcomes, the copying test and GCSE attainment becomes insignificant but early picture and vocabulary tests and the maths test are stronger significant predictors of future worklessness. The amount of variation captured by these characteristics improves across both outcomes with the R-squared increasing to 0.13 from 0.07.

The bivariate relationship between workless fathers and the characteristics of the son for the matched sample are found in Table A4. While many of the associations between having a workless father and the sons' characteristics are weaker for the matched sample, suggesting that part of the correlations observed in Table 4 are driven by the other differences in the background characteristics of workless fathers compared to employed fathers, the majority of the characteristics still have a significant association with coming from a family with a workless father. This is in contrast to the findings of Schoon et. al. (2012), who find that the relationship between parental worklesness and child characteristics in their analysis is driven by other background characteristics of the parent rather than by worklessness itself for more recent cohorts. The non-cognitive and cognitive coefficients diminish by around 50% but the relationship between working part time and hyperactivity and having a workless father increases for this matched sample.

Tables A5 presents the results from the matched decomposition. Non-cognitive skills remain the dominant driver even when accounting for observed differences between employed and workless fathers. These alone account for 11% of the total correlation while cognition alone account for 11.2% of the total correlation. However, when the two groups of characteristics are included together, as seen in Table 5, non-cognitive skills dominate the role of cognition, contributing two-thirds of the total amount accounted for with one-third working through cognition. Behavioural outcomes are also contributing relatively more to the picture for this matched sample accounting for just less than 6% of the total intergenerational correlation compared to 2% in Table 5. This is driven mainly by the increased association between fathers' worklessness and working part time combined with an increase in the association between working part time and future workless experiences. Sons who work part time are 15% less likely to spend a year or more out of work in the matched sample compared to sons who do not work part time. For the most disadvantaged sons, in terms of coming from a home with a workless father,

personality traits and behaviours again dominate cognition and educational attainment in terms of predicting long spells of worklessness in adulthood. The evidence is therefore consistent with the results from the unmatched sample that soft skills are playing more of a role compared cognition and educational attainment.

Overall, this suggests that we should be aware of the biases introduced by this decomposition technique as they may cause us to understate the importance of characteristics in these transmissions overall and may lead us to mistakenly count one group of characteristics as more important than another. That said, the main results do not actually change much from those in the matched decomposition and if anything the precision of the decomposition increases in the matched estimation. The two main conclusions from the analysis remain the same; that personality traits and behaviours dominate cognition and education; and that personality traits and behaviours contribute far more to the total intergenerational correlation that we are able to account for when considering worklessness rather than incomes.

Table A2: Estimating intergenerational worklessness in the BCS matching by and conditioning on family background characteristics

2nd generation measure 16 - 29	1st generation measure Father only observed as workless at 10/16		
	Unconditional	Matching (3 nearest neighbours)	Conditional
A year or more workless	0.2511 (.034)***	0.1764 (.034)***	0.2045 (.035)***
N	4646	824	4646

Robust standard errors in parenthesis in columns 1 and 3. Bootstrapped standard errors from 100 repetitions in parenthesis in column 2. * 90% confidence, ** 95% confidence, *** 99% confidence. All matching and propensity scores from psmatch2 (Leuven and Sianesi, 2010).

Table A3: Estimating the association between sons' non-cognitive skills, cognition, behavioural and educational outcomes and spending a year or more in concurrent spells out of work from age 16-29 for a matched sample of fathers

2nd generation measure 16 – 29 - **a year or more out of work**	Non-cognitive skills	Cognition	Non-cognitive skills and cognition	Adding behavioural outcomes	Adding educational outcomes	Adding behavioural and educational outcomes
Agreeableness	0.0038 (.036)		0.0017 (.037)	0.0045 (.037)	-0.0021 (.037)	0.0008 (.037)
Emotionality	0.0115 (.027)		0.0122 (.027)	0.0101 (.027)	0.0168 (.027)	0.0144 (.027)
Extroversion	0.0182 (.022)		0.0179 (.022)	0.0168 (.022)	0.0093 (.022)	0.0100 (.022)
Hyperactivity	0.0722 (.018)***		0.0683 (.018)***	0.0676 (.018)***	0.0608 (.018)***	0.0607 (.018)***
Conscientiousness	-0.0377 (.018)**		-0.0367 (.018)*	-0.0343 (.018)*	-0.0311 (.019)	-0.0306 (.019)
Self Esteem	-0.0186 (.018)		-0.0199 (.018)	-0.0186 (.018)	-0.0209 (.018)	-0.0204 (.018)
Locus of Control	-0.0503 (.018)***		-0.0397 (.019)**	-0.0369 (.019)*	-0.0260 (.020)	-0.0233 (.020)
Copying test		-0.0028 (.018)	0.0058 (.018)	0.0054 (.018)	0.0150 (.018)	0.0133 (.018)
Early picture and vocab test		-0.0829 (.019)***	-0.0698 (.019)***	-0.0718 (.019)***	-0.0637 (.019)***	-0.0666 (.019)***
Ability Scale		-0.0219 (.020)	0.0050 (.020)	0.0108 (.020)	0.0230 (.026)	0.0283 (.026)
Don't like school				0.0250 (.063)		0.0189 (.063)
School a waste of time				0.1500 (.103)		0.1258 (.103)
Early truant				-0.1207 (.187)		-0.0661 (.187)
Part-time job at school				-0.1494 (.052)***		-0.1513 (.052)***
Maths test					-0.0432 (.027)	-0.0449 (.027)*
Reading test					0.0266 (.028)	0.0266 (.028)
No. of GCSE grade A-C					-0.0061 (.006)	-0.0040 (.006)
Workless father	0.1542 (.034)***	0.1569 (.034)***	0.1450 (.034)***	0.1373 (.034)***	0.1418 (.034)***	0.1331 (.034)***
Adj. R-squared	0.1040	0.0680	0.1153	0.1222	0.1283	0.1331
N	824	824	824	824	824	824

Robust standard errors in parenthesis. * 90% confidence, ** 95% confidence, *** 99% confidence

Table A4: Estimating bivariate associations between sons' non-cognitive skills, cognition, behavioural and educational outcomes and the workless experience of their father for a matched sample of fathers

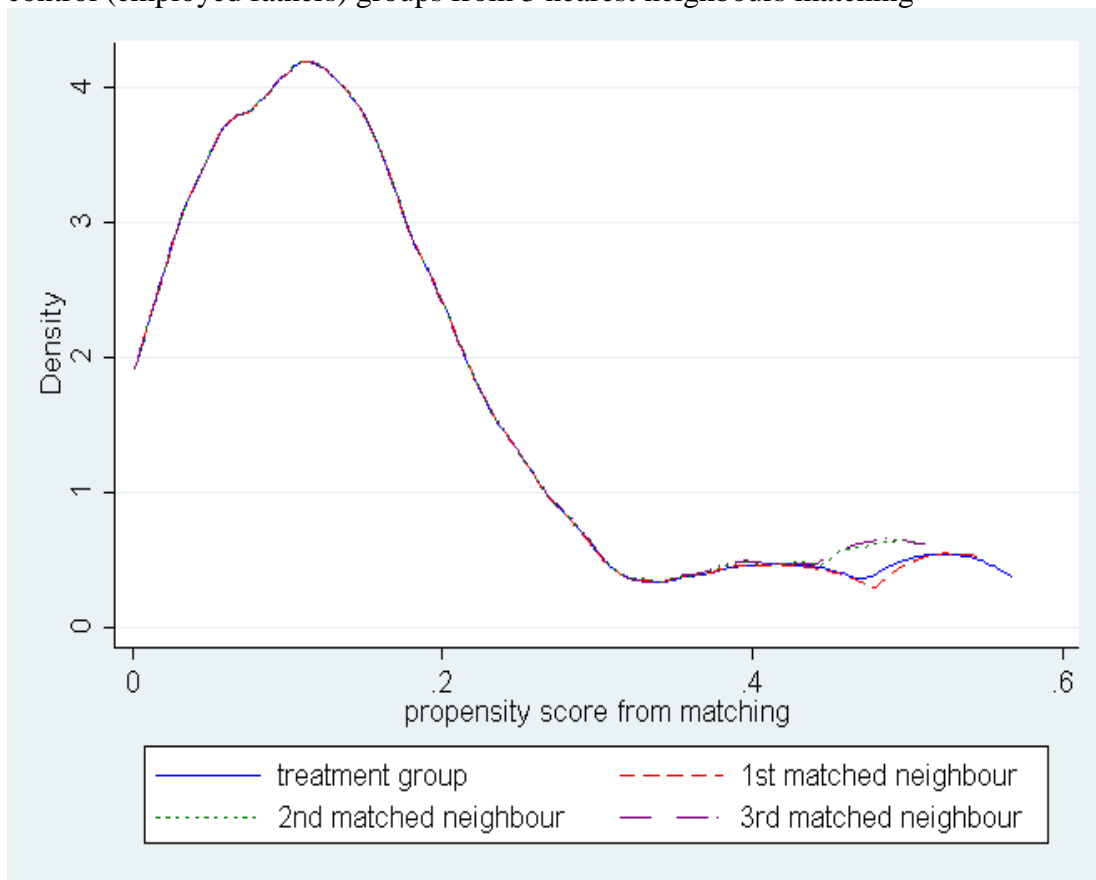| 1st generation measure	Matched sample
Agreeableness	-0.1152 (.064)*
Emotionality	-0.0831 (.072)
Extroversion	-0.1020 (.078)
Hyperactivity	0.0543 (.079)**
Conscientiousness	-0.1282 (.075)
Self Esteem	-0.1345 (.072)*
Locus of Control	-0.2291 (.071)***
Copying test	-0.2353 (.070)***
Early picture and vocabulary	-0.1835 (.066)***
Ability Scale	-0.1769 (.065)***
Don't like school	-0.0087 (.017)
School a waste of time	0.0091 (.012)
Early truant	0.0543 (.063)
Part-time job at school	-0.0645 (.023)***
Maths test	-0.1819 (.069)***
Reading test	-0.2177 (.067)***
No. of GCSE grade A-C	-0.5941 (.219)***

Robust standard errors in parenthesis. * 90% confidence, ** 95% confidence, *** 99% confidence. Coefficients from separate univariate regressions of sons' characteristic on fathers' workless status and quadratic fathers' age controls. N=824

Table A5: Accounting for the intergenerational relationship in spending a year or more in concurrent spells out of work of the sons with their non-cognitive skills, cognition, behavioural and educational outcomes in childhood on the matched sample of fathers

A year or more concurrent spells out of work	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Agreeableness	0.000		0.000	-0.001	0.000	0.000
Emotionality	-0.001		-0.001	-0.001	-0.001	-0.001
Extroversion	-0.002		-0.002	-0.002	-0.001	-0.001
Hyperactivity	0.004		0.004	0.004	0.003	0.003
Conscientiousness	0.005		0.005	0.004	0.004	0.004
Self Esteem	0.003		0.003	0.003	0.003	0.003
Locus of Control	0.012		0.009	0.008	0.006	0.005
Total personality traits	**0.020**		**0.017**	**0.016**	**0.014**	**0.013**
Copying test		0.001	-0.001	-0.001	-0.004	-0.003
Early picture and vocab test		0.015	0.013	0.013	0.012	0.012
Ability Scale		0.004	-0.001	-0.002	-0.004	-0.005
Total cognition		**0.020**	**0.011**	**0.010**	**0.004**	**0.004**
Don't like school				0.000		0.000
School a waste of time				0.001		0.001
Early truant				-0.001		0.000
Part-time job at school				0.010		0.010
Total behavioural outcomes				**0.010**		**0.010**
Maths test					0.008	0.008
Reading test					-0.006	-0.006
No. of GCSE grade A-C					0.004	0.002
Total educational attainment					**0.006**	**0.005**
Total accounted for	0.0195	0.0197	0.0277	0.0361	0.0237	0.0322
Not accounted for	0.1569	0.1566	0.1487	0.1403	0.1527	0.1442
Total	0.1764	0.1764	0.1764	0.1764	0.1764	0.1764
% through non-cognitive	**11.07**		**9.72**	**9.04**	**7.91**	**7.36**
% through cognition		**11.20**	**5.98**	**5.66**	**2.30**	**2.32**
% through beh. outcomes				**5.74**		**5.89**
% through ed. outcomes					**3.23**	**2.70**
% of total	**11.07**	**11.20**	**15.70**	**20.44**	**13.44**	**18.27**

Each cell represents $\gamma\pi$ from equation (6.6) in Section 6.3i) run on a matched sample of individuals, N=824

Figure A1: The distribution of the propensity scores of the treatment (workless fathers) and control (employed fathers) groups from 3 nearest neighbours matching

All matching and propensity scores from psmatch2 (Leuven and Sianesi, 2010).