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## Intergenerational mobility in socio-emotional skills

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24/26

Working paper

# Intergenerational mobility in socio-emotional skills

# Intergenerational Mobility in Socio-emotional Skills\*

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June 4, 2024

## Abstract

This paper investigates the intergenerational transmission of socio-emotional skills during childhood, using data from the 1970 British Cohort Study (BCS70) in the United Kingdom. This dataset enables us to measure two dimensions of socio-emotional development: internalising and externalising skills. More importantly, we can use multiple measures of parents' skills collected during both their childhood and their adulthood. Whereas parent-child skills are strongly related when both are measured contemporaneously, they remain correlated when both are measured in childhood, with a stronger transmission observed from mothers to their children. Additionally, by leveraging the BCS70 data on socio-emotional skills for three generations, we estimate multi-generational persistence. Notably, we find a correlation between the grandmother's internalising skill and the grandchildren's skills, even after accounting for parental skills.

**JEL codes:** J62, D63, I21, J24

**Keywords:** Intergenerational Mobility, Inequality, Socio-emotional Skills, Spectral gap mobility index.

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# 1 Introduction

It is now widely accepted that human development has many dimensions that jointly determine life course outcomes, ranging from labour market earnings and criminal activities, to subjective well-being and health (Currie and Almond, 2011; Almlund et al., 2011; Almond et al., 2018). These different dimensions include cognitive and socio-emotional skills, with the former including the ability to complete simple and complex tasks as well as the ability to learn, pay attention and solve problems, while the latter refers to psychological and preference traits, such as sociability, emotional stability, locus of control and self-esteem, and personality (e.g. conscientiousness, risk aversion and time preferences).

It is also well established that parental skill endowments and parental investment play an important role in determining their children’s development. These influences are particularly visible in the early years of life, because of the brain’s rapid development and malleability and the fact that parents are typically the main source of interaction for very young children (Cunha and Heckman, 2007; Cunha, Heckman, and Schennach, 2010). It is therefore likely that different types of skills are transmitted across generations and that this transmission plays an important, although not exclusive, role in the intergenerational transmission of inequality. The economic literature has examined extensively the intergenerational transmission of inequality, focusing on income and education. Nevertheless, the evidence on the intergenerational transmission of different types of skills and, in particular, of socio-emotional skills is still scarce, despite the fact that these skills are now accepted to be important in determining different dimensions of well-being (Currie and Almond, 2011; Almlund et al., 2011; Almond et al., 2018).<sup>1</sup>

In this paper, we study different aspects of the evolution of socio-emotional skills across generations. We do so by exploiting some of the unique longitudinal dimensions of the 1970 British Cohort Study (BCS70), who are followed from birth onwards. A first feature of the BCS70 is that in 2004, when the cohort members were 34, measures of socio-emotional development of their offspring, if any, were collected. This feature allows us to assess the correlation between comparable measures of socio-emotional skills across two generations. As the cohort members are of both genders, we can study the possibility that socio-emotional skills are transmitted differently (if at all) by *fathers and mothers*. Additionally, when characterising the relation between socio-emotional skills of the cohort members and their offspring, we can use skills measured *before adulthood*, rather than skills observed *at the same calendar time*. Finally, the BCS70 contains information about the cohort members’ parents. We can therefore observe three connected generations and analyse the transmission of skills across them.

To study the dynamics of socio-emotional skills and cognition across generations, we need

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<sup>1</sup>An excellent review paper on intergenerational mobility is Black and Devereux (2011). Some prominent studies on mobility include, for example, Chetty et al. (2014), that map the geography of intergenerational mobility in the United States. Card et al. (2022) study the intergenerational transmission of human capital for children born in the 1920s in the United States. Alesina et al. (2021) map the intergenerational mobility in educational attainment in Africa. Guell et al. (2015) propose an alternative approach to measure mobility by using cross-sectional data on income and the surname of the individual. There is also a growing interest in intergenerational mobility in other outcomes, such as in wealth (Charles and Hurst, 2003) and health (Halliday et al., 2020).

to define what they are and how they are measured. Following the literature (see e.g. Heckman and Zhou (2022)), we use factor analysis to measure cognitive skills and two dimensions of socio-emotional skills, which we label ‘internalising’ and ‘externalising’. The first dimension of socio-emotional skills captures children’s ability to focus their drive and determination, while the second one captures their ability to relate to others (Achenbach, 1966; Achenbach et al., 2016; Attanasio et al., 2020). In addition, since we analyse socio-emotional skills measured at slightly different ages and for different generations, we pay attention to the comparability of these measures across generations (Wu and Estabrook, 2016).

We make three contributions to the understanding of the development of socio-emotional skills. First, we study the intergenerational transmission of skills looking at the socio-emotional skills of cohort members and their offspring. We do this by assessing separately the role played by fathers and mothers in the intergenerational transmission of socio-emotional skills. On the other hand, the literature estimating the intergenerational transmission of income has mostly focused on the intergenerational correlation between fathers and sons, due to the lower likelihood of maternal participation in the labor force (see for example Blenden (2013) and Black and Devereux (2011)).<sup>2</sup> Our data from the age-34 sweep implies that for some children we have information on their mothers; and for others, on their fathers. The evidence we uncover is suggestive that mothers play a predominant role in the intergenerational transmission of socio-emotional skills.

Second, we investigate to what extent the cohort members’ skills measured *during childhood* are associated with their children’s socio-emotional skills *during childhood*, roughly 20 years apart. A possible issue with most of the existing work on the intergenerational transmission of socio-emotional skills is the use of measurements for parents’ and children’s skills obtained *at one point in time*, typically in adulthood for the parents and in adolescence for the children. At these development stages, skills and attitudes are likely to have developed and changed for other reasons, such as schooling and peer effects. On the other hand, socio-emotional skills during childhood are not fully developed and may still be quite malleable (Almlund et al., 2011). Furthermore, while the main direction of intergenerational transmission is presumably from parents to children, it is also possible that children influence their parents’ values and skills. A high (low) correlation between parents and children’s socio-emotional skills and attitudes could, therefore, be found because of a convergence (or divergence) in skills and attitudes during adulthood when the children can also affect parents’ personality and attitudes.<sup>3</sup>

We show that, when using contemporaneously measured skills (i.e., with parental skills measured in adulthood), which are also available in the BCS70, we find estimates that are larger than those we obtain using age-compatible measures. Whereas correlations in contemporaneous measurements may themselves be of interest, it is important to highlight how estimates are sensitive to different measurement timings. The ‘life-cycle bias’ connected with the measurement of certain

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<sup>2</sup>A recent study by Hu and Qian (2023) shows that father-child associations in educational status have become weaker, while mother-child associations have become stronger around the world since 1960.

<sup>3</sup>Dohmen et al. (2011) try to tackle reverse causality due to contemporaneous measurements by using religion as an instrumental variable for the child’s attitude, but the first stage indicates a weak instrumental variable problem even if one accepts its validity.

variables over different intervals of the life cycle is somewhat similar to the one encountered when studying income mobility using earnings data at only one point in time that do not correspond to lifetime earnings. Whether a specific measure has a ‘bias’ or not depends on what concept one ultimately is after. However, it is important to know how and why different estimates may vary depending on the timing of measurements.

Finally, for our third contribution, the data we use allow us to estimate the association of grandparents’ socio-emotional skills with their grandchildren’s socio-emotional skills, even after controlling for parents’ skills. We show that the association of socio-emotional skills might be relevant across more than one generation. Information on grandmothers’ and grandchildren’s socio-emotional skills is *not* often found in datasets. The BSC70 is an exception because the cohort members’ mothers were asked to complete the Malaise Inventory (Rutter et al., 1970) in the 1975, 1980 and 1986 sweeps.<sup>4</sup> We do however note that, in contrast with the preceding analysis where parents’ and children’s measurements are taken at similar ages and thus not contemporaneously, grandmothers’ and parents’ measurements here are contemporaneously taken.

Our study is not the first to look at the intergenerational correlation of skills. Noteworthy contributions to this literature in economics are Dohmen et al. (2011), Anger (2012), Grönqvist et al. (2017) and Alan et al. (2017). The first two papers use data from the German Socio-Economic Panel Study (SOEP) to study respectively the transmission of attitudes and skills from parents to children *during adulthood*. Grönqvist et al. (2017) study the intergenerational transmission of skills in Sweden, using data only on 18-year-old men’s cognitive and socio-emotional skills from military enlistment records. Alan et al. (2017) study the transmission of risk attitudes from mothers to children through elicitation of risk aversion in an incentivised experiment in Turkey.

The psychology literature has also studied the intergenerational correlation of socio-emotional skills. For example, Duncan et al. (2005) use the data from the National Longitudinal Survey of Youth (NLSY) to study personal traits and behaviours measured during adolescence. Loehlin (2005) and Groves (2005) review the psychology literature and conclude that the correlation in socio-emotional skills ranges between 0.10 to 0.30 for children during young adulthood. Unfortunately, these psychology studies are based on a small number of observations and may lack representativeness.

The rest of the paper is organised as follows. In Section 2, we introduce the 1970 British Cohort Study data used in the analysis. Sections 3 and 4 present respectively the derivation of the three dimensions of skills we analyse and the measures of intergenerational mobility in socio-emotional skills and cognition. In Section 5, we present estimates of intergenerational mobility in socio-emotional and cognitive skills. Section 6 investigates the multi-generational persistence in socio-emotional skills by examining the correlation between grandmothers’ and grandchildren’s skills. Section 7 summarizes the results and concludes.

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<sup>4</sup>Our analysis is complementary to the literature examining multi-generational mobility in mental health. For example, Johnson et al. (2013), Hancock et al. (2013) and Bütikofer et al. (ming) study multi-generational mobility in mental health across three generations respectively in the United Kingdom, Australia and Norway. We discuss their approach to study multi-generational mobility in mental health when we measure multi-generational in socio-emotional skills. We notice that they focus only on one dimension of mental health, while socio-emotional skills are multi-dimensional and often divided into internalising and externalising skills.

## 2 Data sources and available measures

We make use of a unique longitudinal database, the 1970 British Cohort Study (BCS70), which follows the lives of people born in England, Scotland and Wales in a single week (April, 5-11) of 1970 and is publicly available at the UK Data Service. Cohort members have been contacted nine times, resulting in information at ages 5, 10, 16, 26, 30, 34, 38, 42, 46 and 51.

Table 1: Rutter A and Strengths and Difficulties Questionnaire Scales

| Rutter A scale administered to parents when they were 5, 10 and 16 years old                                |   |
|---|---|
| 1. Very restless. Often running about or jumping up and down. Hardly ever still.*                           | 2. Is squirmy or fidgety.*  |
| 3. Often destroys own or others' belongings.  | 4. Frequently fights other children.*   |
| 5. Not much liked by other children.  | 6. Often worried, worries about many things.*   |
| 7. Tends to do things on his/her own, is rather solitary.*  | 8. Irritable. Is quick to fly off the handle.   |
| 9. Often appears miserable, unhappy, tearful or distressed.*  | 10. Sometimes takes things belonging to others.   |
| 11. Has twitches, mannerisms or tics of the face or body.   | 12. Frequently sucks thumb or finger.   |
| 13. Frequently bites nails or fingers.  | 14. Is often disobedient.*  |
| 15. Cannot settle to anything for more than a few moments.*   | 16. Tends to be fearful or afraid of new things or new situations.*                       |
| 17. Is over fussy or over particular.   | 18. Often tells lies.   |
| 19. Bullies other children.*  | A. Complains of headaches.*   |
| B. Complains of stomach-ache or has vomited.*   | C. Complains of biliousness   |
| D. Has temper tantrums (that is, complete loss of temper with shouting, angry movements, etc.).*            |   |
| Strengths and Difficulties Questionnaire scale administered to children when they were between the age 3-16 |   |
| 1. Considerate of other people's feelings <sup>+</sup>  | 2. Restless, overactive and not able to sit still for long*                               |
| 3. Often complaining of headaches, stomach-aches or sickness*   | 4. Sharing readily with other children (treats, toys, pencils etc.) <sup>+</sup>          |
| 5. Has often had temper tantrums or hot tempers*  | 6. Rather solitary, tending to play alone*  |
| 7. Generally obedient, usually doing what adults requested* +   | 8. Many worries, often seeming worried*   |
| 9. Helpful if someone was hurt, upset or feeling ill <sup>+</sup>   | 10. Constantly fidgeting and squirming*   |
| 11. Has had at least one good friend <sup>+</sup>   | 12. Has often had fights with other children or bullies them*                             |
| 13. Often unhappy, downhearted or tearful*  | 14. Generally liked by other children <sup>+</sup>  |
| 15. Easily distracted, concentration wandered*  | 16. Nervous or clingy in new situations, easily loses confidence*                         |
| 17. Kind to younger children <sup>+</sup>   | 18. Often lied or cheated <sup>†</sup>  |
| 19. Picked on or bullied by other children  | 20. Has often volunteered to help others (parents, teachers, other children) <sup>+</sup> |
| 21. Able to think things out before acting <sup>†</sup> +   | 22. Stole from home, school or elsewhere <sup>†</sup>                                     |
| 23. Getting on better with adults than with other children  | 24. Many fears, easily scared   |
| 25. Has seen tasks through to the end, good attention span <sup>+</sup>                                     |   |

Note. The Rutter and Strengths and Difficulties Questionnaire items are rated on three levels: 'Does not apply', 'Somewhat applies', 'Certainly applies'. Since they are all behaviours indicating lower skills, we recode all of them in reverse, i.e. 'Certainly applies' = 0, 'Somewhat applies' = 1, 'Does not apply' = 2. The question of the Rutter items in the BCS70 administered when parents were 16 years old refers to the teenager. Items denoted by <sup>+</sup> are positively coded in the original scale and we do not reverse the order for those items. Items denoted by \* are comparable (similarly-worded) questions in the Rutter and Strengths and Difficulties Questionnaire shown in Table 3. Items denoted by <sup>†</sup> are asked only to the children aged 6-16.

The age-34 sweep provides substantial information on the offspring of the cohort members, including a number of tests aimed at measuring their socio-emotional skills. We concentrate on the sample of cohort members linked to their children and present descriptive statistics on the sample of BCS70 with children in Appendix Table E1. An important limitation of this data structure is that the children of the BCS70 cohort, if present when the age-34 sweep was collected, have, inevitably, different ages. This makes the comparison of several dimensions of their development difficult, as different tests are used. This is particularly salient for cognitive skills. For this reason, we limit our analysis to the children of the BCS cohort aged between 3 and 16 at the age-34 sweep

and consider only their socio-emotional skills, for which we can identify a common metric as discussed in Section 3.

The BCS70 sample's socio-emotional skills were measured using the Rutter A questionnaire for the cohort members at ages 5, 10 and 16, and Strengths and Difficulties Questionnaire (SDQ) for the children of the cohort members aged between 3 and 16 at the age-34 sweep. In Table 1, we present the questions from these tests (Rutter et al., 1970; Goodman, 1994). The Rutter A and SDQ are behavioural screening scales, where mothers are asked whether their children exhibit a series of behaviours. The SDQ scale was developed to consider advances in child psychopathology and includes positive as well as undesirable traits. Items take one of three values: 'Does not apply', 'Somewhat applies', and 'Certainly applies'. Since the questions are about behaviours indicating low skills, we recode all of them in reverse for the ease of interpretation, with higher values associated with better socio-emotional skills. We augment the Rutter Scale with three additional parent-reported questions from the parental questionnaire, items A, B, and D in Table 1. These are rated on 4 levels: 'Never in the last 12 months', 'less than once a month', 'at least once a month', and 'at least once a week'.<sup>5</sup>

Appendix Tables E2 and E3, respectively, report sample sizes at the age-34 sweep and response rates for the socio-emotional questions retained in the analysis at the age-5, 10, 16 and 34 sweeps. While survey non-response is low for the cohort member's children, it occurs at the age-16 sweep because of a teacher strike (Appendix Table E3). In Appendix Table E4, we show that survey non-response is not predicted by the cohort members' cognitive or socio-emotional skills. We further discuss these issues in Section 5.1 and show that our results do not depend on the children's age selection.

The cognitive skill measure we use comes from combining information from three tests administered at the age of 5 (Copy Designs, Human Figure Drawing, English Picture Vocabulary Test) and four tests administered at the age of 10 (Shortened Edinburgh Reading Test, Friendly Math Test, Spelling Dictation Task and Pictorial Language Comprehension Test). More specifically, the age-5 cognitive tests are the following: the copy design (the child is asked to copy simple designs adjacently), the human figure drawing (the child draws an entire human figure), the English picture vocabulary test (the child identifies the picture referring to a word among four pictures). The Pictorial Language comprehension test at the age of 10 was based on the English Picture Vocabulary Test administered at the age of 5, where the child identifies the picture referring to a word among four pictures.

Finally, teachers to the cohort members were also asked to answer socio-emotional questions similar to the ones asked to the cohort member's mothers in the Rutter A questionnaire at the age-10 sweep. In Appendix C.3, we use these data to address possible concerns about misreporting bias and obtain similar estimates.

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<sup>5</sup>We recode these into binary indicators, with 'Never' and 'Less than once a month' to 1 and zero otherwise. At the age 10 sweep, the Rutter A scale is continuous from 0 to 100, where 0 means 'Does not apply' and 100 means 'Certainly applies'. We recode it in reverse. In order to make it comparable to the Rutter A scale in the other waves, we recode the items as follows: if the response is below 40, we code the answer as 0; if the response is between 40 and 70, we code the answer as 1; if the response is between 70 and 100, we code the answer as 2.

### 3 The dimensions of skills and their measurement

Skills in childhood are intrinsically difficult to measure. As discussed in the previous section, a wide range of measures are available, typically behavioural screening scales, where parents or teachers are asked to evaluate a number of items on the child’s behaviour, and cognitive tests. To extract efficiently estimates of socio-emotional and cognitive skills from these measures, the use of factor models has become common.

We follow much of the literature and focus on one single cognitive factor and two factors for socio-emotional skills reflected in the available measures (Achenbach, 1966; Achenbach et al., 2016). We first use exploratory factor analysis to identify which measures are relevant for which factor and test the hypothesis that a dedicated system, where a single factor loads on each of the available measures, represents the data well. Using this evidence, we then proceed to the estimation of the factor models we use in our analysis of intergenerational mobility.

#### 3.1 Exploratory analysis

In what follows, we analyse the intergenerational transmissions of socio-emotional skills. We follow the previous literature, which has identified two dimensions of socio-emotional skills and has labeled them as ‘externalising’ and ‘internalising’ socio-emotional skills (Attanasio et al., 2020; Moroni et al., 2019). These two constructs have also been used extensively in the psychology literature (Achenbach, 1966; Achenbach et al., 2016). The first factor captures the ability of children to relate to others and the second one their ability to focus, their drive and determination.

Table 2: Subscale of comparable items

| Itm. | Factor | Cat. | Title                  | Rutter Wording (Parents during childhood)  | SDQ Wording (Children aged 3-16)                             |
|------|--------|------|------------------------|--|--|
| 1    | EXT    | 3    | <i>Restless</i>        | Very restless. Often running about or jumping up and down. Hardly ever still       | Restless, overactive and not able to sit still for long      |
| 2    | EXT    | 3    | <i>Squirmy/fidgety</i> | Is squirmy or fidgety.   | Constantly fidgeting and squirming                           |
| 3    | EXT    | 3    | <i>Fights/bullies</i>  | Frequently fights other children   | Has often had fights with other children or bullied them     |
| 4    | EXT    | 3    | <i>Distracted</i>      | Cannot settle to anything for more than a few moments.                             | Easily distracted, concentration wandered                    |
| 5    | EXT    | 2/3  | <i>Tantrums</i>        | Has temper tantrums (complete loss of temper with shouting, angry movements, etc.) | Has often had temper tantrums or hot tempers                 |
| 6    | EXT    | 3    | <i>Disobedient</i>     | Is often disobedient   | (+) Generally obedient, usually doing what adults requested  |
| 7    | INT    | 3    | <i>Worried</i>         | Often worried, worries about many things   | Many worries, often seeming worried                          |
| 8    | INT    | 3    | <i>Fearful</i>         | Tends to be fearful or afraid of new things or new situations                      | Nervous or clingy in new situations, easily loses confidence |
| 9    | INT    | 3    | <i>Solitary</i>        | Tends to do things on his/her own, is rather solitary                              | Rather solitary, tending to play alone                       |
| 10   | INT    | 3    | <i>Unhappy</i>         | Often appears miserable, unhappy, tearful or distressed                            | Often unhappy, downhearted or tearful                        |
| 11   | INT    | 2/3  | <i>Aches</i>           | Complains of headaches + stomach-ache or has vomited                               | Often complaining of headaches, stomach-aches or sickness    |

Note. Itm. is item number. Factor is the latent construct to which the item loads - EXT is externalising skills, INT is internalising skills. Cat. is the number of categories in which the item is coded - 2 denotes a binary item (applies/does not apply) and 3 denotes a 3-category item. Title is a short label for the item. Wording columns show the actual wording in the scales used in each of the cohort studies. Since they are all behaviours indicating lower skills, we recode all of them in reverse, i.e. ‘Certainly applies’ = 0, ‘Somewhat applies’ = 1, ‘Does not apply’ = 2. Items denoted by (+) are positively coded in the original scale.

To establish which measures are related to each of the two factors, we perform an exploratory factor analysis (EFA) and concentrate on the 11 items from the Rutter A and Strengths and Difficulties Questionnaire (SDQ) scale that are common across the cohort members and their children, listed in Table 2, as in [Attanasio et al. \(2020\)](#). The EFA is based on decomposing the polychoric correlation matrix of the items and using maximum likelihood estimation ([Olsson, 1979](#)).<sup>6</sup>

Table 3 presents the estimates of the EFA of the division proposed in Table 2. The factor loadings in this Table show a clear separation between items. We highlight that the factor loadings have a similar magnitudes across groups, pointing out that there is a similar association between the item and the factor across groups.

Table 3: Loadings from exploratory factor analysis

| Item | Title                  | Parents at age 5 |               | Parents at age 10 |               | Parents at age 16 |               | Children aged 3-16 |               |
|------|------------------------|------------------|---------------|-------------------|---------------|-------------------|---------------|--------------------|---------------|
|      |                        | EXT              | INT           | EXT               | INT           | EXT               | INT           | EXT                | INT           |
| 1    | <i>Restless</i>        | <b>0.8648</b>    | -0.1281       | <b>0.8108</b>     | -0.1640       | <b>0.8000</b>     | -0.1228       | <b>0.6040</b>      | 0.0785        |
| 2    | <i>Squirmy/figdety</i> | <b>0.7816</b>    | 0.0100        | <b>0.6919</b>     | 0.0263        | <b>0.7286</b>     | 0.0103        | <b>0.6166</b>      | 0.1066        |
| 3    | <i>Fights/bullies</i>  | <b>0.4830</b>    | 0.2039        | <b>0.4955</b>     | 0.0021        | <b>0.6111</b>     | 0.0058        | <b>0.6875</b>      | -0.0050       |
| 4    | <i>Distracted</i>      | <b>0.6431</b>    | 0.0556        | <b>0.5927</b>     | 0.0705        | <b>0.6493</b>     | 0.0709        | <b>0.7113</b>      | 0.0553        |
| 5    | <i>Tantrums</i>        | <b>0.5466</b>    | 0.1570        | <b>0.4892</b>     | 0.1756        | <b>0.4998</b>     | 0.1262        | <b>0.7244</b>      | -0.0164       |
| 6    | <i>Disobedient</i>     | <b>0.5732</b>    | -0.0575       | <b>0.6684</b>     | 0.0288        | <b>0.6890</b>     | -0.0016       | <b>0.8162</b>      | -0.1781       |
| 7    | <i>Worried</i>         | -0.1092          | <b>0.7993</b> | -0.0981           | <b>0.7030</b> | -0.0055           | <b>0.7953</b> | -0.0701            | <b>0.7747</b> |
| 8    | <i>Fearful</i>         | 0.0657           | <b>0.4692</b> | -0.0921           | <b>0.5659</b> | -0.1245           | <b>0.7277</b> | -0.0798            | <b>0.6837</b> |
| 9    | <i>Solitary</i>        | -0.0391          | <b>0.4794</b> | 0.0989            | <b>0.2828</b> | 0.0463            | <b>0.3125</b> | 0.1060             | <b>0.4432</b> |
| 10   | <i>Unhappy</i>         | 0.0492           | <b>0.7948</b> | 0.2346            | <b>0.5117</b> | 0.2664            | <b>0.5016</b> | 0.3889             | <b>0.4102</b> |
| 11   | <i>Aches</i>           | -0.0078          | <b>0.5367</b> | -0.0492           | <b>0.4103</b> | -0.0360           | <b>0.3897</b> | 0.1322             | <b>0.1758</b> |

Note. The table displays the factors loadings obtained from exploratory factor analysis (EFA) by sample. The EFA is based on the decomposition of the polychoric correlation matrix, and uses PROMAX rotation. Since they are all behaviours indicating lower skills, we recode all of them in reverse, i.e. ‘Certainly applies’ = 0, ‘Somewhat applies’ = 1, ‘Does not apply’ = 2.

### 3.2 Factor model

We specify a factor model to estimate the relationship between internalising and externalising skills and the available measures, the Rutter and SDQ items, based on the results of the exploratory analysis described in section 3.1. For most of our analysis, we consider two groups of individuals  $c \in \{C_1, C_2\}$ , corresponding respectively to the children of the cohort members and the cohort members. In Figure 2, we examine instead four groups of individuals  $c \in \{C_1, C_2, C_3, C_4\}$ , corresponding respectively to the children of the cohort members and the cohort members at the age of 5, 10 and 16.

Each individual is denoted by  $i = 1, \dots, N_c$ . For each individual and group, we observe categorical item responses  $Z_{ijc}$ , corresponding to the common Rutter/SDQ questions (Table 2) where  $j$  indexes the 11 available items. We follow the literature and assume a latent bi-dimensional vector of externalising and internalising socio-emotional skills  $Y_{ic} = (Y_{ic}^{EXT}, Y_{ic}^{INT})$ .

<sup>6</sup>The polychoric correlation is an estimate for the correlation between two normally distributed continuous random variables observed as ordinal variables. The solution is rescaled using oblique factor rotation obtained via the PROMAX protocol outlined in [Hendrickson and White \(1964\)](#) (with  $k = 3$ ). Since we use a dedicated factor structure based on the oblique factor rotation matrix suggested above, our factor scores (i.e., skills) are *not* orthogonal. Their estimated correlation is presented in Table E5.

The relationship between the latent factors  $Y_{ic}$  and the available measures  $Z_{ijc}$  is characterised by item- and group-specific intercepts  $v_{jc}$  and loadings  $\lambda_{jc}$  and is affected by an independent measurement error term  $u_{ijc}$ . The measures are defined in terms of the following variable:

$$Z_{ijc}^* = v_{jc} + \lambda_{jc}^\top Y_{ic} + u_{ijc}. \quad (1)$$

We consider a dedicated factor structure, where each item loads only on one latent dimension, and follow the structure found in the exploratory factor analysis (Heckman et al., 2013). We estimate a baseline model which is characterized by the bare minimum number of assumptions with the parameterisation defined below (Wu and Estabrook, 2016).

Given the specification of the behavioural scale, the measures  $Z_{ijc}$  have a discrete nature and take one of an ordered number of values. To allow for such measures, we introduce item- and group-specific threshold parameters  $\tau_{jc}$  as follows:

$$Z_{ijc} = s \quad \text{if} \quad \tau_{s,jc} \geq Z_{ijc}^* \geq \tau_{s+1,jc} \quad \text{for} \quad s = 0, 1, 2, \quad (2)$$

with  $\tau_{0,jc} = -\infty$  and  $\tau_{3,jc} = \infty$ . The values taken by  $Z_{ijc}$ ,  $s = 0, 1, 2$ , correspond to those in our data ('Certainly applies' = 0, 'Somewhat applies' = 1, 'Does not apply' = 2).

Following the literature, we assume that the latent factors and the measurement error terms are normally distributed:

$$Y_{ic} \sim \mathcal{N}(\kappa_c, \sigma_{Y_c}^2) \quad \text{and} \quad u_{ijc} \sim \mathcal{N}(0, \sigma_c^2). \quad (3)$$

Finally, we make the normalization assumption needed to deal with factor indeterminacy by setting the mean  $\kappa_c$  and the variance  $\sigma_{Y_c}^2$  of the factor equal to 0 and 1 respectively. In addition, the intercepts  $v_{jc}$  are equal to zero and the error variance  $\sigma_c^2$  to 1, while the loadings  $\lambda_{jc}$  and threshold  $\tau_{jc}$  are free to vary. In Appendix A, we follow Attanasio et al. (2020) and test for measurement invariance since any comparison between socio-emotional skills across different generations requires that the socio-emotional measures we derive have the same relationship with the latent constructs (Vandenberg and Lance, 2000; Putnick and Bornstein, 2016). We fail to reject measurement invariance, so that the latent factors measured for the different groups are comparable.

While the focus of the analysis is on the intergenerational transmission of socio-emotional skills, in what follows we want to check whether the links we identify are robust to controlling for parental cognitive skills, for which we have a variety of markers. To measure parental cognitive skills during childhood, we consider a factor model with continuous items. The continuous items are the raw scores from the Copy Designs, Human Figure Drawing, English Picture Vocabulary Test, Shortened Edinburgh Reading Test, Friendly Math Test, Spelling Dictation Task and Pictorial Language Comprehension Test. Appendix Figure E1 shows the distributions of the latent factors: internalising, externalising and cognitive skills.

## 4 Measuring intergenerational mobility

We perform the analysis of intergenerational persistence of skills in one step, estimating the measurement system and the regression jointly. In particular, we analyse how different dimensions of parents' development observed during childhood relate to the children's socio-emotional development (internalising and externalising) in 2004, when the parents were 34 years old.<sup>7</sup>

To perform this analysis, we estimate jointly a measurement system and the relationship among the factors following the procedure in [Muthen \(1984\)](#) to estimate parameters of interest jointly, avoiding biases that would arise from a two-step procedure. We describe the estimation methodology in [Appendix B](#).

**Intergenerational mobility equation** To study how socio-emotional and cognitive skills can be transmitted across generations, we relate outcomes observed in the children to outcomes observed in their parents *prior to their adulthood*.

In particular, for each BCS member, who we identify as parent  $i$ , we identify a child in household  $i$ , if present in 2004 and included in the study, and estimate:

$$Y_i^C = \phi + \gamma^\top Y_i^P + \rho^\top \mathbf{X}_i + \epsilon_i, \quad (4)$$

where  $Y_i^C$  is the child  $i$ 's socio-emotional skill score and  $\gamma$  is a vector of parameters measuring intergenerational mobility in skills (i.e. internalising, externalising and cognitive skills). Higher values of the coefficient  $\gamma$  correspond to lower mobility.

The vector  $Y_i^P$  represents the socio-emotional and cognitive skills of child  $i$ 's parent, as measured during the parent's childhood. As these skills are observed when the parent (cohort member) is 5, 10 and 16, two possible approaches can be pursued to measure  $Y_i^P$  and deal with possible measurement error.

Here, we mainly report results estimating  $Y_i^P$  from a factor model, combining the measures for the parents available at ages 5, 10 and 16. An alternative strategy would be to use a factor model to obtain estimates of the parent's skills at ages 5, 10 and 16 and use the age-5 and 10 measures as instruments for the age 16, under the assumption that these are all error-ridden measurements for the same underlying skill with independent measurement errors. We discuss the estimates for this second approach in [Section 5](#) and show that indeed they are very similar to the first approach in the [Appendix C](#) (see, for example, [Madansky \(1964\)](#), [Pudney \(1982\)](#), [Cunha and Heckman \(2008\)](#), and [Bollen \(2012\)](#) for a discussion on both approaches).

Therefore, parents' internalising and externalising skills during childhood are measured by estimating a factor model combining the Rutter A questionnaires administered at the age-5, 10 and 16 sweeps. Parents' cognitive skills during childhood are measured by estimating a factor model combining the cognitive tests administered at age-5 and 10 sweeps.<sup>8</sup>

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<sup>7</sup>We do not consider the children's cognitive development, as they were of different ages, posing comparability problems with those measures.

<sup>8</sup>We do not include the cognitive tests administered at age 16 because of a teacher-led industrial strike, disrupting

In our specifications, we control for a vector  $\mathbf{X}_i$  of individual characteristics, which include the parent’s region of birth, the parent’s gender, the child’s gender and age, the number of children in the cohort member and child’s household, the mother’s age at the parent’s birth, a dummy equal to 1 if the parent is the first born, the parent’s employment status at the age of 34, the grandmother’s employment status and education in 1975 and the number of children in the parent’s household when the parent is 5 years old. We include these controls to accommodate some other possible channels that might relate to skills. For example, the employment variables are here to proxy for other channels like income that might explain skills. Region of birth fixed effects can account for the fact that parents were born in different geographical areas. We also include controls for family characteristics to consider the fact that the family composition can influence skills.

As mentioned in the introduction, the nature of the data allows us to study separately the role played by mothers and fathers in the intergenerational transmission of skills. To do this, we can estimate equation (4) separately for male and female cohort members.

We compute standard errors by bootstrap. More specifically, we first generate 200 samples by block sampling with replacement from the original sample (i.e. we randomly draw the entire history of the parent-child link with replacement from the original sample). Then, for each bootstrap sample, we estimate the measurement system and the regression equation jointly.

**Intergenerational rank transitions** Another common measure of intergenerational mobility is to study the children’s outcomes ( $R_i^C$ ) from parents ( $R_i^P$ ) at a given quintile of the distribution (Chetty et al., 2014). For example, a measure which is often reported is the probability of going from the lowest to the highest quintile of the skill distribution (Corak and Heisz, 1999):

$$LH = Pr(R_i^C \geq 80 | R_i^P < 20). \quad (5)$$

We thus produce matrices of transition probabilities across quintiles of the skill distribution. We do this for the parent’s internalising, externalising and cognitive skills during childhood to document how mobility may differ at different points of the skill distribution.

To facilitate comparison across the several matrices, we propose a summary measure to compare the different transition matrices and order them in terms of mobility. Our measure is based on the difference between the largest and the second largest eigenvalues in the transition matrix. This difference is usually referred to as the ‘spectral gap.’ We thus call this measure the ‘*spectral gap mobility index*’. This measure is useful to understand how far the intergenerational transition matrices are from an identity matrix, which corresponds to a table with no mobility across quintiles: all its eigenvalues are equal to one and the spectral gap is zero. The discrepancy between one and the second largest could be seen as a departure from zero mobility, where higher numbers of the ‘*spectral gap mobility index*’ corresponds to higher mobility.<sup>9</sup>

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the dissemination of the questionnaire. The strike led to administer only 2 cognitive tests (spelling test and vocabulary test) – out of 4 tests proposed – only to a small subset of the cohort members.

<sup>9</sup>In the sociology literature, Sommers and Conlisk (1979) also note the use of the second largest eigenvalue as a measure of immobility.

## 5 Intergenerational correlations of socio-emotional skills

In this section, we present evidence on the relationship between children’s internalising and externalising socio-emotional skills and their parents’ skills in different domains. As mentioned in the introduction, we distinguish this type of intergenerational correlation by parent’s gender. We also look at the correlation between children’s socio-emotional skills and various dimensions of their parents’ skills, including socio-emotional skills measured at different points in the parents’ life cycle. We then look at how the ranking of the children’s skills is affected by the ranking of their parents, by estimating transition matrices.

For this purpose, we use data from the sweep that contains information on the children of the 1970 cohort, which was collected when the cohort members were about 34 years old. In what follows, we refer to the cohort members as parents.

### 5.1 Intergenerational mobility: average and gender specific.

In Table 4, we report the results we obtain estimating equation (4) for the whole sample, estimating jointly the intergenerational mobility equation and the latent variables on internalising and externalizing socio-emotional skills and cognition, extracted from the available measures using the factor model discussed above.

The different specifications we report are informative about how parental internalising, externalising and cognitive skills, as measured during childhood, relate to their children’s socio-emotional skills during childhood, even after including a large set of controls. In particular, parents’ skills combine information on the skills measured at ages 5, 10 and 16 and we interpret the coefficients on these variables as measuring intergenerational mobility. In Panel A, we present intergenerational mobility estimates for the child’s internalising skill, while in Panel B we present the child’s externalising skill.

As noted in Section 4, estimating a factor model, combining measures of parents’ skills taken at ages 5, 10 and 16, yields similar results to those obtained using an instrumental variable strategy, where we use measures of the parents’ skills at earlier ages as instruments for their observed skills at later ages (Madansky, 1964; Pudney, 1982; Cunha and Heckman, 2008; Bollen, 2012). Appendix Table C1 presents similar estimates from both methods, designed to deal in different ways with measurement error, using multiple measures with independent errors.

A clear pattern emerges: the child’s internalising skill is highly correlated with the parent’s internalising and cognitive skills, while it is not associated with the other dimension of the parent’s socio-emotional skills (i.e., the externalising skill). Analogously, the child’s externalising skill is correlated with the parent’s cognition and externalising skills, but not with the parent’s internalising skill.

Differently from previous studies, in Table 5, we examine whether intergenerational mobility in socio-emotional skills differs by the parent’s gender. The BCS70 allows us to perform this analysis as both genders are represented in the survey and both have their children tested. The most striking result in Table 5 is the fact that most of the skill correlation between parents and

Table 4: Intergenerational mobility in socio-emotional skills

| <b>Panel A:</b>                 |  |                     |                     |                     |
|---------------------------------|--|---------------------|---------------------|---------------------|
| Dependent variable:             | <b>Child's Internalising (INT) Skill</b> |                     |                     |                     |
|                                 | (1)                                      | (2)                 | (3)                 | (4)                 |
| Parent's INT (during childhood) | 0.168***<br>(0.050)                      | 0.165***<br>(0.047) | 0.153***<br>(0.052) | 0.192***<br>(0.067) |
| Parent's EXT (during childhood) |  |                     |                     | -0.082<br>(0.071)   |
| Parent's COG (during childhood) |  |                     | 0.141***<br>(0.047) | 0.157**<br>(0.052)  |
| Observations                    | 1035                                     | 1035                | 1035                | 1035                |
| $R^2$                           | 0.027                                    | 0.114               | 0.131               | 0.135               |
| Region of birth FE (BCS70 5y)   | No                                       | Yes                 | Yes                 | Yes                 |
| Child's age FE                  | No                                       | Yes                 | Yes                 | Yes                 |
| Other controls                  | No                                       | Yes                 | Yes                 | Yes                 |

| <b>Panel B:</b>                 |  |                     |                     |                     |
|---------------------------------|--|---------------------|---------------------|---------------------|
| Dependent variable:             | <b>Child's Externalising (EXT) Skill</b> |                     |                     |                     |
|                                 | (1)                                      | (2)                 | (3)                 | (4)                 |
| Parent's INT (during childhood) |  |                     |                     | -0.040<br>(0.057)   |
| Parent's EXT (during childhood) | 0.259***<br>(0.047)                      | 0.256***<br>(0.048) | 0.222***<br>(0.048) | 0.243***<br>(0.054) |
| Parent's COG (during childhood) |  |                     | 0.154***<br>(0.042) | 0.153***<br>(0.041) |
| Observations                    | 1035                                     | 1035                | 1035                | 1035                |
| $R^2$                           | 0.063                                    | 0.146               | 0.164               | 0.165               |
| Region of birth FE (BCS70 5y)   | No                                       | Yes                 | Yes                 | Yes                 |
| Child's age FE                  | No                                       | Yes                 | Yes                 | Yes                 |
| Other controls                  | No                                       | Yes                 | Yes                 | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills (child's socio-emotional skills on parent's skills *during childhood*). The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the parent's gender, the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

children is between mother and child rather than father and child.

This evidence is consistent with [Hu and Qian \(2023\)](#), showing that father-child educational mobility have become weaker, while mother-child educational mobility have become stronger around the world since 1960. We conjecture that child-care sharing arrangements between father and mother may be related to those findings (see, for example, [Craig and Mullan \(2011\)](#)). This finding calls for further investigation and rich information on both parents' care-giving responsibilities to investigate the mechanisms behind this finding.

We perform several robustness for Tables 4 and 5. First, a potential criticism of these results is that they are estimated on the sample of children of the 1970 cohort, when the cohort members are 34. Cohort members with no children at 34, therefore, cannot be included in the analysis. It is not surprising, for instance, that a larger number of females than males is present in this sample. Selection into this sample is unlikely to be random and this selection process can bias our results.

Table 5: Intergenerational mobility in socio-emotional skills by the parent's gender

| <b>Panel A: Mother-child</b>    |                                   |                     |                                   |                     |
|---------------------------------|-----------------------------------|---------------------|-----------------------------------|---------------------|
| Dependent variable:             | Child's Internalising (INT) Skill |                     | Child's Externalising (EXT) Skill |                     |
|                                 | (1)                               | (2)                 | (3)                               | (4)                 |
| Parent's INT (during childhood) | 0.219***<br>(0.062)               | 0.221***<br>(0.081) |                                   | -0.065<br>(0.074)   |
| Parent's EXT (during childhood) |                                   | -0.096<br>(0.079)   | 0.300***<br>(0.054)               | 0.288***<br>(0.072) |
| Parent's COG (during childhood) |                                   | 0.173**<br>(0.063)  |                                   | 0.190***<br>(0.058) |
| Observations                    | 752                               | 752                 | 752                               | 752                 |
| $R^2$                           | 0.046                             | 0.159               | 0.083                             | 0.182               |
| Region of birth FE (BCS70 5y)   | No                                | Yes                 | No                                | Yes                 |
| Child's age FE                  | No                                | Yes                 | No                                | Yes                 |
| Other controls                  | No                                | Yes                 | No                                | Yes                 |
| <b>Panel B: Father-child</b>    |                                   |                     |                                   |                     |
| Dependent variable:             | Child's Internalising (INT) Skill |                     | Child's Externalising (EXT) Skill |                     |
|                                 | (1)                               | (2)                 | (3)                               | (4)                 |
| Parent's INT (during childhood) | -0.011<br>(0.109)                 | 0.152<br>(0.158)    |                                   | 0.070<br>(0.171)    |
| Parent's EXT (during childhood) |                                   | -0.099<br>(0.150)   | 0.094<br>(0.104)                  | 0.045<br>(0.159)    |
| Parent's COG (during childhood) |                                   | 0.164<br>(0.145)    |                                   | 0.114<br>(0.114)    |
| Observations                    | 283                               | 283                 | 283                               | 283                 |
| $R^2$                           | 0.000                             | 0.165               | 0.009                             | 0.174               |
| Region of birth FE (BCS70 5y)   | No                                | Yes                 | No                                | Yes                 |
| Child's age FE                  | No                                | Yes                 | No                                | Yes                 |
| Other controls                  | No                                | Yes                 | No                                | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills by parent's gender (child's socio-emotional skills on parent's skills *during childhood*). The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

To address these issues, we re-estimate the specification in Column 4 of Table 4 by using a Heckman selection model to account for the potential selection bias induced by fertility decisions. In the selection equation for the fertility decision at age 34, we add marital status as an excluded variable, alongside with other cohort members' covariates. The results, reported in Appendix Table C2, are essentially unaffected. Additionally, cohort members have children at different ages. As a consequence, their children's socio-emotional skills are measured at different ages, which can raise concerns about the stability of the measures across ages. If we control for the child's age in our regressions, we obtain results (reported in Appendix Table C3) that are quantitatively very similar to those in Table 4.

Second, not only cohort members of different genders have, on average, children at different ages, but at age 34, female cohort members are much more likely to have children than male cohort members. As noted previously, we do control for the child's age in all our regressions, which may be particularly relevant in this case. Additionally, we control for selection into the sample for the

intergenerational mobility estimates by gender in Table 5 and obtain substantially similar results (Appendix Table C4).

Third, Appendix Table C5 reproduces Table 4 by estimating Tobit regressions for censored data as some measures of socio-emotional skills may suffer from ceiling effects (McBee, 2010). The inability to characterize adequately skills in the upper end of the distribution may understate the intergenerational correlations in skills. However, we find that estimates in Appendix Table C5 are quantitatively very similar to Table 4.

Fourth, one might worry that the significant results obtained for mothers relative to fathers in Table 5 may stem from the comparatively larger sample size for the former relative to the latter. Appendix Table C6 re-estimates Columns 1 and 3 of Panel B (Table 5) by randomly selecting a subsample of mothers and children, ensuring that it matches the size of the sample of fathers and children. Even with a smaller randomly-selected mother-child sample, we still find statistically significant estimates for the transmission of internalising and externalising skills from mothers to children. This suggests that the non-significant estimates for the father-child sample is not driven by power considerations. Additionally, Appendix Tables C7 and C8 present some additional specifications of the estimates presented in Table 5.

Fifth, as a robustness check on the results in Tables 4 and 5, we also use the data collected on the cohort members at the age-10 sweep from Rutter A questionnaire administered to their teachers. We can exploit these data to address possible concerns about misreporting bias and estimate intergenerational mobility in socio-emotional skills by using the questions answered by the teachers, instead of the cohort members' mothers. Appendix Tables C9 and C10 reproduce Tables 4 and 5, using this information.

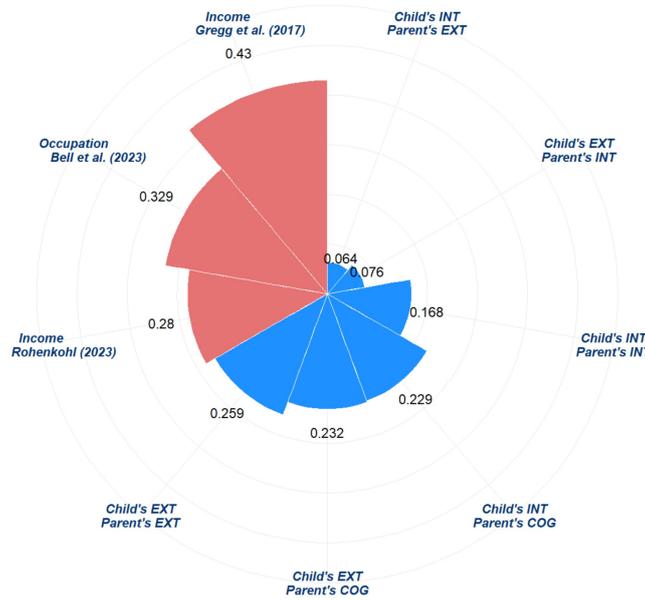
The evidence, using the questions answered by the teachers, mitigates the concern that mothers may report their daughters as more similar to themselves and their sons as more dissimilar. Such behaviour would create contemporaneous correlations between mother-child pairs, driven mostly by mother-girl pairs. We therefore compute the correlations between mother-daughter (internalising skill: 0.320 (SE 0.081); externalising skill: 0.279 (SE 0.075)) and mother-son (internalising skill: 0.099 (SE 0.100); externalising skill: 0.335 (SE 0.080)). The non-statistically difference in the correlations by mother-daughter and mother-son hints that the mother-child correlation is not driven by a specific gender-combination.

Finally, we notice that the magnitudes of our estimates are similar to, though somewhat smaller than, the ones in the UK for intergenerational mobility in occupation (Bell et al., 2023), and income (Gregg et al., 2017; Rohenkohl, 2023). This is shown in the Nightingale rose chart (Figure 1), which compares the mobility estimates from the studies mentioned above with the mobility estimates in socio-emotional skills for each skill separately without controls (Appendix Figure C1).<sup>10</sup> We however urge caution in comparing our results to the findings in intergenerational mobility in income and/or occupation because of different datasets, variables and model specifications.

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<sup>10</sup>Appendix F contextualizes our estimates on intergenerational mobility in skills during childhood by estimating the relationship between skills during childhood and log pay at age 42 in Table F1, providing evidence that skills during childhood are predictive of log pay. A similar result is also presented in Papageorge et al. (2019).

Figure 1: Comparison of the mobility measures



Note. The Nightingale rose chart presents a comparison of the mobility measures in socio-emotional skills from the non-instrumented regressions without controls (equation 4 with no controls) to the mobility measures (i.e., coefficients from the OLS regressions) in other economic domains. The measurement system and the mobility equation are estimated jointly with no controls. Bell et al. (2023) and Rohenkohl (2023) study an older cohort born respectively in 1974-83 and 1973-1991. Gregg et al. (2017) study mobility in income for the BCS70. Higher values of the OLS coefficient correspond to lower mobility.

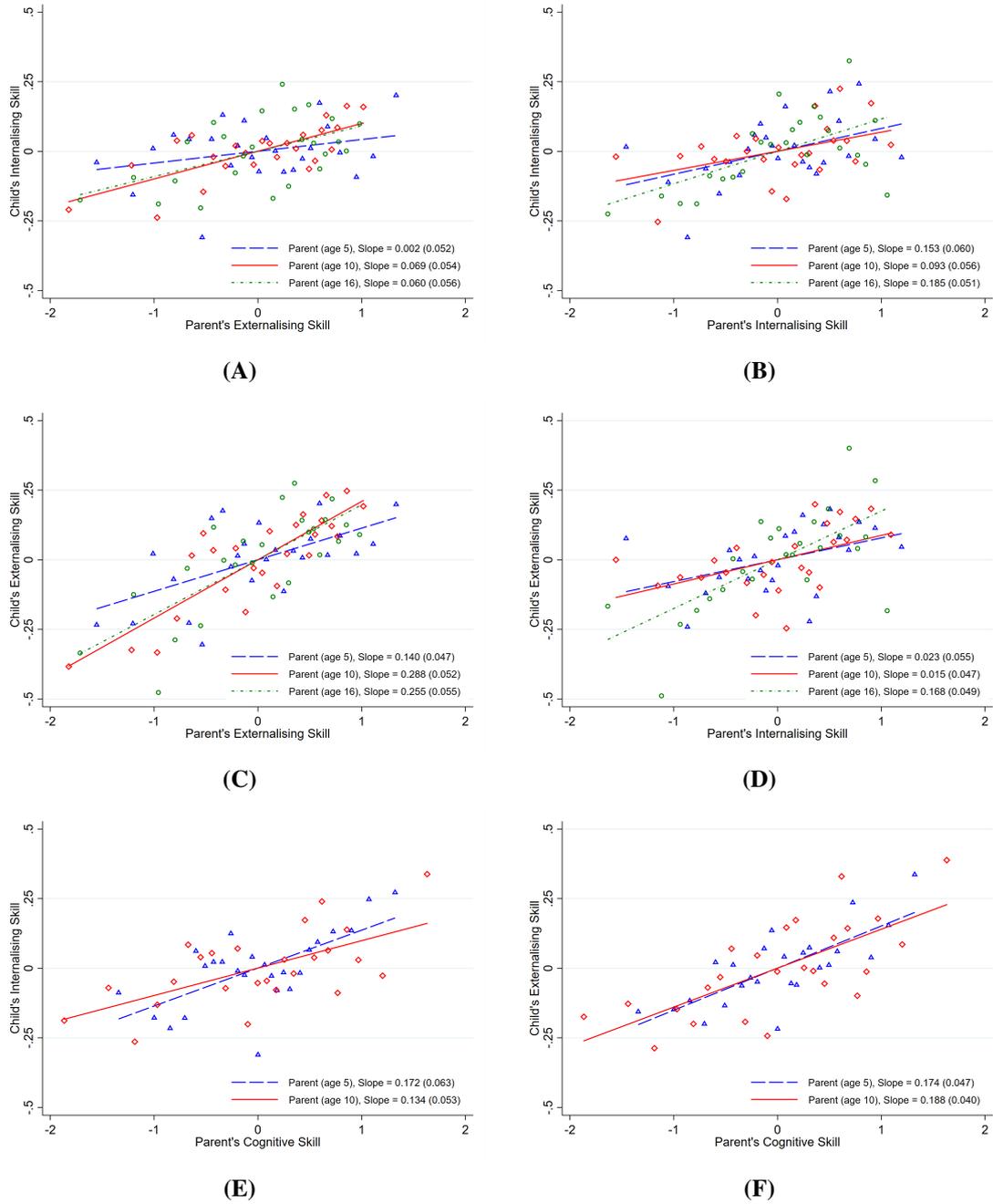
## 5.2 The timing of parental measures

In Table 4, we characterise intergenerational mobility estimates using parental internalising, externalising and cognitive skills *during childhood* combining measurements obtained at different ages. To complement the evidence from this Table and offer a graphic representation of the mobility results, we residualise the child's socio-emotional skills (internalising and externalising) and parent's socio-emotional skills at the ages of 5, 10 and 16 and cognitive skills at ages 5 and 10 separately against the control variables in Table 4 and plot these residuals in Figure 2 along with the best fitting line for each plot.<sup>11</sup> The pattern that emerges from the panels in this figure is similar to the evidence in Table 4. The slope coefficients in plots (A), (B) and (E) from Figure 2 are broadly comparable to the coefficient estimates in Panel A from Table 4, while plots (C), (D) and (F) are comparable to Panel B from Table 4.

An important difference between the results we present and most evidence in the literature on intergenerational mobility is that in the latter children's and parents' skills or attitudes were

<sup>11</sup>We project each socio-emotional skill on the parent's gender, the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975, the number of children in the parent's household when the parent is 5 years old, region of the parent's birth fixed effects and age of child fixed effects and obtain the residualised skill. Second, we plot the residualised skill of child against the residualised skill of the parent. The residualisation emulates the Frisch-Waugh-Lovell Theorem, which establishes that the multiple regression coefficient of a specific variable can also be obtained by first netting out the effect of other variable(s) in the regression model from both the dependent and independent variable of interest and performing a simple regression using those residuals. Note here nonetheless that we also estimate the skills simultaneously.

Figure 2: Association between the children’s residualised socio-emotional skills and the parents’ residualised skills at different ages.



Note. These figures present binned scatter plots of the relationship between the children’s and the parent’s residualised skills. Each panel plots the mean child skill within each parent skill bin. To construct each series, we group parents into 25 equally sized (4 percentile points) bins and plot the mean child’s skill versus the mean parent’s skill within each bin. The slopes are obtained by estimating the measurement system and the mobility equation jointly. All standard errors in parentheses are obtained using 200 bootstrap repetitions.

measured *contemporaneously*, implying that parental skills are measured in adulthood. On the other hand, we measure children’s and parents’ skills during the *childhood* of both generations,

which are roughly 20 years apart. To investigate the importance of this difference, Table 6 presents estimates for intergenerational mobility, both using measures of the parent’s internalising skills measured during their childhood (as in Table 4) and measured at the same time as those of their children (see for example, [Dohmen et al. \(2011\)](#) and [Anger \(2012\)](#)).<sup>12</sup>

Table 6: Intergenerational mobility estimates (childhood and adult measures of parental skills)

| Dependent variable:                     | Internalising (INT) Skill |                     |                     |
|---|---------------------------|---------------------|---------------------|
|   | Child<br>(1)              | Child<br>(2)        | Child<br>(3)        |
| Parent’s INT (during childhood)         | 0.208***<br>(0.067)       |                     | 0.137*<br>(0.078)   |
| Parent’s INT (contemporaneous - age 34) |                           | 0.426***<br>(0.077) | 0.393***<br>(0.090) |
| Observations                            | 919                       | 919                 | 919                 |
| $R^2$                                   | 0.093                     | 0.198               | 0.208               |
| Region of birth FE (BCS70 5y)           | Yes                       | Yes                 | Yes                 |
| Child’s age FE                          | Yes                       | Yes                 | Yes                 |
| Other controls                          | Yes                       | Yes                 | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in socio-emotional skills. The measurement system and the intergenerational mobility equation are estimated jointly. The internalising skill is derived by a factor model that considers 3 items (unhappy, worried and fearful) common across the 4 different sweeps to assure comparability/measurement invariance across measures (the age-34 measure comes from the Malaise questionnaire). Other controls include the parent’s gender, the child’s gender, the number of children in the household, the mother’s age at the parent’s birth, a dummy equal to 1 if the parent is the first born, the parent’s employment status at the age of 34, the grandmother’s employment status and education on 1975 and the number of children in the parent’s household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

When we use contemporaneously measured internalising skills for parents and children, the estimated coefficient on the parent’s internalising skill (column 2, Table 6) is twice as large as the one we estimate when using measures of socio-emotional skills collected in different waves during childhood both for parents and children (column 1, Table 6). Moreover, as is apparent from comparing the  $R^2$  of the different columns, parental skills measured contemporaneously are better predictors of children skills.

The larger role played by skills measured during adulthood could occur for several reasons. The transmission of skills may appear more persistent due to contemporaneous environmental factors or reverse causality, leading to greater correlation between parents’ and children’s skills. Instead, skills measured during childhood may not have fully developed yet, which could explain the smaller coefficient estimate. The estimated coefficient at age 34 is even higher when one instruments the contemporaneously measured parental internalising skill with parental internalising skill measured at age 26. This pattern is also observed in [Dohmen et al. \(2011\)](#), when contemporaneously measured parental trust and risk attitudes are instrumented (see Tables 1 and 5 in their paper). This indicates that, even when instrumented, estimates using contemporaneously

<sup>12</sup>We focus on internalising skill to assure comparability/measurement invariance of skills across different ages as internalising skill can be measured with similarly-worded questionnaire items (i.e., unhappy, worried and fearful) for children and parents during childhood and adulthood (the age-34 measure comes from the Malaise questionnaire). Interestingly, our estimates of intergenerational mobility do not change even if we use fewer items to measure socio-emotional skills. We notice that the estimates of mobility in Column 2 in Panel A of Table 4 are robust and similar to the ones in column 1 in Table 6.

measured parental skills are much higher than those measured in childhood.

To better understand this phenomenon, in Column 3 of Table 6 we relate children's skills with parental skills as measured both during childhood and adulthood. Interestingly, both skills are important predictors, underscoring the sensitivity of the estimates to the timing of skill measurement. The coefficient on parental skill measured during adulthood, however, is estimated to be almost three times larger than that on skills measured during childhood.

### 5.3 Intergenerational rank transitions

We now turn to a different measure of mobility, relating the position in the skill distribution of the 1970 cohort with the position of their children. We do so in Table 7, which reports the transition matrices from the quintile of a skill distribution a parent belongs to, to the quintile of a skill their child belongs to. For the parents we consider internalising, externalising and cognitive skills during childhood, while for the child we consider externalising and internalising skills.

In particular, the transition probabilities report measures of directional mobility, highlighting how mobility may change at different quintiles of the skill distribution. One advantage of reporting transition matrices is to gain a better understanding on whether intergenerational persistence in socio-emotional skills arises from what happens in the tails. For each matrix, we also present the '*spectral gap mobility index*' introduced earlier to facilitate comparison across matrices.<sup>13</sup>

Interestingly, children of very low- or very high-skill parents mostly stay in the same quintile as their parents, while children of parents in the middle of the skills distribution often end up in a different quintile from their parents. We also notice that there are large variations in the percentage of children staying in the same quintile of their parents as well as those moving up or down across different skills and ages. The probability of moving from the lowest to the highest quintile ranges from 13.1 to 17.7, highlighting the importance of distinguishing between skills.

The '*spectral gap mobility index*' indicates that the intergenerational transition matrix with higher mobility is the one relating the child's internalising skill to the parent's externalising skill during childhood, while the one with lower mobility is the one relating the child's externalising skill to the parent's externalising skill during childhood. The correlation between the '*spectral gap mobility index*' and the intergenerational mobility coefficients without any controls is -0.898 (the correlation is negative because a higher coefficient implies lower mobility, while a high spectral gap mobility index implies higher mobility).

As we did with our previous estimates of intergenerational mobility, we also consider the transition matrices reported in Table 7 for the mother-child and father-child pairs, which we report in Appendix Tables C11 and C12. Examining the transition probabilities by gender directly unveils heterogeneities not readily apparent when focusing solely on the spectral gap mobility index. To highlight these patterns, Table 8 presents the difference between the mother-child and father-child transition matrices.

On average, we observe lower mobility in the mother-child transition matrices. Namely, there tends to be a higher probability for the child to stay in same quintile as the mother compared to a

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<sup>13</sup>Bootstrap standard errors of the '*spectral gap mobility index*' from 200 repetitions are presented in parentheses.

Table 7: Intergenerational transition matrix

| Child's EXT - Parent's EXT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 33.5            | 15.9 | 19.3 | 14.9 | 12.5 |
|   | 2 | 21.3            | 21.7 | 21.7 | 17.8 | 19.9 |
|   | 3 | 18.3            | 21.3 | 22.2 | 18.3 | 19   |
|   | 4 | 12.7            | 21.3 | 13.5 | 24   | 26.9 |
|   | 5 | 14.2            | 19.8 | 23.2 | 25   | 21.8 |
| <b>Spectral gap mobility index: 0.800 (0.038)</b> |   |                 |      |      |      |      |

| Child's INT - Parent's EXT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 25.4            | 13.5 | 18.8 | 15.4 | 22.2 |
|   | 2 | 26.9            | 21.7 | 21.3 | 17.8 | 13.9 |
|   | 3 | 18.8            | 19.8 | 17.4 | 22.6 | 21.3 |
|   | 4 | 15.2            | 21.3 | 20.8 | 23.1 | 21.8 |
|   | 5 | 13.7            | 23.7 | 21.7 | 21.2 | 20.8 |
| <b>Spectral gap mobility index: 0.913 (0.025)</b> |   |                 |      |      |      |      |

| Child's EXT - Parent's INT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 17.2            | 21.4 | 18.8 | 20.3 | 17.5 |
|   | 2 | 24.2            | 21.4 | 15.5 | 24.6 | 17.1 |
|   | 3 | 18.7            | 19.4 | 20.3 | 17.4 | 23   |
|   | 4 | 22.2            | 19.4 | 23.2 | 18.8 | 15.7 |
|   | 5 | 17.7            | 18.4 | 22.2 | 18.8 | 26.7 |
| <b>Spectral gap mobility index: 0.898 (0.031)</b> |   |                 |      |      |      |      |

| Child's INT - Parent's INT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 22.7            | 20.4 | 18.8 | 16.9 | 16.6 |
|   | 2 | 21.2            | 25.7 | 17.4 | 19.8 | 17.1 |
|   | 3 | 22.2            | 18.4 | 24.2 | 18.8 | 16.6 |
|   | 4 | 18.7            | 18.4 | 20.3 | 21.7 | 23   |
|   | 5 | 15.2            | 17   | 19.3 | 22.7 | 26.7 |
| <b>Spectral gap mobility index: 0.885 (0.034)</b> |   |                 |      |      |      |      |

| Child's EXT - Parent's COG (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 26.3            | 22.8 | 17.3 | 20.3 | 9.3  |
|   | 2 | 23.2            | 19.9 | 21.6 | 19.3 | 18.5 |
|   | 3 | 19.7            | 24.3 | 14.9 | 21.3 | 19   |
|   | 4 | 15.7            | 17   | 23.1 | 15.5 | 27.3 |
|   | 5 | 15.2            | 16   | 23.1 | 23.7 | 25.9 |
| <b>Spectral gap mobility index: 0.844 (0.035)</b> |   |                 |      |      |      |      |

| Child's INT - Parent's COG (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 25.8            | 20.4 | 17.8 | 18.4 | 13.4 |
|   | 2 | 25.8            | 22.3 | 20.2 | 20.3 | 13   |
|   | 3 | 16.2            | 22.8 | 19.7 | 20.3 | 20.8 |
|   | 4 | 19.2            | 15   | 18.8 | 23.2 | 25.9 |
|   | 5 | 13.1            | 19.4 | 23.6 | 17.9 | 26.9 |
| <b>Spectral gap mobility index: 0.862 (0.038)</b> |   |                 |      |      |      |      |

Note. The Tables present the percent frequency with which a child is in certain skill quintile (row) when parent is in a certain skill quintile (column). The spectral gap mobility index is computed by taking the difference between one and the second largest eigenvalues of the transition matrices. The transition matrices are stochastic matrices; therefore, their largest eigenvalue is always one. The discrepancy between one and the second largest could be seen as a departure from zero mobility, which corresponds to an identity matrix. Higher numbers of the spectral gap mobility index corresponds to higher mobility. All standard errors of the spectral gap mobility index in parentheses are obtained using 200 bootstrap repetition, taking into account the factor estimation stage that precedes the estimation of the transition matrix and its respective eigenvalues.

father in the same quintile and a lower relative probability of moving to another quintile. This can be observed when comparing the diagonals, which indicate the probability of the child staying in the same quintile as the mother minus the probability of staying in the same quintile as the father, as reported in Table 8.

Furthermore, there is less mobility at the lower end for mother-child pairs compared to father-child pairs. Specifically, the probability of children ending up in the first quintile is consistently higher when the mother is in the first quintile, indicating a more challenging escape from the bottom of the distribution for children, whose mothers have lower skills. This contrasts with the situation at the top of the distribution, where the pattern is reversed. Notably, children with fathers at the top are more likely to remain at the top quintile than those with mothers at the top.

Table 8: Difference in intergenerational transition matrix between mother-child and father-child

| Child's EXT - Parent's EXT (during childhood) |   |                 |            |             |             | Child's INT - Parent's EXT (during childhood) |   |             |                 |             |             |             |   |
|---|---|-----------------|------------|-------------|-------------|---|---|-------------|-----------------|-------------|-------------|-------------|---|
|   |   | Parent quintile |            |             |             |   |   |             | Parent quintile |             |             |             |   |
|   |   | 1               | 2          | 3           | 4           | 5   |   |             | 1               | 2           | 3           | 4           | 5 |
| Child quintile                                | 1 | <b>8.5</b>      | -0.3       | -10.8       | 5.2         | -3.0  | 1 | <b>8.5</b>  | 2.6             | -6.1        | -1.9        | -3.1        |   |
|   | 2 | 5.1             | <b>0.5</b> | 4.2         | -7.4        | -2.4  | 2 | -3.7        | <b>6.9</b>      | -8.1        | -5.7        | 9.0         |   |
|   | 3 | 1.7             | 3.2        | <b>-8.8</b> | 1.3         | 3.4   | 3 | -3.7        | -6.6            | <b>4.0</b>  | 6.7         | 1.9         |   |
|   | 4 | -9.5            | -13.3      | 7.8         | <b>3.4</b>  | 9.0   | 4 | 0.1         | -2.6            | 1.5         | <b>2.8</b>  | 1.1         |   |
|   | 5 | -6.0            | 9.9        | 7.5         | -2.4        | <b>-6.9</b>                                   | 5 | -1.1        | -0.3            | 8.8         | -1.9        | <b>-8.8</b> |   |
| $\Delta$ Spectral gap mobility index: -0.057  |   |                 |            |             |             | $\Delta$ Spectral gap mobility index: 0.018   |   |             |                 |             |             |             |   |
| Child's EXT - Parent's INT (during childhood) |   |                 |            |             |             | Child's INT - Parent's INT (during childhood) |   |             |                 |             |             |             |   |
|   |   | Parent quintile |            |             |             |   |   |             | Parent quintile |             |             |             |   |
|   |   | 1               | 2          | 3           | 4           | 5   |   |             | 1               | 2           | 3           | 4           | 5 |
| Child quintile                                | 1 | <b>6.0</b>      | -0.4       | 13.8        | -13         | -6.1  | 1 | <b>18.1</b> | -6.0            | 13.1        | -18.6       | -5.7        |   |
|   | 2 | -3.3            | <b>1.4</b> | 7.8         | -13.8       | 7.2   | 2 | -10.0       | <b>2.5</b>      | 4.6         | 5.3         | -4.2        |   |
|   | 3 | -9.7            | -4.4       | <b>-3.1</b> | 8.4         | 8.7   | 3 | -14.8       | -2.3            | <b>11.2</b> | 1.4         | 6.4         |   |
|   | 4 | 6.0             | -2.4       | -9.2        | <b>6.0</b>  | -2.3  | 4 | 5.1         | 6.2             | -16.9       | <b>3.4</b>  | 5.2         |   |
|   | 5 | 0.9             | 5.8        | -9.3        | 12.4        | <b>-7.6</b>                                   | 5 | 1.6         | -0.4            | -12.0       | 8.7         | <b>-1.6</b> |   |
| $\Delta$ Spectral gap mobility index: 0.075   |   |                 |            |             |             | $\Delta$ Spectral gap mobility index: 0.045   |   |             |                 |             |             |             |   |
| Child's EXT - Parent's COG (during childhood) |   |                 |            |             |             | Child's INT - Parent's COG (during childhood) |   |             |                 |             |             |             |   |
|   |   | Parent quintile |            |             |             |   |   |             | Parent quintile |             |             |             |   |
|   |   | 1               | 2          | 3           | 4           | 5   |   |             | 1               | 2           | 3           | 4           | 5 |
| Child quintile                                | 1 | <b>13.0</b>     | 3.2        | -9.6        | -5.8        | -0.6  | 1 | <b>6.5</b>  | 3.4             | -7.6        | -2.2        | -0.2        |   |
|   | 2 | -5.2            | <b>5.0</b> | -1.5        | -4.6        | 5.5   | 2 | -1.4        | <b>8.3</b>      | -2.9        | -11.0       | 5.3         |   |
|   | 3 | -0.1            | 5.4        | <b>0.5</b>  | 0.5         | -5.2  | 3 | -1.3        | -0.9            | <b>3.3</b>  | -7.4        | 8.5         |   |
|   | 4 | -2.7            | -10.4      | 12.7        | <b>-1.3</b> | -0.3  | 4 | -1.7        | -5.4            | 8.0         | <b>13.7</b> | -11.2       |   |
|   | 5 | -5.0            | -3.2       | -2.0        | 11.0        | <b>0.7</b>                                    | 5 | -2.0        | -5.4            | -0.9        | 6.9         | <b>-2.5</b> |   |
| $\Delta$ Spectral gap mobility index: -0.093  |   |                 |            |             |             | $\Delta$ Spectral gap mobility index: -0.050  |   |             |                 |             |             |             |   |

Note. The Table presents the difference in intergenerational transition matrix between mother-child and father-child (i.e., the mother-child transition matrix minus the father-child transition matrix). The  $\Delta$  spectral gap mobility index is the difference in the spectral gap mobility index between mother-child and father-child one.

## 6 Multi-generational persistence in socio-emotional skills

During the 1975, 1980 and 1986 sweeps, the mothers of the subjects (i.e., grandmothers to the children of the 1970 cohort) were also asked some socio-emotional related questions. We exploit these data to study multi-generational persistence in socio-emotional skills, that is, the relationship between the grandmother and grandchild's socio-emotional skills.

The data on the grandmother's socio-emotional skill in adulthood come from the cohort members' mothers who have completed the Malaise Inventory (Rutter et al., 1970) in the 1975, 1980 and 1986 sweeps. Appendix Table D1 presents the set of 24 'yes-no' self-completion questions asked to the grandmothers to measure their levels of psychological distress, or depression.<sup>14</sup> These scales have been used extensively and have been shown to have internal consistency, hold in different socioeconomic groups and differentiate moderately well between individuals with and without psychiatric disorders (Rutter et al., 1970; Rodgers et al., 1999). As done in Section 3, we focus on comparable questionnaire items between grandmothers, cohort members and grandchildren,

<sup>14</sup>The 1975-sweep scale is binary, the 1980-sweep scale is continuous from 0 to 100 and the-1986 sweep scale has 3 categories. We convert them to binary. The continuous scale between 0 and 100 (where 100 means "seldom or never") is recoded 'no behavioural problem' (dummy equal to 1) if the answer is below 70. We have tried different cutoffs and the results are robust.

shown in Appendix Table D2, to measure their ‘internalising skill’. Subsequently, we estimate the measurement system and the multi-generational mobility equation jointly.

Table 9 presents the estimates of multi-generational mobility. Panel A presents the estimates for the internalising skill, while Panel B for the externalising skill. Column 1 of both panels presents the intergenerational mobility estimates when we correlate the grandmother’s internalising skill to the parent’s internalising (Panel A) and externalising (Panel B) skills. In this instance, the measures of skills for the mothers (aged around 25 years old in 1975) and the cohort members are contemporaneous. These results hint at the bias that we highlight in Section 5 when we estimate intergenerational mobility in socio-emotional skills using contemporaneous measures. The intergenerational mobility coefficients obtained from using contemporaneous measures of socio-emotional skills are larger than the ones in Section 5 when we use parents’ socio-emotional skills *before they reached adulthood*

Columns (2)-(5) present the estimates for multi-generational persistence in the internalising and externalising skills in Panels A and B. The estimates show that the grandmother’s internalising skill in adulthood is predictive of the grandchild’s internalising and externalising skills during childhood. This finding hints at a strong persistence in socio-emotional skills, which goes back even to the grandmother’s generation. In turn, this result reiterates the findings by [Adermon et al. \(2021\)](#), who study long-run intergenerational persistence in human capital, proxied by the child’s GPA in the last year of compulsory schooling, using information on outcomes for the extended family in Sweden.

Finally, these findings complement the literature investigating multi-generational mobility in mental health, which is related to a certain extent to socio-emotional skills. For example, [Johnson et al. \(2013\)](#) and [Hancock et al. \(2013\)](#) study multi-generational mobility in mental health in the UK and Australia respectively. Their approach to study multi-generational mobility, however, does not consider the multi-dimensionality of children’s skills. In addition, their estimates may suffer from some of the problems, which we have mentioned in the introduction and discussed in Section 5. For example, they use contemporaneous measures of parents’ and children’s mental health, which could lead to reverse causality if the disruptive child affects the parents’ mental health. Their measure of grandchildren’s mental health may not be directly comparable to grandmothers and parents’ one because they use questionnaires, containing different items, and obtain their measure by averaging the responses, instead of estimating a factor model.

Table 9: Multi-generational mobility in socio-emotional skills

| <b>Panel A: grandchild's INT skill</b> |                                     |                     |   |                     |                     |
|--|-------------------------------------|---------------------|---|---------------------|---------------------|
| Dependent variable:                    | <b>Parent's Internalising Skill</b> |                     | <b>Grandchild's Internalising Skill</b> |                     |                     |
|  | (1)                                 | (2)                 | (3)                                     | (4)                 | (5)                 |
| Grandmother's INT                      | 0.708***<br>(0.071)                 | 0.138***<br>(0.053) | 0.117**<br>(0.049)                      | 0.137***<br>(0.051) | 0.074<br>(0.075)    |
| Parent's COG (during childhood)        |                                     |                     | 0.164***<br>(0.051)                     | 0.176***<br>(0.054) | 0.184***<br>(0.049) |
| Parent's EXT (during childhood)        |                                     |                     |   | -0.054<br>(0.059)   | -0.094<br>(0.063)   |
| Parent's INT (during childhood)        |                                     |                     |   |                     | 0.145*<br>(0.075)   |
| Observations                           | 994                                 | 994                 | 994                                     | 994                 | 994                 |
| $R^2$                                  | 0.350                               | 0.078               | 0.102                                   | 0.103               | 0.115               |
| Region of birth FE (BCS70 5y)          | Yes                                 | Yes                 | Yes                                     | Yes                 | Yes                 |
| Child's age FE                         | No                                  | Yes                 | Yes                                     | Yes                 | Yes                 |
| Other controls                         | Yes                                 | Yes                 | Yes                                     | Yes                 | Yes                 |

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| <b>Panel B: grandchild's EXT skill</b> |                                     |                     |   |                     |                     |
|--|-------------------------------------|---------------------|---|---------------------|---------------------|
| Dependent variable:                    | <b>Parent's Externalising Skill</b> |                     | <b>Grandchild's Externalising Skill</b> |                     |                     |
|  | (1)                                 | (2)                 | (3)                                     | (4)                 | (5)                 |
| Grandmother's INT                      | 0.478***<br>(0.048)                 | 0.159***<br>(0.043) | 0.132***<br>(0.043)                     | 0.058<br>(0.051)    | 0.108*<br>(0.057)   |
| Parent's COG (during childhood)        |                                     |                     | 0.231***<br>(0.039)                     | 0.196***<br>(0.046) | 0.191***<br>(0.044) |
| Parent's EXT (during childhood)        |                                     |                     |   | 0.191***<br>(0.058) | 0.221***<br>(0.051) |
| Parent's INT (during childhood)        |                                     |                     |   |                     | -0.106*<br>(0.062)  |
| Observations                           | 994                                 | 994                 | 994                                     | 994                 | 994                 |
| $R^2$                                  | 0.207                               | 0.063               | 0.110                                   | 0.135               | 0.141               |
| Region of birth FE (BCS70 5y)          | Yes                                 | Yes                 | Yes                                     | Yes                 | Yes                 |
| Child's age FE                         | No                                  | Yes                 | Yes                                     | Yes                 | Yes                 |
| Other controls                         | Yes                                 | Yes                 | Yes                                     | Yes                 | Yes                 |

Note. The Table presents estimates for the multi-generational mobility in socio-emotional skills. The measurement system and the mobility equation are estimated jointly. Other controls include the cohort member's gender, the age of the cohort member's mother at birth, the grandchild's gender. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 7 Conclusion

This study investigates intergenerational mobility in skills during childhood in the United Kingdom, using unique data from the 1970 British Cohort Study. We document that parental skills *during childhood* are predictive of their children's socio-emotional skills *during childhood*. These results contribute to the literature by tackling some of the concerns from previous estimates of intergenerational skill transmission.

First, we estimate heterogeneity in the transmission process *by mother and father* and move beyond estimating the intergenerational transmission by correlating parents and children. We find that most of the transmission occurs from mothers to children.

Second, we incorporate multiple assessments of parental socio-emotional skills gathered through-

out *both childhood and adulthood*. This is in contrast to the prior literature, that primarily focuses on measuring contemporaneously parents' and children's skills during adulthood. Using multiple measures over the life cycle enables us to show that the transmission of skills from parents to children becomes increasingly persistent when parental skills are measured later in life. Additionally, it enables us to reasonably infer that the primary direction of intergenerational transmission is from parents to children, thereby ruling out the possibility of children influencing their parents' skills, which can be more salient when using contemporaneous measures.

Finally, multi-generational mobility in socio-emotional skills is investigated, presenting evidence that the transmission of socio-emotional skills remains persistent. The grandmother's socio-emotional skill predicts her own grandchild's socio-emotional skills.

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# Appendices to "Intergenerational Mobility in Socio-emotional Skills"

## A Measurement invariance

As in [Attanasio et al. \(2020\)](#), we test for measurement invariance since any comparison between socio-emotional skills across different generations requires that the socio-emotional measures we derived have the same relationship with the latent constructs ([Vandenberg and Lance, 2000](#); [Putnick and Bornstein, 2016](#)). Specifically, the items in the age-5, 10 and 16 sweeps for the cohort members and the child-sweep must measure internalising and externalising in the same way.

This is a formally testable property following the assumptions introduced by [Wu and Estabrook \(2016\)](#). Intuitively, this is done by comparing the baseline model, namely the minimal identifiable model, with a series of models with stronger restrictions on the item- and cohort-specific intercepts  $v_{ic}$  and loadings  $\lambda_{ic}$ , requiring them to be the same across groups. Their fit is compared to see if the models with stronger restrictions have a worse fit. If this is not the case, invariance is achieved.

We estimate three models with additional restrictions that we can compare with the baseline model and assess their relative fit. First, we estimate the threshold invariant model which is observationally equivalent to the baseline model when each item is a categorical variable with three categories ([Wu and Estabrook, 2016](#)). We highlight that the number of parameters and fit are indeed the same for the baseline and threshold invariant model.

Second, we estimate the loading- and threshold-invariant model, which imposes stronger restrictions. Namely, we impose that the factor loadings  $\lambda_{ic}$  and the threshold on the parameters must be the same between parents and children. This means that the items in the Rutter/SDQ scale from the children and parents have the same relationship with the latent skill because the factor loadings are the same across groups. If the fit of the model is similar to the baseline one, then socio-emotional skills can be placed on the same scale and we can compare the variance.

Third, we estimate a loading-, threshold-, and intercept-invariant model. Namely, we impose that the factor loadings  $\lambda_{jc}$ , the intercepts  $v_{jc}$  and the threshold be the same between parents and children. If the fit of the model does not worsen compared to the baseline model, we can also compare the means of the socio-emotional skills between the two groups.

Table [A1](#) compares the fit of each model. We first present the  $\chi^2$  statistic, but also other alternative goodness-of-fit indices commonly used, such as the root mean squared error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI).<sup>2</sup>

The baseline model fits the data well. When we restrict the threshold and loadings to be the same across groups, this yields a fit comparable to the baseline one. The fit worsens when we also

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<sup>2</sup>The RMSEA is defined as  $\sqrt{(\chi^2 - df)/df(N - 1)}$ , where  $df$  are the degrees of freedom and  $N$  is the sample size. Lower values imply a better fit and [MacCallum et al. \(1996\)](#) suggest measures between 0.05 and 0.08 to be fair. On the other hand, CFI and TLI determine how far our model is from the model where the variables have no correlation across them). The CFI is defined as  $(\epsilon_{\text{Null Model}} - \epsilon_{\text{Alternative Model}})/\epsilon_{\text{Null Model}}$ , where  $\epsilon = \chi^2 - df$ , whereas the TLI is defined as  $(\epsilon_{\text{Null Model}} - \epsilon_{\text{Alternative Model}})/(\epsilon_{\text{Null Model}} - 1)$ , where now  $\epsilon = \chi^2/df$ . Both indices are between 0 and 1 and a higher value corresponds to a better fit for the alternative model.

Table A1: Measurement invariance fit comparison

| Model  | Number of parameters | $\chi^2$ | RMSEA | CFI   | TLI   |
|--|----------------------|----------|-------|-------|-------|
| Baseline model/ Threshold Invariance         | 136                  | 1876.094 | 0.060 | 0.959 | 0.948 |
| Threshold and loading invariance             | 108                  | 2803.019 | 0.069 | 0.938 | 0.932 |
| Threshold, loading, and intercept invariance | 81                   | 6457.661 | 0.100 | 0.851 | 0.856 |

Note. The table compares the optimal number of factors suggested by different approaches. RMSEA stands for the root mean squared error of approximation, CFI for the comparative fit index, and TLI for the Tucker-Lewis index.

restrict the intercepts to be the same, but still provides comparable fit according to the measures above.

## B Joint estimation of regressions and factor model

We outline here the estimation method developed by [Muthen \(1984\)](#) in the psychometric literature to estimate structural equation models (SEM) with categorical items.<sup>3</sup> We adopt this approach to estimate each of the regressions proposed in Section 4 jointly with the factor model introduced in Section 3.2. Since social-emotional skills correspond to the factors in the model presented in Section 3.2, an intuitive estimation strategy would proceed in two steps. First, the factor model is estimated. Second, the predicted factors from the factor model are used in the regression. Because the estimation error in the first step would emulate a measurement error, this might lead to concerns about measurement error bias. The joint estimation of the regression of interest and factor model addresses this potential concern.

We briefly describe here the strategy proposed by [Muthen \(1984\)](#) to estimate the measurement system and the regression jointly. The estimation protocol first estimates the parameters for the “reduced form” implied by the factor model and regression of interest. This is a categorical model for the observed item responses  $Z_{ijc}$  as functions of the observable covariates  $\mathbf{X}_i$  in the regression of interest. These reduced form parameters comprise the thresholds  $\tau_{jc}$  and intercept, slope and covariance parameters that are functions of the “structural” parameters in the factor model and regression of interest. Letting  $\sigma$  denote the reduced form parameters (as in [Muthen \(1984\)](#)) and  $\theta$  denote the structural parameters, we thus have that  $\sigma = g(\theta)$  for a known function  $g(\cdot)$ . Given the normality assumption on  $u_{ijc}$ , the reduced form parameters collected in  $\sigma$  can be estimated by maximum likelihood methods. Let  $\hat{\sigma}$  denote the estimates obtained in this initial stage.

Once the estimates  $\hat{\sigma}$  are obtained, the procedure fits the structural parameters using a minimum distance estimator based on the following objective function:

$$F_W(\theta) = (g(\theta) - \hat{\sigma})^\top \mathbf{W}^{-1} (g(\theta) - \hat{\sigma}), \quad (6)$$

for a weight matrix  $\mathbf{W}$ , to be minimised with respect to  $\theta$ . [Muthen \(1984\)](#) suggests using as  $\mathbf{W}$  a consistent estimator for asymptotic covariance matrix of  $\hat{\sigma}$ . The corresponding estimator for  $\theta$  is referred to in the psychometrics literature as the Weighted Least Squares (WLS) estimator. Alter-

<sup>3</sup>[Goldberger \(1971\)](#) is an excellent review of the common themes between econometrics and psychometrics.

native weight matrices, computationally more tractable and often better performing statistically in small samples, are instead: (1) the diagonal of  $\mathbf{W}$  (Diagonally Weighted Least Squares, DWLS) or the (2) the identity matrix (Unweighted Least Squares, ULS). We adopt the DWLS weight matrix in the estimation. The estimation is carried out through the R Lavaan package version 0.6-8 (Rosseel, 2012).

## C Mobility in socio-emotional skills

### C.1 Factor models and instrumental variables to address measurement error

Table C1: Factor models and Instrumental variables: Intergenerational mobility in socio-emotional skills

| Dependent variable:           | Child's Internalising (INT) Skill |                    | Child's Externalising (EXT) Skill |                     |
|-------------------------------|-----------------------------------|--------------------|-----------------------------------|---------------------|
|                               | Factor<br>(1)                     | IV<br>(2)          | Factor<br>(3)                     | IV<br>(4)           |
| Parent's INT                  | 0.192***<br>(0.067)               | 0.193**<br>(0.086) | -0.040<br>(0.057)                 | -0.136<br>(0.078)   |
| Parent's EXT                  | -0.082<br>(0.071)                 | -0.071<br>(0.061)  | 0.243***<br>(0.054)               | 0.214***<br>(0.060) |
| Parent's COG                  | 0.157**<br>(0.052)                | 0.128**<br>(0.056) | 0.153***<br>(0.041)               | 0.141***<br>(0.052) |
| Observations                  | 1035                              | 1035               | 1035                              | 1035                |
| Region of birth FE (BCS70 5y) | Yes                               | Yes                | Yes                               | Yes                 |
| Child's age FE                | Yes                               | Yes                | Yes                               | Yes                 |
| Other controls                | Yes                               | Yes                | Yes                               | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills (child's socio-emotional skills on parent's skills *during childhood*). The measurement system and the intergenerational mobility equation are estimated jointly. Odd columns present the estimates from a factor model, combining the measures for the cohort members (the parents) available at ages 5, 10 and 16. Even columns employ a factor model to obtain estimates of the parent's skills at ages 5, 10 and 16 and use the age-5 and 10 measures as instruments for the age 16. Other controls include the parent's gender, the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## C.2 Robustness: other tables

Table C2: Heckman selection: Intergenerational mobility in socio-emotional skills

| Dependent variable:             | Child's Internalising (INT) Skill |                    | Child's Externalising (EXT) Skill |                     |
|---------------------------------|-----------------------------------|--------------------|-----------------------------------|---------------------|
|                                 | (1)                               | (2)                | (3)                               | (4)                 |
| Parent's INT (during childhood) | 0.192***<br>(0.067)               | 0.177**<br>(0.067) | -0.040<br>(0.057)                 | -0.059<br>(0.053)   |
| Parent's EXT (during childhood) | -0.082<br>(0.071)                 | -0.082<br>(0.075)  | 0.243***<br>(0.054)               | 0.243***<br>(0.059) |
| Parent's COG (during childhood) | 0.157**<br>(0.052)                | 0.168**<br>(0.057) | 0.153***<br>(0.041)               | 0.173***<br>(0.044) |
| Inverse Mills ration            |                                   | -0.228<br>(0.195)  |                                   | -0.279<br>(0.203)   |
| Observations                    | 1035                              | 1035               | 1035                              | 1035                |
| $R^2$                           | 0.135                             | 0.138              | 0.165                             | 0.172               |
| Heckman selection               | No                                | Yes                | No                                | Yes                 |
| Region of birth FE (BCS70 5y)   | Yes                               | Yes                | Yes                               | Yes                 |
| Child's age FE                  | Yes                               | Yes                | Yes                               | Yes                 |
| Other controls                  | Yes                               | Yes                | Yes                               | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills (child's socio-emotional skills on parent's skills *during childhood*). Even columns present the estimates for the Heckman selection model. In the Heckman selection model for the fertility decision at age 34, we add marital status alongside other cohort member covariates in the selection equation. The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the parent's gender, the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

Table C3: Intergenerational mobility in socio-emotional skills with and without child's age control

| Dependent variable:             | Child's Internalising (INT) Skill |                     | Child's Externalising (EXT) Skill |                     |
|---------------------------------|-----------------------------------|---------------------|-----------------------------------|---------------------|
|                                 | (1)                               | (2)                 | (3)                               | (4)                 |
| Parent's INT (during childhood) | 0.192***<br>(0.067)               | 0.180**<br>(0.075)  | -0.040<br>(0.057)                 | -0.034<br>(0.059)   |
| Parent's EXT (during childhood) | -0.082<br>(0.071)                 | -0.072<br>(0.068)   | 0.243***<br>(0.054)               | 0.234***<br>(0.060) |
| Parent's COG (during childhood) | 0.157**<br>(0.052)                | 0.198***<br>(0.064) | 0.153***<br>(0.041)               | 0.141***<br>(0.042) |
| Observations                    | 1035                              | 1035                | 1035                              | 1035                |
| $R^2$                           | 0.135                             | 0.092               | 0.165                             | 0.155               |
| Controlling for child's age     | Yes                               | No                  | Yes                               | No                  |
| Region of birth FE (BCS70 5y)   | Yes                               | Yes                 | Yes                               | Yes                 |
| Other controls                  | Yes                               | Yes                 | Yes                               | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills (child's socio-emotional skills on parent's skills *during childhood*). Even columns present the estimates when *not* controlling for the age of the child. The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the parent's gender, the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

Table C4: Heckman selection: Intergenerational mobility in socio-emotional skills by the parent's gender

| Dependent variable:             | Child's Internalising (INT) Skill |                     | Child's Externalising (EXT) Skill |                     |
|---------------------------------|-----------------------------------|---------------------|-----------------------------------|---------------------|
|                                 | Mother-child<br>(1)               | Father-child<br>(2) | Mother-child<br>(3)               | Father-child<br>(4) |
| Parent's INT (during childhood) | 0.197***<br>(0.071)               | 0.161<br>(0.159)    | -0.090<br>(0.072)                 | 0.069<br>(0.135)    |
| Parent's EXT (during childhood) | -0.087<br>(0.094)                 | -0.099<br>(0.191)   | 0.291***<br>(0.072)               | 0.043<br>(0.136)    |
| Parent's COG (during childhood) | 0.175**<br>(0.070)                | 0.088<br>(0.142)    | 0.213***<br>(0.050)               | 0.135<br>(0.207)    |
| Inverse Mills ration            | -0.360*<br>(0.209)                | 0.667<br>(0.609)    | -0.307<br>(0.191)                 | -0.080<br>(0.494)   |
| Observations                    | 752                               | 283                 | 752                               | 283                 |
| $R^2$                           | 0.162                             | 0.157               | 0.191                             | 0.178               |
| Heckman selection               | Yes                               | Yes                 | Yes                               | Yes                 |
| Region of birth FE (BCS70 5y)   | Yes                               | Yes                 | Yes                               | Yes                 |
| Child's age FE                  | Yes                               | Yes                 | Yes                               | Yes                 |
| Other controls                  | Yes                               | Yes                 | Yes                               | Yes                 |

Note. The Table presents estimates for the Heckman selection model for equation 4 on the intergenerational mobility in skills by the parent's gender (child's socio-emotional skills on parent's skills *during childhood*). In the Heckman selection model for the fertility decision at age 34, we add marital status alongside other cohort member covariates in the selection equation. The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

Table C5: Intergenerational mobility in socio-emotional skills - Tobit model for ceiling effects

| Dependent variable:             | Child's Internalising (INT) Skill |                      | Child's Externalising (EXT) Skill |                     |
|---------------------------------|-----------------------------------|----------------------|-----------------------------------|---------------------|
|                                 | (1)                               | (2)                  | (3)                               | (4)                 |
| Parent's INT (during childhood) | 0.192***<br>(0.067)               | 0.231***<br>(0.030)  | -0.040<br>(0.057)                 | -0.042<br>(0.037)   |
| Parent's EXT (during childhood) | -0.082<br>(0.071)                 | -0.118***<br>(0.034) | 0.243***<br>(0.054)               | 0.255***<br>(0.036) |
| Parent's COG (during childhood) | 0.157**<br>(0.052)                | 0.203***<br>(0.025)  | 0.153***<br>(0.041)               | 0.156***<br>(0.025) |
| Observations                    | 1035                              | 1035                 | 1035                              | 1035                |
| Tobit model                     | No                                | Yes                  | No                                | Yes                 |
| Region of birth FE (BCS70 5y)   | Yes                               | Yes                  | Yes                               | Yes                 |
| Child's age FE                  | Yes                               | Yes                  | Yes                               | Yes                 |
| Other controls                  | Yes                               | Yes                  | Yes                               | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills (child's socio-emotional skills on parent's skills *during childhood*). Even columns present the estimates when estimating a Tobit model where the censoring is the largest value in socio-emotional skills in the upper end of the distribution which may suffer from ceiling effects (McBee, 2010). Other controls include the parent's gender, the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

Table C6: Intergenerational mobility in socio-emotional skills by the parent's gender (randomly selected sample of mothers and children, ensuring that it matches the size of the sample of fathers and children)

| <b>Panel: Child-mother</b>      |  |  |
|---------------------------------|--|--|
| Dependent variable:             | <b>Child's Internalising (INT) Skill</b> | <b>Child's Externalising (EXT) Skill</b> |
|                                 | (1)                                      | (2)                                      |
| Parent's INT (during childhood) | 0.311**<br>(0.125)                       |  |
| Parent's EXT (during childhood) |  | 0.350***<br>(0.094)                      |
| Observations                    | 283                                      | 283                                      |
| Region of birth FE (BCS70 5y)   | No                                       | No                                       |
| Child's age FE                  | No                                       | No                                       |
| Other controls                  | No                                       | No                                       |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills for the mother-child sample. The mother-child sample is randomly selected, ensuring that it matches the size of the sample of fathers and children. The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table C7: Intergenerational mobility in internalising skill by the parent's gender

| <b>Panel A: Child-mother</b>    |  |                     |                  |                     |                    |                     |
|---------------------------------|--|---------------------|------------------|---------------------|--------------------|---------------------|
| Dependent variable:             | <b>Child's Internalising (INT) Skill</b> |                     |                  |                     |                    |                     |
|                                 | (1)                                      | (2)                 | (3)              | (4)                 | (5)                | (6)                 |
| Parent's INT (during childhood) | 0.219***<br>(0.062)                      | 0.195***<br>(0.059) |                  | 0.173***<br>(0.055) |                    | 0.221***<br>(0.081) |
| Parent's EXT (during childhood) |  |                     | 0.060<br>(0.061) |                     | 0.010<br>(0.073)   | -0.096<br>(0.079)   |
| Parent's COG (during childhood) |  |                     |                  | 0.153***<br>(0.057) | 0.174**<br>(0.089) | 0.173**<br>(0.063)  |
| Observations                    | 752                                      | 752                 | 752              | 752                 | 752                | 752                 |
| $R^2$                           | 0.046                                    | 0.136               | 0.105            | 0.153               | 0.126              | 0.159               |
| Region of birth FE (BCS70 5y)   | No                                       | Yes                 | Yes              | Yes                 | Yes                | Yes                 |
| Child's age FE                  | No                                       | Yes                 | Yes              | Yes                 | Yes                | Yes                 |
| Other controls                  | No                                       | Yes                 | Yes              | Yes                 | Yes                | Yes                 |

| <b>Panel B: Child-father</b>    |  |                  |                   |                   |                  |                   |
|---------------------------------|--|------------------|-------------------|-------------------|------------------|-------------------|
| Dependent variable:             | <b>Child's Internalising (INT) Skill</b> |                  |                   |                   |                  |                   |
|                                 | (1)                                      | (2)              | (3)               | (4)               | (5)              | (6)               |
| Parent's INT (during childhood) | -0.011<br>(0.109)                        | 0.090<br>(0.113) |                   | 0.087<br>(0.107)  |                  | 0.152<br>(0.158)  |
| Parent's EXT (during childhood) |  |                  | -0.006<br>(0.107) |                   | 0.023<br>(0.123) | -0.099<br>(0.150) |
| Parent's COG (during childhood) |  |                  |                   | 0.148*<br>(0.090) | 0.155<br>(0.096) | 0.164<br>(0.145)  |
| Observations                    | 283                                      | 283              | 283               | 283               | 283              | 283               |
| $R^2$                           | 0.000                                    | 0.144            | 0.138             | 0.163             | 0.158            | 0.165             |
| Region of birth FE (BCS70 5y)   | No                                       | Yes              | Yes               | Yes               | Yes              | Yes               |
| Child's age FE                  | No                                       | Yes              | Yes               | Yes               | Yes              | Yes               |
| Other controls                  | No                                       | Yes              | Yes               | Yes               | Yes              | Yes               |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills (child's socio-emotional skills on parent's skills *during childhood*). The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table C8: Intergenerational mobility in externalising skills by the parent's gender

| <b>Panel A: Child-mother</b>    |  |                     |                    |                     |                     |                     |
|---------------------------------|--|---------------------|--------------------|---------------------|---------------------|---------------------|
| Dependent variable:             | <b>Child's Externalising (EXT) Skill</b> |                     |                    |                     |                     |                     |
|                                 | (1)                                      | (2)                 | (3)                | (4)                 | (5)                 | (6)                 |
| Parent's INT (during childhood) |  |                     | 0.097**<br>(0.048) |                     | 0.063<br>(0.050)    | -0.065<br>(0.074)   |
| Parent's EXT (during childhood) | 0.300***<br>(0.054)                      | 0.303***<br>(0.057) |                    | 0.253***<br>(0.060) |                     | 0.288***<br>(0.072) |
| Parent's COG (during childhood) |  |                     |                    | 0.190***<br>(0.054) | 0.245***<br>(0.047) | 0.190***<br>(0.058) |
| Observations                    | 752                                      | 752                 | 752                | 752                 | 752                 | 752                 |
| $R^2$                           | 0.083                                    | 0.152               | 0.082              | 0.179               | 0.133               | 0.182               |
| Region of birth FE (BCS70 5y)   | No                                       | Yes                 | Yes                | Yes                 | Yes                 | Yes                 |
| Child's age FE                  | No                                       | Yes                 | Yes                | Yes                 | Yes                 | Yes                 |
| Other controls                  | No                                       | Yes                 | Yes                | Yes                 | Yes                 | Yes                 |

| <b>Panel B: Child-father</b>    |  |                  |                  |                  |                  |                  |
|---------------------------------|--|------------------|------------------|------------------|------------------|------------------|
| Dependent variable:             | <b>Child's Externalising (EXT) Skill</b> |                  |                  |                  |                  |                  |
|                                 | (1)                                      | (2)              | (3)              | (4)              | (5)              | (6)              |
| Parent's INT (during childhood) |  |                  | 0.075<br>(0.105) |                  | 0.071<br>(0.116) | 0.070<br>(0.171) |
| Parent's EXT (during childhood) | 0.094<br>(0.104)                         | 0.093<br>(0.099) |                  | 0.081<br>(0.091) |                  | 0.045<br>(0.159) |
| Parent's COG (during childhood) |  |                  |                  | 0.113<br>(0.096) | 0.119<br>(0.115) | 0.114<br>(0.114) |
| Observations                    | 283                                      | 283              | 283              | 283              | 283              | 283              |
| $R^2$                           | 0.009                                    | 0.161            | 0.159            | 0.171            | 0.170            | 0.174            |
| Region of birth FE (BCS70 5y)   | No                                       | Yes              | Yes              | Yes              | Yes              | Yes              |
| Child's age FE                  | No                                       | Yes              | Yes              | Yes              | Yes              | Yes              |
| Other controls                  | No                                       | Yes              | Yes              | Yes              | Yes              | Yes              |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills (child's socio-emotional skills on parent's skills *during childhood*). The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

### C.3 Robustness: mobility estimates with items from questionnaire administered to teachers at the age-10 sweep

To address any concerns about misreporting bias, we present Appendix Table C9 which shows the estimates for equation (4) on the intergenerational mobility in socio-emotional skills during childhood, where socio-emotional skills at the age-10 sweep are derived from questionnaire administered to the teachers to the cohort members (i.e., parents) - instead of their parents directly. The estimates are indeed similar to the ones obtained in Section 5 when we use the data from the Rutter A questionnaire administered to the parents. We notice that we have missing data on 5 child-parent pairs when estimating intergenerational mobility using the teachers' data.

Similarly, Appendix Table C10 reproduces Table 5. In the father-child estimates when using the teachers' data, the model has encountered problems to converge. We have experimented with different starting values, such as setting all parameter values to zero, except the factor loadings and (residual) variances, which are set to one. Alternatively, it is also possible to set them as follows: the starting values for the factor loadings are estimated by using a two-stage least squares estimator, the residual variances of observed variables are set to half the observed variance, and all other (residual) variances are set to 0.05. The remaining parameters (regression coefficients, covariances) are set to zero. We have used the second set of starting values which leads to a lower objective function than alternative starting values.

Table C9: Intergenerational mobility regression of child's socio-emotional skills on parent's skills - Socio-emotional skills at the age-10 sweep derived from questionnaire administered to teachers to the cohort members (i.e., parents).

| Dependent variable:             | Internalising (INT) Skill |                    |                     | Externalising (EXT) Skill |                     |                     |
|---------------------------------|---------------------------|--------------------|---------------------|---------------------------|---------------------|---------------------|
|                                 | (1)                       | (2)                | (3)                 | (4)                       | (5)                 | (6)                 |
| Parent's INT (during childhood) | 0.208***<br>(0.056)       |                    | 0.229***<br>(0.068) | 0.115**<br>(0.049)        |                     | 0.037<br>(0.052)    |
| Parent's EXT (during childhood) |                           | 0.032<br>(0.059)   | -0.050<br>(0.059)   |                           | 0.243***<br>(0.046) | 0.230***<br>(0.052) |
| Parent's COG (during childhood) | 0.116**<br>(0.052)        | 0.140**<br>(0.057) | 0.127**<br>(0.056)  | 0.196***<br>(0.045)       | 0.149***<br>(0.048) | 0.146***<br>(0.044) |
| Observations                    | 1030                      | 1030               | 1030                | 1030                      | 1030                | 1030                |
| $R^2$                           | 0.120                     | 0.087              | 0.124               | 0.139                     | 0.173               | 0.174               |
| Region of birth FE (BCS70 5y)   | Yes                       | Yes                | Yes                 | Yes                       | Yes                 | Yes                 |
| Child's age FE                  | Yes                       | Yes                | Yes                 | Yes                       | Yes                 | Yes                 |
| Other controls                  | Yes                       | Yes                | Yes                 | Yes                       | Yes                 | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in socio-emotional skills. Socio-emotional skill at the age-10 sweep derived from the questionnaire administered to teachers. The measurement system and the intergenerational mobility equation are estimated jointly. We do not include items for disobedient and aches because teachers were not administered such questions. Other controls include the parent's gender, the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

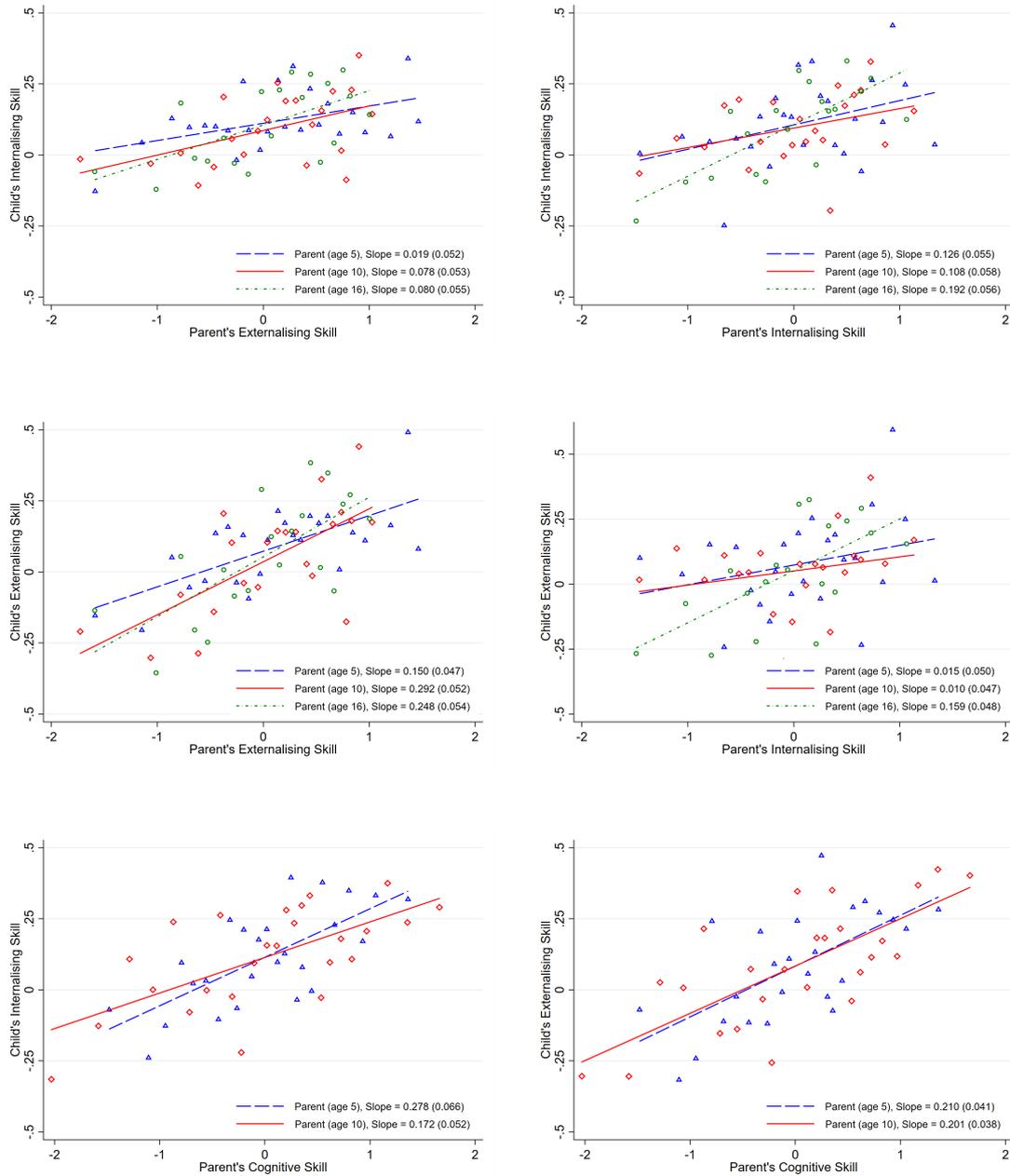
Table C10: Intergenerational mobility in socio-emotional skills by the parent's gender (age-10 sweep questionnaire administered to teachers)

| <b>Panel A: Mother-child</b>    |                                   |                     |                                   |                     |
|---------------------------------|-----------------------------------|---------------------|-----------------------------------|---------------------|
| Dependent variable:             | Child's Internalising (INT) Skill |                     | Child's Externalising (EXT) Skill |                     |
|                                 | (1)                               | (2)                 | (3)                               | (4)                 |
| Parent's INT (during childhood) | 0.347***<br>(0.069)               | 0.259***<br>(0.070) |                                   | 0.025<br>(0.067)    |
| Parent's EXT (during childhood) |                                   | -0.008<br>(0.074)   | 0.328***<br>(0.056)               | 0.270***<br>(0.072) |
| Parent's COG (during childhood) |                                   | 0.112*<br>(0.061)   |                                   | 0.174***<br>(0.058) |
| Observations                    | 751                               | 751                 | 751                               | 751                 |
| $R^2$                           | 0.108                             | 0.278               | 0.097                             | 0.444               |
| Region of birth FE (BCS70 5y)   | No                                | Yes                 | No                                | Yes                 |
| Child's age FE                  | No                                | Yes                 | No                                | Yes                 |
| Other controls                  | No                                | Yes                 | No                                | Yes                 |
| <b>Panel B: Father-child</b>    |                                   |                     |                                   |                     |
| Dependent variable:             | Child's Internalising (INT) Skill |                     | Child's Externalising (EXT) Skill |                     |
|                                 | (1)                               | (2)                 | (3)                               | (4)                 |
| Parent's INT (during childhood) | 0.023<br>(0.188)                  | 0.213<br>(0.190)    |                                   | 0.149<br>(0.173)    |
| Parent's EXT (during childhood) |                                   | 0.249*<br>(0.156)   | 0.222**<br>(0.108)                | 0.135<br>(0.120)    |
| Parent's COG (during childhood) |                                   | 0.232*<br>(0.127)   |                                   | 0.107<br>(0.102)    |
| Observations                    | 279                               | 279                 | 279                               | 279                 |
| $R^2$                           | 0.001                             | 0.413               | 0.047                             | 0.389               |
| Region of birth FE (BCS70 5y)   | No                                | Yes                 | No                                | Yes                 |
| Child's age FE                  | No                                | Yes                 | No                                | Yes                 |
| Other controls                  | No                                | Yes                 | No                                | Yes                 |

Note. The Table presents estimates for equation 4 on the intergenerational mobility in skills by parent's gender (child's socio-emotional skills on parent's skills *during childhood*), using the age-10 sweep questionnaire administered to teachers. The measurement system and the intergenerational mobility equation are estimated jointly. Other controls include the child's gender, the number of children in the household, the mother's age at the parent's birth, a dummy equal to 1 if the parent is the first born, the parent's employment status at the age of 34, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

## C.4 Association between the children's and parents' socio-emotional skills at different ages

Figure C1: Association between the children's (non-residualised) socio-emotional skills and the parents' (non-residualised) skills at different ages.



Note. These figures present non-parametric binned scatter plots of the relationship between the children's and the parent's skills when we do not include any controls. Each panel plots the mean child socio-emotional skill within each parent skill bin. To construct each series, we group parents into 25 equally sized (4 percentile points) bins and plot the mean child's skill versus the mean parent's skill within each bin. The slopes are obtained by estimating the measurement system and the mobility equation jointly. All standard errors in parentheses are obtained using 200 bootstrap repetitions.

## C.5 Intergenerational rank transitions by sex

Table C11: Intergenerational transition matrix (mother-child)

| Child's EXT - Parent's EXT (during childhood)     |   |                 |      |      |      |      | Child's INT - Parent's EXT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 34              | 15.8 | 14.2 | 13.7 | 18.1 | Child quintile                                    | 1 | 28.5            | 15.1 | 13.5 | 15   | 23.2 |
|   | 2 | 21.5            | 23.7 | 20.3 | 16.3 | 18.7 |   | 2 | 23.6            | 23   | 16.9 | 16.3 | 21.3 |
|   | 3 | 18.1            | 21.1 | 21.6 | 21.6 | 17.4 |   | 3 | 18.1            | 18.4 | 23.6 | 20.3 | 19.4 |
|   | 4 | 16              | 17.1 | 20.3 | 20.3 | 26.5 |   | 4 | 14.6            | 22.4 | 17.6 | 24.8 | 23.9 |
|   | 5 | 10.4            | 22.4 | 23.6 | 28.1 | 19.4 |   | 5 | 15.3            | 21.1 | 28.4 | 23.5 | 12.3 |
| <b>Spectral gap mobility index: 0.823 (0.051)</b> |   |                 |      |      |      |      | <b>Spectral gap mobility index: 0.921 (0.035)</b> |   |                 |      |      |      |      |
| Child's EXT - Parent's INT (during childhood)     |   |                 |      |      |      |      | Child's INT - Parent's INT (during childhood)     |   |                 |      |      |      |      |
|   |   | Parent quintile |      |      |      |      |   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 20.8            | 20.7 | 24.5 | 13.3 | 15.9 | Child quintile                                    | 1 | 29.2            | 13.3 | 23.8 | 14.7 | 14.6 |
|   | 2 | 20.8            | 20.7 | 18.5 | 21.3 | 19.1 |   | 2 | 21.5            | 20   | 22.5 | 19.3 | 17.8 |
|   | 3 | 18.1            | 16.7 | 21.9 | 20.7 | 22.3 |   | 3 | 16.7            | 24   | 21.9 | 20.7 | 16.6 |
|   | 4 | 20.8            | 18.7 | 21.2 | 20   | 19.7 |   | 4 | 18.1            | 22   | 15.2 | 22.7 | 25.5 |
|   | 5 | 19.4            | 23.3 | 13.9 | 24.7 | 22.9 |   | 5 | 14.6            | 20.7 | 16.6 | 22.7 | 25.5 |
| <b>Spectral gap mobility index: 0.938 (0.030)</b> |   |                 |      |      |      |      | <b>Spectral gap mobility index: 0.859 (0.037)</b> |   |                 |      |      |      |      |
| Child's EXT - Parent's COG (during childhood)     |   |                 |      |      |      |      | Child's INT - Parent's COG (during childhood)     |   |                 |      |      |      |      |
|   |   | Parent quintile |      |      |      |      |   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 31.5            | 22.5 | 17.2 | 15.3 | 9.6  | Child quintile                                    | 1 | 28.7            | 19.2 | 19.2 | 15.3 | 13.4 |
|   | 2 | 18.9            | 22.5 | 19.9 | 20   | 19.1 |   | 2 | 24.5            | 25.8 | 18.5 | 15.3 | 17.2 |
|   | 3 | 20.3            | 21.2 | 16.6 | 23.3 | 18.5 |   | 3 | 15.4            | 21.9 | 21.2 | 20.7 | 20.4 |
|   | 4 | 14              | 15.9 | 25.2 | 18   | 26.8 |   | 4 | 16.8            | 13.9 | 20.5 | 26   | 26.1 |
|   | 5 | 15.4            | 17.9 | 21.2 | 23.3 | 26.1 |   | 5 | 14.7            | 19.2 | 20.5 | 22.7 | 22.9 |
| <b>Spectral gap mobility index: 0.814 (0.044)</b> |   |                 |      |      |      |      | <b>Spectral gap mobility index: 0.824 (0.047)</b> |   |                 |      |      |      |      |

Note. The Tables present the percent frequency with which a child is in certain skill quintile (row) when parent is in a certain skill quintile (column) for the mother-child pairs. The spectral gap mobility index is computed by taking the difference between one and the second largest eigenvalues of the transition matrices. The transition matrices are stochastic matrices; therefore, their largest eigenvalue is always one. The discrepancy between one and the second largest could be seen as a departure from zero mobility, which corresponds to an identity matrix. Higher numbers of the spectral gap mobility index corresponds to higher mobility. All standard errors of the spectral gap mobility index in parentheses are obtained using 200 bootstrap repetition, taking into account the factor estimation stage that precedes the estimation of the transition matrix and its respective eigenvalues.

Table C12: Intergenerational transition matrix (father-child)

| Child's EXT - Parent's EXT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 25.5            | 16.1 | 25   | 8.5  | 21.1 |
|   | 2 | 16.4            | 23.2 | 16.1 | 23.7 | 21.1 |
|   | 3 | 16.4            | 17.9 | 30.4 | 20.3 | 14   |
|   | 4 | 25.5            | 30.4 | 12.5 | 16.9 | 17.5 |
|   | 5 | 16.4            | 12.5 | 16.1 | 30.5 | 26.3 |
| <b>Spectral gap mobility index: 0.880 (0.053)</b> |   |                 |      |      |      |      |

| Child's INT - Parent's EXT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 20              | 12.5 | 19.6 | 16.9 | 26.3 |
|   | 2 | 27.3            | 16.1 | 25   | 22   | 12.3 |
|   | 3 | 21.8            | 25   | 19.6 | 13.6 | 17.5 |
|   | 4 | 14.5            | 25   | 16.1 | 22   | 22.8 |
|   | 5 | 16.4            | 21.4 | 19.6 | 25.4 | 21.1 |
| <b>Spectral gap mobility index: 0.903 (0.050)</b> |   |                 |      |      |      |      |

| Child's EXT - Parent's INT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 14.8            | 21.1 | 10.7 | 26.3 | 22   |
|   | 2 | 24.1            | 19.3 | 10.7 | 35.1 | 11.9 |
|   | 3 | 27.8            | 21.1 | 25   | 12.3 | 13.6 |
|   | 4 | 14.8            | 21.1 | 30.4 | 14   | 22   |
|   | 5 | 18.5            | 17.5 | 23.2 | 12.3 | 30.5 |
| <b>Spectral gap mobility index: 0.863 (0.047)</b> |   |                 |      |      |      |      |

| Child's INT - Parent's INT (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 11.1            | 19.3 | 10.7 | 33.3 | 20.3 |
|   | 2 | 31.5            | 17.5 | 17.9 | 14   | 22   |
|   | 3 | 31.5            | 26.3 | 10.7 | 19.3 | 10.2 |
|   | 4 | 13              | 15.8 | 32.1 | 19.3 | 20.3 |
|   | 5 | 13              | 21.1 | 28.6 | 14   | 27.1 |
| <b>Spectral gap mobility index: 0.814 (0.046)</b> |   |                 |      |      |      |      |

| Child's EXT - Parent's COG (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 18.5            | 19.3 | 26.8 | 21.1 | 10.2 |
|   | 2 | 24.1            | 17.5 | 21.4 | 24.6 | 13.6 |
|   | 3 | 20.4            | 15.8 | 16.1 | 22.8 | 23.7 |
|   | 4 | 16.7            | 26.3 | 12.5 | 19.3 | 27.1 |
|   | 5 | 20.4            | 21.1 | 23.2 | 12.3 | 25.4 |
| <b>Spectral gap mobility index: 0.907 (0.051)</b> |   |                 |      |      |      |      |

| Child's INT - Parent's COG (during childhood)     |   |                 |      |      |      |      |
|---|---|-----------------|------|------|------|------|
|   |   | Parent quintile |      |      |      |      |
|   |   | 1               | 2    | 3    | 4    | 5    |
| Child quintile                                    | 1 | 22.2            | 15.8 | 26.8 | 17.5 | 13.6 |
|   | 2 | 25.9            | 17.5 | 21.4 | 26.3 | 11.9 |
|   | 3 | 16.7            | 22.8 | 17.9 | 28.1 | 11.9 |
|   | 4 | 18.5            | 19.3 | 12.5 | 12.3 | 37.3 |
|   | 5 | 16.7            | 24.6 | 21.4 | 15.8 | 25.4 |
| <b>Spectral gap mobility index: 0.874 (0.052)</b> |   |                 |      |      |      |      |

Note. The Tables present the percent frequency with which a child is in certain skill quintile (row) when parent is in a certain skill quintile (column) for the father-child pairs. The spectral gap mobility index is computed by taking the difference between one and the second largest eigenvalues of the transition matrices. The transition matrices are stochastic matrices; therefore, their largest eigenvalue is always one. The discrepancy between one and the second largest could be seen as a departure from zero mobility, which corresponds to an identity matrix. Higher numbers of the spectral gap mobility index corresponds to higher mobility. All standard errors of the spectral gap mobility index in parentheses are obtained using 200 bootstrap repetition, taking into account the factor estimation stage that precedes the estimation of the transition matrix and its respective eigenvalues.

## D Mother malaise questionnaire

Table D1: Malaise Inventory Questions

Cohort members' mothers (i.e. grandmothers to the children of the 1970 cohort) answered the following questions

|                                   |                                  |
|-----------------------------------|----------------------------------|
| 1. Tired Most of Time             | 13. Easily Upset or Irritated    |
| 2. Often Feel Depressed           | 14. Frightened of Going Out      |
| 3. Often Have Bad Headaches       | 15. Constantly Keyed Up, Jittery |
| 4. Often Get Worried              | 16. Suffer From Indigestion      |
| 5. Sleeping Difficulty            | 17. Suffer From Upset Stomach    |
| 6. Waking Unnecessarily Early     | 18. Is Appetite Poor             |
| 7. Worn Out Worrying About Health | 19. Everything Gets on Nerves    |
| 8. Often Get Into Violent Rage    | 20. Does Heart Race              |
| 9. Do People Annoy and Irritate   | 21. Often Have Bad Pains in Eyes |
| 10. Had Twitching of Face,Head    | 22. Rheumatism, Fibrositis       |
| 11. Scared for No Good Reason     | 23. Had Nervous Breakdown        |
| 12. Scared to be Alone            | 24. Other Health Problems        |

Note. The table reports the Malaise inventory questions. Cohort members' mothers (i.e. grandmothers to the children of the 1970 cohort) answered them at the age-5 sweep. The Malaise inventory questions are a set of self-completion questions which combine to measure levels of psychological distress, or depression. The 24 items of the inventory are 'yes-no' questions.

Table D2: Subscale of comparable items between grandmother and grandchild

| Itm. | Factor | Cat. | Title           | Mother's malaise (grandmother)                           | Rutter Wording (Children aged 3-16)                          |
|------|--------|------|-----------------|--|--|
| 1    | INT    | 2    | <i>Worried</i>  | Often Get Worried  | Many worries, often seeming worried                          |
| 2    | INT    | 2    | <i>Fearful</i>  | Scared for No Good Reason                                | Nervous or clingy in new situations,                         |
| 3    | INT    | 2    | <i>Unhappy</i>  | Often Feel Depressed                                     | Often unhappy, downhearted or tearful                        |
| 4    | INT    | 2    | <i>Aches</i>    | Suffer From Upset Stomach<br>stomach-ache or has vomited | Often complaining of headaches, stomach-aches<br>or sickness |
| 5    | INT    | 2    | <i>Solitary</i> | Scared to be alone                                       | Rather solitary, tending to play alone                       |

Note. Itm. is item number. Factor is the latent construct to which the item loads - EXT is externalizing skills, INT is internalizing skills. Cat. is the number of categories in which the item is coded - 2 denotes a binary item (applies/does not apply). For the Rutter Wording (Children aged 3-16), 3-category item is converted to be binary (Does not apply is 1). Title is a short label for the item. Wording columns show the actual wording in the scales used in each of the cohort studies.

## E Descriptive statistics

Appendix Table E1 reports the descriptive statistics for the sample of parent and children linked. Appendix Table E2 presents the number of responses in the BCS70 at the age-34 sweep. Appendix Table E3 reports the response rates for the questionnaire items used in the main analysis. Appendix Table E5 reports the correlation matrix of internalising and externalising skills at different ages.

Table E1: Descriptive statistics

|   | Mean<br>(1) | Household characteristics<br>St.Dev.<br>(2) | N<br>(3) |
|---|-------------|---|----------|
| <b>Grandparents at age-5 sweep</b>          |             |   |          |
| Grandmother's age                           | 25          | 4.87  | 1035     |
| Grandmother has higher education degree (%) | 5.89        | 23.56                                       | 1035     |
| Grandmother is not employed (%)             | 57.29       | 49.49                                       | 1035     |
| <b>Parents (BCS70 cohort members)</b>       |             |   |          |
| Number other children in HH (5y)            | 1.54        | 1.03  | 1035     |
| First born (%)                              | 40.58       | 49.13                                       | 1035     |
| Male (%)                                    | 27.34       | 44.59                                       | 1035     |
| Employed at age 34 (%)                      | 74.78       | 43.45                                       | 1035     |
| <b>Region of birth</b>                      |             |   |          |
| North (%)                                   | 19.90       | 39.95                                       | 1035     |
| Yorksh. + Humbers. (%)                      | 10.72       | 30.96                                       | 1035     |
| East Midlands (%)                           | 7.15        | 25.78                                       | 1035     |
| West Midlands (%)                           | 11.50       | 31.91                                       | 1035     |
| South West (%)                              | 7.63        | 26.57                                       | 1035     |
| East + SE (%)                               | 29.95       | 45.83                                       | 1035     |
| Wales (%)                                   | 5.41        | 22.63                                       | 1035     |
| Scotland (%)                                | 7.73        | 26.72                                       | 1035     |
| <b>Children at age-34 sweep</b>             |             |   |          |
| Total number of children                    | 2           | 0.89  | 1035     |
| Child's age                                 | 7           | 3.35  | 1035     |
| Child's sex (%)                             | 51.90       | 49.02                                       | 1035     |

Note. The mean is reported in column 1, the standard deviation in column 2, and the number of observations of parent-children link in column 3.

Table E2: Number of responses in British Cohort Study (BCS70) at the age-34 sweep

|                                 | Number of observations |
|---------------------------------|------------------------|
| <b>BCS70 cohort members:</b>    |                        |
| Core interviews                 | 9,665                  |
| <b>Parent and Child Survey:</b> |                        |
| Children aged 0-11 months       | 414                    |
| Children aged 1-2 years         | 825                    |
| Children aged 3-5 years         | 1,259                  |
| Children aged 6-16 years        | 2,285                  |

Note. This Table presents the sample sizes of the age-34 sweep. It contains the number of completed interviews by cohort members with or without children. "Core interviews" refers to cohort members with or without children. For the cohort members with children, the sample sizes are also divided by children's age for the parents. The socio-emotional skill questions were administered only to the parents who have children between the age of 3 and 16.

Table E3: Item response rates for children and parents at age-5, 10, 16 and 34 sweeps

| Itm. | Title                  | Children | Parents (age 5) | Parents (age 10) | Parents (age 16) |
|------|------------------------|----------|-----------------|------------------|------------------|
| 1    | <i>Restless</i>        | 0.997    | 0.804           | 0.852            | 0.619            |
| 2    | <i>Squirmy/fidgety</i> | 0.997    | 0.801           | 0.850            | 0.620            |
| 3    | <i>Fights/bullies</i>  | 0.998    | 0.810           | 0.850            | 0.617            |
| 4    | <i>Distracted</i>      | 0.998    | 0.809           | 0.851            | 0.618            |
| 5    | <i>Tantrums</i>        | 0.998    | 0.775           | 0.813            | 0.625            |
| 6    | <i>Disobedient</i>     | 0.998    | 0.808           | 0.848            | 0.620            |
| 7    | <i>Worried</i>         | 0.997    | 0.808           | 0.850            | 0.615            |
| 8    | <i>Fearful</i>         | 0.998    | 0.809           | 0.851            | 0.622            |
| 9    | <i>Solitary</i>        | 0.997    | 0.807           | 0.852            | 0.619            |
| 10   | <i>Unhappy</i>         | 0.999    | 0.809           | 0.850            | 0.620            |
| 11   | <i>Aches</i>           | 0.997    | 0.795           | 0.849            | 0.625            |

Note. Itm. is item number. Title is a short label for the item. Columns 3-6 report the item response rates. The response rate is lower at the age 16 sweep because of a teacher-led industrial strike disrupting the dissemination of the questionnaire.

Table E4: Survey non-response (Rutter A questionnaire age-16 sweep)

| Dependent variable:           | Survey non-response (age-16 sweep)<br>(1) |
|-------------------------------|---|
| Cohort member's INT (age 5)   | -0.009<br>(0.015)                         |
| Cohort member's EXT (age 5)   | -0.011<br>(0.014)                         |
| Cohort member's EXT (age 5)   | -0.012<br>(0.013)                         |
| Observations                  | 283                                       |
| Region of birth FE (BCS70 5y) | Yes                                       |
| Other controls                | Yes                                       |

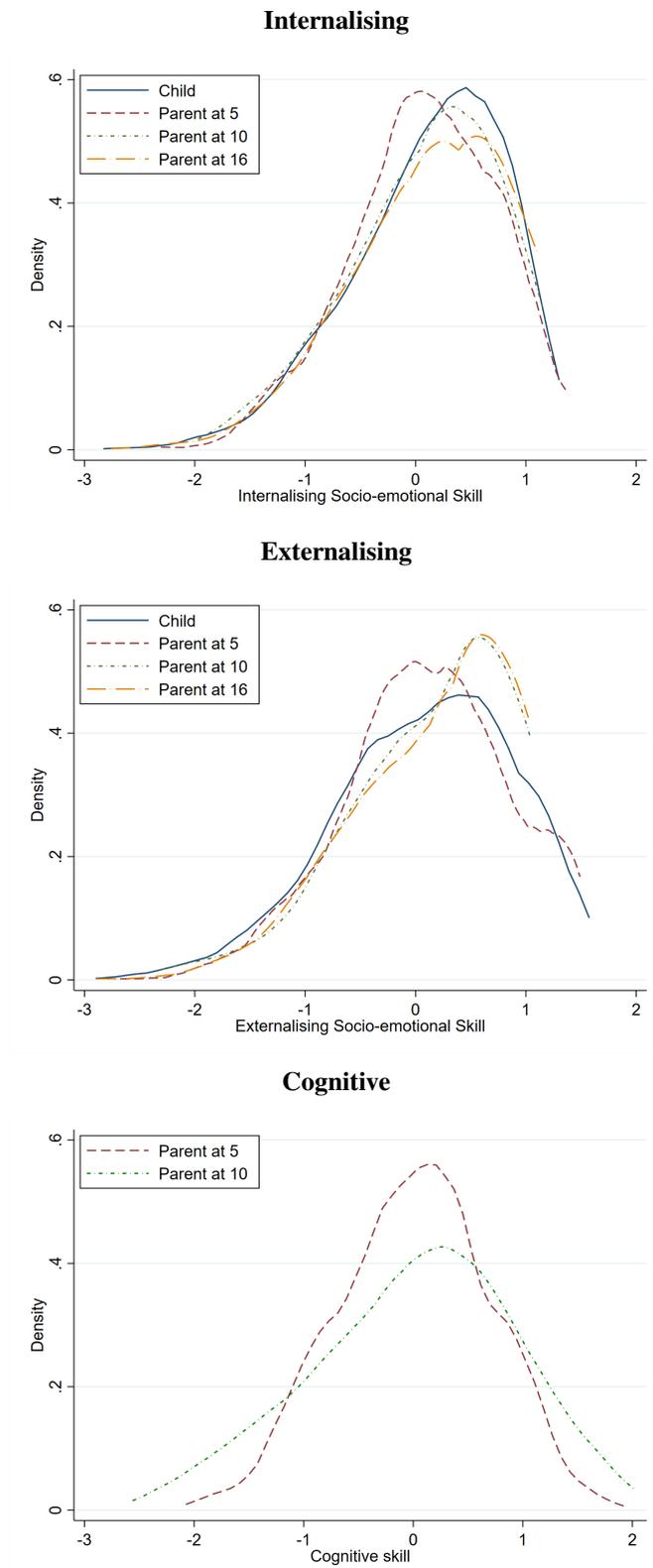
Note. The Table presents estimates for survey non-response on cohort members' skills. The measurement system and the outcome equation are estimated jointly. Other controls include the mother's age at the parent's birth, a dummy equal to 1 if the cohort member is the first born, the grandmother's employment status and education in 1975 and the number of children in the parent's household when the parent is 5 years old. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table E5: Correlation matrix of internalizing and externalizing skills at different ages

|              | INT (age 5) | INT (age 10) | INT (age 16) | EXT (age 5) | EXT (age 10) | EXT (age 16) |
|--------------|-------------|--------------|--------------|-------------|--------------|--------------|
| INT (age 5)  | 1           |              |              |             |              |              |
| INT (age 10) | 0.44        | 1            |              |             |              |              |
| INT (age 16) | 0.43        | 0.41         | 1            |             |              |              |
| EXT (age 5)  | 0.66        | 0.32         | 0.33         | 1           |              |              |
| EXT (age 10) | 0.31        | 0.66         | 0.35         | 0.46        | 1            |              |
| EXT (age 16) | 0.40        | 0.37         | 0.82         | 0.45        | 0.48         | 1            |

Note. The table reports the Pearson correlation of the internalizing and externalizing factor scores at different ages.

Figure E1: Distribution of Factor Scores



Note. These figures present the distributions of the internalising and externalising socio-emotional skills for the children and parents respectively at age 5, 10, and 16 and parents' cognitive skills at age 5 and 10. Higher scores correspond to better skills. The distribution is estimated nonparametrically, using an Epanechnikov kernel. The scale of the Rutter/SDQ items at the age-5, age-16 and child-questionnaire sweep is categorical. The scale of the Rutter items at the age-10 sweep is converted to a categorical variable. The scale of the cognitive test items is continuous.

## F Relationship between skills during childhood and log pay during adulthood

Appendix Table F1 presents estimates for the regression of BCS70 parents' skills (during childhood) on economic outcomes at age 42.

Table F1: Log pay at age 42

| Dependent variable:                    | <b>Log Pay (age 42)</b> |                  |                     |                     |                     |
|--|-------------------------|------------------|---------------------|---------------------|---------------------|
|  | (1)                     | (2)              | (3)                 | (4)                 | (5)                 |
| Internalizing skill (during childhood) | 0.129***<br>(0.048)     |                  |                     | 0.135***<br>(0.052) | 0.126**<br>(0.054)  |
| Externalizing skill (during childhood) |                         | 0.058<br>(0.049) |                     | -0.003<br>(0.054)   | -0.076<br>(0.057)   |
| Cognitive skill (during childhood)     |                         |                  | 0.217***<br>(0.033) |                     | 0.225***<br>(0.038) |
| Observations                           | 719                     | 719              | 719                 | 719                 | 719                 |
| $R^2$                                  | 0.021                   | 0.004            | 0.059               | 0.022               | 0.078               |
| Controls                               | No                      | No               | No                  | No                  | No                  |

Note. The Table presents estimates for the regression of BCS70 parents' skills (during childhood) on economic outcomes at age 42 (BCS70 sample). The measurement system and the equation are estimated jointly. Gross weekly pay is weekly pre-tax pay from the respondent's main activity, conditional on being a paid employee or self-employed. The mean of weekly pre-tax log pay is 5.821. The employment rate in the sample is 85%. The cognitive skill measure comes from a factor model where three tests administered at the age of 5 and 10 are combined: Copy Designs (child is asked to copy simple designs adjacently), Human Figure Drawing (child draws an entire human figure), English Picture Vocabulary Test (child identifies the picture referring to a word among four pictures), Shortened Edinburgh Reading Test, Friendly Math Test, Spelling Dictation Task and Pictorial Language Comprehension Test. All standard errors in parentheses are obtained using 200 bootstrap repetitions (\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).