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The importance of family income in the formation and evolution of non-cognitive skills in childhood☆

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Abstract

Little is known about the relationship between family income and children's non-cognitive (or socio-emotional) skill formation. This is an important gap, as these skills have been hypothesized to be a critical link between early outcomes and adult socioeconomic status. This paper presents new evidence of the importance of family income in the formation and evolution of children's non-cognitive skills using a recent US panel dataset that tracks children between grades K-5. Findings suggest an important divergence in non-cognitive skills based on family income that accumulates over time and does not seem to be explained by children's health status differences.

JEL classification

I21; J24

Keywords

Non-cognitive skills; Income gradient; ECLSK

"Genius is 1 percent inspiration and 99 percent perspiration."

Thomas Edison

1. Introduction

Parental socio-economic status is an important determinant of a child's future socio-economic status (SES), and the pathway to this link is thought to be some combination of genes (inheritance), parental time investments in the child weighted by the quality of that time, access to marketed goods and services, community resources and other aspects of the home environment. The intermediate outcome of this combination of factors is a variety of forms of human capital, and ones most frequently studied are health and cognitive development (years of schooling and test scores, for example). Numerous papers have been

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Supplementary materials

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written on poor-non-poor gaps in health and school performance among children but far fewer on non-cognitive gaps by SES, even though evidence is accumulating that these non-cognitive skills may also be critically important as determinants of future success.

Beginning primarily with work by Case, Lubotsky and Paxson (2002), economists and other social scientists have focused on the childhood origins of the large differences in health and economic status during adulthood. This work showed that the relationship between family income and child health grows stronger as children age, likely in part due to the cumulative effects of living in low-income households who face associated stress, more frequent health shocks and limited access to health care. This research has spawned a large set of papers that show that these empirical relationships can be found across countries with very different welfare and health systems as well as across time periods (Currie & Stabile, 2003; Condliffe & Link, 2008; Khanama, Nghiemb & Connelly, 2009; Propper, Rigg & Burgess, 2007 ; See Fletcher and Wolfe (2014) for review).

A relatively less studied but related question is whether similar patterns exist in other areas of childhood development, such as so-called “non-cognitive” (socio-emotional/personality) skills. As opposed to cognitive skills, which are measured by scores on tests such as reading, math, history or science as well as IQ tests, non-cognitive skills are both more difficult to measure and there is less agreement on which ones are important. [1],[2]

The limited agreement on both the conceptualization of non-cognitive skills and inconsistent measurement may contribute to the lack of attention by economists. The limited study of non-cognitive or socio-emotional skills is a potentially important omission since socio-emotional skills may be a critical factor in predicting a range of important adult outcomes. This domain of skill formation has also become the subject of intense study in economics in recent years. [3] For example, work with the NLSY (Heckman, Sixtrud & Urzua, 2006) found that locus of control and self-esteem were likely critical in determining years of schooling. [4],[5] In a recent overview paper, Brunello and Schlotter (2011) suggest that non-cognitive skills are important as determinants of these skills but also of cognitive skills more generally and cite evidence of the importance of this under-researched area of human capital. They also stress the very limited knowledge of the *determinants* of non-cognitive skills and raise (but do not answer) the question of whether these are malleable and might respond to interventions.

[1]For adults, economists have tended to use a five-factor model related to personality psychology: conscientiousness, emotional stability, agreeableness, extraversion and autonomy (Nyhus & Pns, 2005). These overlap but are not entirely identical to the big five among psychologists who use “OCEAN”; openness to experience, conscientiousness, extraversion, agreeableness and neuroticism (similar to emotional stability). See John (1990).

[2]For children, while there is some overlap (independence for example), there is somewhat more emphasis on maturity, learning skills, motivation, attention, patience, and the ability to act appropriately (externalizing and internalizing behaviors)(see ter Weel 2008 and related papers in the symposium covered by the 2008 volume of the *Journal of Human Resources*).

[3]Heckman stated...“ the preoccupation with cognition and academic smarts as measured by test scores to the exclusion of social adaptability and motivation causes a serious bias in the evaluation of many human capital interventions.” (Heckman, 1999).

[4]Their results suggest that going from the 25th to 75th percentile in the distribution of non-cognitive skills is associated with a 25 percentage point increase in the probability of having graduated college by age 30.

[5]Fletcher (2013) shows evidence that the personality trait of extroversion is positively related to labor market outcomes. A recent paper (Savelyev, 2012) also documents the importance of one particular non-cognitive skill, conscientiousness, as a determinant of life expectancy for men.

The objective of this paper is to increase our knowledge of the ways in which family socio-economic status, in particular income, influences the acquisition of non-cognitive skills as a child grows up. We study this issue for a particular set of non-cognitive skills; a priori we have no expectation that the tie from parental income to non-cognitive skills will be similar, much less the same, across all non-cognitive skills. In supplementary analysis (see Appendix Table A), we also attempt to ascertain the links from non-cognitive skills to cognitive skills and/or whether non-cognitive skills appear to be influenced by earlier cognitive skills in order to further understand the importance and determinants of the various non-cognitive measures in the data.

Increasing our understanding of the factors critical in explaining the formation of socio-emotional skills during childhood and also whether the divergence in these skills is in part due to family resources is our focus. Evidence on this question may provide clues on whether policies that increase the resources of low income households may have positive effects on children's socio-emotional development, though the descriptive results in this paper serve only as a first step in this direction.

This paper contributes to the literature by providing some of the first evidence of the magnitude of differences by family income in socio-emotional skills at Kindergarten and how these differences change as children age. We do this by using a recent panel study from the US that tracks a national sample of children between Kindergarten and 5th grade to examine the associations between family income and a broad set of measures of children's socio-emotional skill development. The panel nature of the data allows measures of permanent family income to be assessed and the sampling structure of the data allows the inclusion of neighborhood measures of human capital, including income. The rich set of survey questions enables us to separate the potential direct effects of family income on skills with the indirect effects that might operate through children's health. In particular, we hypothesize that children growing up in homes with greater income will 1) have higher socio-emotional (non-cognitive) skills and 2) that these effects will accumulate over time such that the tie between family income and each socio-emotional scale variable will increase as the child ages. The results from the analysis suggest important deficits in socio-emotional skills at school-entry for children from low-income households that grow as children age. The deficits are apparent for all measured skills and each skill has a unique trajectory over time, though by 5th grade the original differences by family income have often doubled or tripled in size. The results suggest a potential window of opportunity for intervention to reduce disparities in socio-emotional skills is early in life, potentially prior to school age.

2. Background literature

Although there is a substantial body of work in psychology and other allied disciplines exploring aspects of the determinants and consequences of non-cognitive skills, much less research exists within economics. What is available is relatively recent and has focused on the consequences of non-cognitive skills, typically on labor market outcomes or schooling outcomes. In contrast, virtually no research in the economics literature has focused on understanding the determinants of non-cognitive skills or their evolution using panel data.

Broadly, consequences of poor non-cognitive skills have been found in several areas of the labor market, including job performance, wages, and occupational choice, as well as in educational outcomes for children of all ages. Additionally, some economics research has attempted to understand the potential complementarities between non-cognitive skills and cognitive skills in these labor market outcomes and have broadly shown extensive complementarity.

Amongst the early economics study of the importance of non-cognitive skills was the study of general education degrees (or GED) recipients (Heckman & Rubinstein, 2001), which provided evidence that while GED recipients have cognitive test scores equal to those of high school graduates, on average, they only have earnings equal to those of high school dropouts. One explanation for this pattern is that GED recipients tend to have limited non-cognitive skills. It is this lack of skills that prevents them from being successful in the military, the labor force and in personal relationships.

With this evidence on labor market outcomes, there has also been interest in whether educational attainments and health are affected directly. For example, in an early examination, Coleman and DeLeire (2003) use a measure of locus of control [6] to explore the importance of this particular non-cognitive trait in influencing years of schooling. More recently, a broad overview paper on personality characteristics (a variety of non-cognitive factors) and their importance for years of schooling found that conscientiousness was an important predictor of both grades and years of schooling, while openness to experience was important for years of schooling (Borghans et al., 2008). This paper reports on a meta-analysis from the psychology literature which looks at evidence on the importance of personality traits in explaining job performance, health and schooling success. This review suggested that while IQ was a more important factor than any of the big 5 personality traits, conscientiousness was an important factor for college grades and years of schooling. Indeed, conscientiousness was the single most important predictor of life expectancy (more important than IQ), but the two were reversed in terms of predicting job performance. Conscientiousness was found to be important for all jobs while IQ was most important for complex jobs, including professors, scientists and senior managers (Schmidt & Hunter, 2004). Coneus, Gernandt and Saam (2009) also explored this issue using the German Socio-economic panel and found an important role for non-cognitive skills in reducing the probability of dropping out of school and that the importance of these skills increased with age.

Further decoupling the importance of non-cognitive skills for education and labor market success, Judge and Hurst (2007) showed that positive self-reports of self-esteem, internal locus of control, and emotional stability usefully predict future income over and above both grades and years of schooling using data for the U.S. from NLSY 1979. In essence they find that more schooling and better grades are important for those with positive personality traits but do not pay off otherwise. They speculate that those who rate high on these traits search

[6]Locus of control refers to the extent to which individuals believe that they can control events that may affect them. This measure ranges from internal locus of control, where individuals believe they generally have control over their lives, and external locus of control, where individuals believe that others (the environment, a higher power, etc.) control their outcomes.

for challenging and rewarding jobs, persist on difficult tasks, and are motivated to tackle any failure.

This emerging evidence on the importance of non-cognitive skills on adult socioeconomic outcomes then leads to the question of how early in life these skills appear to be important determinants of outcomes. A study using British data attempted to understand the importance of cognitive and non-cognitive skills on years of schooling (Carneiro, Crawford & Goodman, 2006). Non-cognitive skills were measured by social adjustment at age 11 and the authors found that children who had higher levels of social adjustment at age 11 were more likely to remain in school past age 16 and to get a higher degree. They also found that the influence of higher cognitive skills on these two outcomes is low if social adjustment is low but important if social adjustment skills are high, again suggesting interactive effects.

With these findings suggesting the importance of the early development of non-cognitive skills on later life outcomes, a few tentative policy-related findings have also emerged. For example, Cunha, Heckman, Lochner and Masterov (2006) suggest that much of the effectiveness of early childhood interventions seem to come from increasing non-cognitive skills and motivation. The authors suggest that while IQ is fairly stable after age 10, self-control, motivation and other traits are malleable at later ages (see also Heckman (2000)). [7,8]

This emerging evidence of the importance of non-cognitive skills for adolescent and adult socioeconomic outcomes as well as the preliminary work suggesting that these skills are malleable for school-aged children suggest a need to further document the critical determinants of non-cognitive skills during childhood. [9] Indeed, there is very little evidence of the links between family income and socio-emotional skills development during childhood. [10] One of the few examinations in the literature was done by Violato, Petrou, Gray and Redshaw (2011), utilizing data from the UK. The authors find substantial links that are “explained” by several family processes such as parental stress and investments in children. However, these authors focus on younger aged children (through age 5), while the current paper traces outcomes between the ages of 6 and 12. [11]

3. Data

In this paper we use the Early Childhood Longitudinal Study-Kindergarten Cohort data (ECLS-K). These panel data were collected beginning in 1998/99 and follow children from Kindergarten through 5th Grade (in spring of 2004), so that the ages of the children span

[7]Though, as one would expect, there is also great persistence in these measures during childhood. See Morgan, Farkas & Wu (2009) for evidence of the persistence of externalizing and internalizing behaviors between ages 6–12. Fletcher and Padron (2016) show some evidence that early child bearing may shape non-cognitive skills in young adulthood.

[8]This type of evidence is also consistent with evidence using animals (see Knudsen, Heckman, Cameron and Shonkoff (2006) and Suomi (1999)), where experimental manipulation of the resources early in development are tracked to show relationships with measures of motivation or other “non-cognitive skills”.

[9]Additionally, Gupta and Simonsen (2010) provide evidence that child care quality influences non-cognitive outcomes for some children at age seven using Danish data.

[10]There is more conclusive evidence of the impacts of family income on cognitive skills. For example, see Dahl and Lochner (2012) for one such analysis.

[11]The data also contain a limited number of socio-emotional skills and these skills are often not assessed the same way as children age. The authors do include a temperament scale for 9-month old children and a behavior scale for ages 3 and 5.

from roughly 6 to 12 years old. [12] The core survey contains reports by parents, children, and teachers in a variety of standard domains, though the study focuses on educational experiences of school-age children. [13] Conceptually, we aim to link children's outcomes with a summary measure of family resources. Ideally, we would have access to complete income histories for each family; we might also wish to include measures of expected income, as families will often gain more resources as they, and their children age. The income measures we have are those collected at each wave; we use them to construct several measures of family income to assess the tie to our outcomes of interest and to test for robustness, as each measure has limitations. For our preferred measure we construct "permanent income" by averaging the income measures up to the current survey grade. [14] In addition to standard socio-demographic and education questions, the study collected direct cognitive and non-cognitive assessments in each wave, including reading and mathematics test scores, and social/emotional scales. The social and emotional development assessments were created to focus on aspects of social competence that include social skills (self-control, cooperation) and problem behaviors (impulsivity and aggression). These assessments were formed based on reports of both teachers and parents, though we focus on teacher reports in this paper. [15] The social ratings scale (SRS) is an adaptation of the Social Skills Rating System developed by Gresham and Elliott (1990), where frequency scales are used. The behaviors are reported as exhibited: 1 never; 2 occasionally/sometimes; 3 regularly but not all the time; and 4 most of the time.

The scales included in the data are meant to capture multiple domains of socio-emotional skills and are based on work by Gresham and Elliott (1990). The primary aggregated scales are under the umbrella of a set of Social Ratings Scales, with labels including "Interpersonal Skills", "Externalizing Symptoms", "Internalizing Symptoms", "Self-Control Skills" and "Approaches to Learning."[16] The subcomponents of the Approaches to Learning scale have been released to researchers through a separate contractual agreement and include the following items: "Keeps belongings organized"; "Shows eagerness to learn new things"; "Works independently"; "Easily adapts to changes in routine"; "Persists in completing tasks"; and "Pays attention well".

Table 1 presents summary statistics for grades Kindergarten and 5th grade and includes all children present in the sample for each grade. The social ratings scales range from 1–4, but since they are averages of many sub-scales, they are "continuous". The scales do not substantially increase between Kindergarten and 5th grade suggesting that teachers may treat them as relative rather than absolute skills. Special education rates increase from 4 to 10%

[12]While the panel follows children through 8th grade, there are no teacher-reported socio-emotional measures collected during the 8th grade wave.

[13]According to the ECLS, trained evaluators assessed children in schools while parents were surveyed by phone. Teachers and school administrators completed questionnaires at their schools. Details on assessments can be found at http://nces.ed.gov/ecls/kinderassessments.asp.

[14]For example, the measure of permanent income for 3rd graders is the average of the income reports for Kindergarten, First Grade, and Third Grade for each student. This has the mechanical issue of increasing in accuracy as the child ages. We prefer it to permanent income across all grades as that measure would include measures after the observed measure of non-cognitive skills.

[15]Teacher assessments are likely to be comparable, at least across children in the same classroom, than those of individual parents. Teacher assessments may be relative within their current and past classrooms; nevertheless we view them as likely more consistent and informative than parent's assessments, which are based on a far smaller set of children.

[16]Internalizing scales are similar to measures of depression and anxiety whereas externalizing measures are typically thought of as emotional behavioral disorders and conduct disorders.

between K and 5th grade. The similarities in the observable characteristics (e.g. maternal education, birth weight) in the table between Kindergarten and 5th grade suggest that attrition issues have not substantially altered the observed characteristics of the sample. [17] Table 2 further divides the Approaches to Learning scale into its relevant subscales. Since these sub-scales include values of 1–4, we also provide the descriptive distributions of the sub-scales in the sample. Many scales are quite stable between Kindergarten and 5th grade, though most show slight decreases, with the "eager to learn" subscale exhibiting the most prominent decline as these children age.

Below we test our hypothesis that as children age there is an increasing tie between family income and the full set of available social-emotional skill indices. Thus we hypothesize that the disparity in non-cognitive skills increases over the childhood period with children in higher income families increasingly being more advantaged. Our hypothesis is consistent with most evidence examining childhood health and some evidence regarding cognitive outcomes (e.g. Case et al., 2002). Our prior work using the same data set we use here provided evidence of the steepening of the income gradient with regard to health (Fletcher & Wolfe, 2014). We hypothesize that the same link will exist between income and non-cognitive skills. These skills are likely to be sensitive to stress, family stability, parents' emotional status and safety in one's neighborhood. All of these are tied to income. All of them have some likely overlap in the way they influence health. [18] It is on this basis that we formed our hypothesis. In particular we hypothesize that children growing up in homes with greater income will 1) have higher socio-emotional (non-cognitive) skills and 2) that these differences will increase over time such that the tie between family income and each socio-emotional scale variable will be greater as the child ages. The basis for our hypothesis is that children in lower income families are likely to experience more stress, more family instability, see fewer successful role models in their neighborhood, and may also be more exposed to environmental hazards, among other experiences of disadvantage. [19]

To test these hypotheses, we employ a standard empirical human capital model:

$$S_{it} = \beta_0 + \beta_1 \log(Y_{it}) + \delta X_{it} + \varepsilon_{it}$$

where S_{it} the skill of interest for child i at time t is a function of family income and a vector of demographic control variables including age, sex, race, parental characteristics such as education, age, and marital status. We expect that the coefficient on log Y will be positive in our regression estimates for each grade. We also expect that the coefficient on log Y will be larger at higher grades. In some specifications, we add measures of child health, such as birth weight and self (mother) reported health status to potentially separate the direct effects

[17] See also the formal analysis of attrition in the survey by the NCES: http://nces.ed.gov/pubs2009/2009003.pdf.

[18] In Fletcher and Wolfe (2014) we provide evidence on the income gradient of health where the coefficient on income is increasing as a child ages (that is, is in a higher grade). All of the coefficients on log family income are significant at the 1% level. The other control variables all have the expected signs but few are statistically significant at standard levels: the exceptions are racial dummy variables and maternal education. The increasing tie between income and health can be substantiated by converting the coefficients into marginal effects.

[19] Recent evidence shows that gray matter in areas of the brain such as the prefrontal lobe, which is important for executive function or non-cognitive functions, exhibit a maturation gap among children growing up in poor families. See Hair et al. (2015). That work shows this exists even for children of low income parents who are well-educated.

of family income on skill development from the indirect effects that may operate through child health including early child health (Case et al., 2002). We expect that using permanent income (income measured in all years prior and contemporary with the time non-cognitive skills are measured) will show a steeper tie with non-cognitive outcomes than the use of single-year measures. This is because non-cognitive skills develop over time and so will be influenced by prior family resources as well as current resources and because permanent income is a less noisy measure of family resources. We conduct a test of this hypothesis to try and separate the effect of less noise in the measure from a cumulative effect. Specifications use OLS regression analysis, though the aggregated scales are continuous and the sub-scales take values 1–4, as described above.

4. Results

In all analyses that follow, we use the 5th grade longitudinal sample weights provided in the ECLSK. We begin by examining whether there are differences in socio-emotional skills by family income as children enter school. In Table 3, we present the income differences in our set of socio-emotional skills at Kindergarten. The first three measures of socio-emotional skills, approaches to learning, interpersonal skills and self-control are all positive indicators; the last two, externalizing and internalizing are negative indicators. All five show the expected relationship to a family's permanent income at Kindergarten entry. Externalizing appears somewhat less robustly tied to family income—the statistical significance is only at the 10% level. Overall these simple relationships suggest that children from lower income families begin school with disadvantages in terms of their non-cognitive skills and that this holds across multiple measure of skills. We expect these differences to grow, but it is possible that once children spend time in school, differences tied to parental resources could be reduced or even eliminated.

In Table 4, we begin our examination of the determinants of trajectories of socio-emotional skills by focusing on the Approaches to Learning scale. [20] Our focus is on the tie to family income. We find substantial evidence that children living in higher income families have higher scores on approaches to learning. And the general pattern is one of increasing advantage as the children age though the pattern is primarily observed between K and 5th grade. The results (coefficients) show that the tie from income to approaches to learning more than doubles from kindergarten to the fifth grade. [21] In terms of other included variables, males have lower scores on this scale than females—a nearly 1/3 standard deviation difference that grows as the children age. Black students enter school with lower scores on this scale and this difference also grows to over 1/10th of a standard deviations. In contrast, Hispanic students have a relative advantage that fluctuates over time in comparison to whites. Children with parents with higher education also have small and persistent advantages on this skill measure.

[20] Recall that the scale includes measures such as: "Keeps belongings organized"; "Shows eagerness to learn new things"; "Works independently"; "Easily adapts to changes in routine"; "Persists in completing tasks"; and "Pays attention well".

[21] The exception to this trend is the result for grade 1, but this too shows a positive tie between parental income and the approaches to learning scale.

Table 5 shows these results are quite similar for each of the subscales: attention, organized, eager to learn, independent, adaptable and persistence. All of these exhibit an analogous pattern in terms of the tie to family income. Organization and persistence show the strongest ties. We provide formal tests of statistical differences in these tables; typically the differences between Kindergarten and first grade are not statistically significant nor are the differences between 3rd and 5th grade, though there are typically substantial differences between Kindergarten and 3rd and/or 5th grades.

Table 6 presents results for several additional indices of socio-emotional behavior, self-control, interpersonal skills, and mental health outcomes and special education status. Consistent with the results for approaches to learning in Table 4, we find sizeable differences in many of the skill indices by family income, and these gaps double in size as children age from kindergarten through 5th grade. For mental health outcomes, we examine internalizing and externalizing scales. Internalizing scales are more akin to measures of depression and anxiety whereas externalizing measures are typically thought of as emotional behavioral disorders and conduct disorders. We find relatively large differences in the evolution of these scales as children age. Children from poorer families have higher externalizing scores at school entry, but the disparity is relatively constant beginning with first grade and continuing through fifth grade. In contrast, children from poorer families also enter Kindergarten with higher internalizing score, and this gap triples by 5th grade. We find little evidence of initial differences in special education status by family income, though by 5th grade family income is a strong predictor of placement. Finally, we present a summary measure of all the socio-emotional skills in the data using factor analysis and again find large initial differences in these skills at Kindergarten entry that grow substantially by fifth grade.

5. Robustness and potential mechanisms

We consider several additional examinations of potential mechanisms that may account for a portion of the patterns we find in the data. We first ask whether it is family income that directly influences non-cognitive skills or whether it is the purchase of attendance at schools with peers who have higher non-cognitive skills. [22] The results presented in Table 7 suggest that family income plays a direct role but that part of the influence may be through "purchasing" better school peers, which may occur through paying for private school tuition or, more commonly, through purchasing housing in areas with "better schools" (defined here according to average non-cognitive ability of sampled students in the child's cohort). For most estimates and nearly all of our measures of non-cognitive skills, including, in particular, the combined factor, self-control, organization, eager to learn, interpersonal skills, adaptability independent and approaches to learning, the direct influence of family income is positive, it increases as the child ages, and the family level gradient is reduced by the inclusion of the average non-cognitive factor of other classmates sampled in the ECLS-K. [23]

[22]We recognize that this approach faces the difficulties identified by Manski (1993) as the reflection problem. However we are less interested in how the school group influences the individual but rather whether inclusion of the group "behaviors" reduces the influence of family income. Given this we proceed but with caution.

[23]An alternative explanation of these findings is that, since the socio-emotional skill measures are reported by the teacher for all children in the classroom, we are in part controlling for teacher styles of reporting and not objective measures of skills. In unreported specifications available upon request, we find that the inclusion of teacher fixed effects does not change our main results qualitatively.

Interestingly, for many of these outcomes the results for 5th grade differ and suggest that when the school-level non-cognitive factor is included, the influence of family income actually increases. These results then provide evidence of the robustness of the income gradient of non-cognitive skills and also suggest that school composition in terms of these skills may be most important in the earliest grades. This is consistent with literature on the importance of readiness to learn in the earliest grades, a philosophy tied to Head Start funding. [24] It is also consistent with findings on the Perry Pre-School project, which did not appear to increase IQ, though it did improve scores and personality traits (Heckman, Moon, Pinto, Savelyev & Yavitz, 2010).

A second examination we include is a focus on the potential links between child health and socio-emotional skills and family income. As we noted above, there is substantial evidence of strong links between family income and childhood health across many countries and time periods, including a study using the dataset used in this study (see Fletcher and Wolfe (2014)). Thus, it could be the case that an important channel linking family income and children's non-cognitive skills is through this established health channel. Our results in Table 8 suggest that child health may well play a role in the process. For about half of our socio-emotional measures, we find statistical differences in specifications that control for lagged child health compared with our baseline results. In general, controlling for health reduces the links between family income and socio-emotional skill by 5th grade, though these reductions do not change the qualitative results presented above and are typically in the 15–30% range of reductions in the socio-emotional skill gradients. [25]

5.1. Robustness: Testing alternative measures of income

In our core estimates, we used permanent family income defined as the average income over all years up to and including the year the child is being observed. But there are alternative definitions that can be used as well—current income (year t income), a rolling average of three separate observations of income (such that income in kindergarten is the average of kindergarten, first and third grades, and so on) and permanent income (including future income) using all available measures of income; the latter approach has the advantage of consistency in removing "noise" in our measure of income. [26] We explore these in our tests of robustness in Appendix Table B. These tables compare results for grades K, 1, 3 and 5 for each of these five alternative measures of family income for all of our dependent variables. The other variables in the regressions remain unchanged.

[24]When we run a set of similar estimates using test scores as the outcome and a test score factor for the school we find a somewhat similar pattern. In these specifications, there is a strong tie between family income and performance on tests (math, reading or a combination) that is increasing over grades K to 8th grade. The inclusion of the school mean test score factor reduces the influence of income slightly with the greatest reduction in Kindergarten (by more than half) but only by about 10% by grades 5 and 8. Results are available from the authors by request.

[25]Like the analysis of child health as a potential mechanism, we also followed the suggestion of a reviewer to pursue a similar analysis that controlled for mathematics/reading test scores as a mechanism. In results presented in Supplementary Appendix G, we find evidence that inclusion of Kindergarten test scores does indeed reduce the family income gradient in non-cognitive measures by approximately 40%. The pattern of statistical significance remains nearly the same. However, we view the interpretation of these results as problematic because of the lack of clarity in the direction of influence between cognitive and non-cognitive outcomes for children. It is unclear whether non-cognitive performance directly effects cognitive scores, or the reverse, or both, so that including these controls could be seen as including "mechanisms" rather than confounders. Uncovering these dynamic effects across domains should be the subject of future research.

[26]We note however that the standard deviations of our various measures of income do not differ substantially.

The results overall suggest a good deal of consistency across these measures of income. Although in principle the measure of permanent income has the disadvantage of including income flows following the measurements of socio-emotional skills, the alternative measures of income each suffer disadvantages. Contemporaneous income (Measure 2 in the table) is predicted to lead to attenuated estimates because of its noise as a single measure. The use of rolling averages (Measures 3 and 4) have the advantage that they do not include "future" income but have the disadvantage of becoming more precise as children age (we only have one measure of income for Kindergarteners but four measures for 5th graders). The use of all measures of income in the data set, which include future income, has the advantage of using all possible information to increase accuracy, but the disadvantage of including income after the measures of child outcomes (Measures 5 and 6). With these issues outlined, the practical impact of the various disadvantages of each measure appears to be small for our qualitative results. Indeed, as shown in Appendix Table B, all of our results are substantially robust across the six measures of income, with the Kindergarten results far below those for fifth grade. The final column reports the p-values of a joint test of differences in these coefficients based on income measurement compared with the baseline measures we use in the main text; we only find one statistical difference and the even then the coefficients are qualitatively the same. Fig. 1 captures the differences. [27]

5.2. Robustness: Child fixed effects

While a substantial pathway linking family income with child non-cognitive scores does not appear to be primarily through school (and peer) selection, we may be capturing intergenerational links between parent and child non-cognitive skills that could be from shared genetic backgrounds. To partially examine this issue, we estimated a pooled set of results using child fixed effects. For a number of reasons, we consider these results as a check of robustness but otherwise not conclusive nor our preferred specifications. Adding interactions between family income and survey wave (i.e. grade) is the way we examine whether the income effects are driven by time-invariant factors. [28] These specifications have some disadvantages, including the need to use contemporaneous measures of income and the reduction in both exogenous and endogenous variation in the processes we seek to understand. In particular, in the fixed effects model, we remove the "permanent" component of income, which is the primary focus of this article; in addition, measurement error in family income and in the socio-emotional measures could attenuate our results without signaling an important role for intergenerational transmission of socio-emotional skills tied to income. These analyses also do not adequately take into account the dynamic effects [29] of income on socio-emotional skill accumulation, which limits our ability to interpret the results.

[27]Another robustness check we present in Appendix Table C is whether using an unbalanced sample differs with the results using a balanced sample. Although statistical tests uncover differences in the coefficients in a few cases, the qualitative results do not change using the balanced sample.

[28]We thank Elaine Liu for suggesting this line of inquiry.

[29]One way to think about this issue is that, like sibling fixed effects models, if there are spillovers between units, the estimates will be biased. Likewise, if income in one year has an impact on future socio-emotional skills, we would be capturing these within-person spillovers and thus estimating biased effects.

Appendix Table D reports these results. We find evidence that controlling for child fixed effects (and thus time-invariant parental characteristics) does not eliminate the effects of income, although the effects are clearly smaller and less significant. The estimated pattern is suggestive evidence that income is not simply proxying for parental non-cognitive skills rather than of family resources. This result is consistent with the limited role of parental schooling in our core estimates.

6. Conclusion

In this paper, we use a recent US panel of school-aged children followed between Kindergarten and 5th grade to examine the effects of family income on children's non-cognitive skill development. Although economists have long examined the relationships between family circumstances and children's health and cognitive development (i.e. school performance and test scores), there is very limited research providing information examining the potential effects on a broader and complementary set of skills. We find consistent evidence of the importance of this often overlooked set of outcomes.

For our national sample, we document several stylized facts. We provide evidence that children enter Kindergarten with substantial differences in non-cognitive skill endowments based on family resources. We then trace the evolution of these skill differences as children age through the 5th grade (12 years old) and show that the disadvantages grow substantially —often doubling or tripling in magnitude over the six years of this study window. We finally assess whether these skill differences can be explained by alternative measures of income, differences in children's health, differences in parental time invariant characteristics (such as their own non-cognitive skills) or differences in peer (classmate) skills. In each case, we find our results to be largely robust to these alternatives, suggesting a compelling link between family income and children's non-cognitive skill development net of these other factors that are independently associated with family income.

These results are important for understanding the intergenerational transmission of poverty or SES more generally. They suggest that beyond those outcomes already studied (health and cognitive outcomes) that family income also is associated with non-cognitive skills at school entry and as children age through school. These skills are themselves important in determining an individual's success in schooling and in later employment outcomes. Non-cognitive skill differences seem to be an important route by which one's family of origin influences one's future family's SES. How might public policy influence this link? One avenue may be the use of visiting nurses who have been shown to influence the parenting skills of low income mothers; another is pre-school which also has been shown to positively influence the child's non-cognitive skills getting a child ready for school. [30] These are the programs that have been tested; but having provided evidence of the importance of family income in determining non-cognitive skills it is time to develop programs that may more directly attempt to influence these skills as an additional pathway to attempt to break the intergenerational poverty link.

[30]Neidell and Waldfogel (2011) report that peer preschool attendance affects children's academic but not non-cognitive skills using the ECLS-K data.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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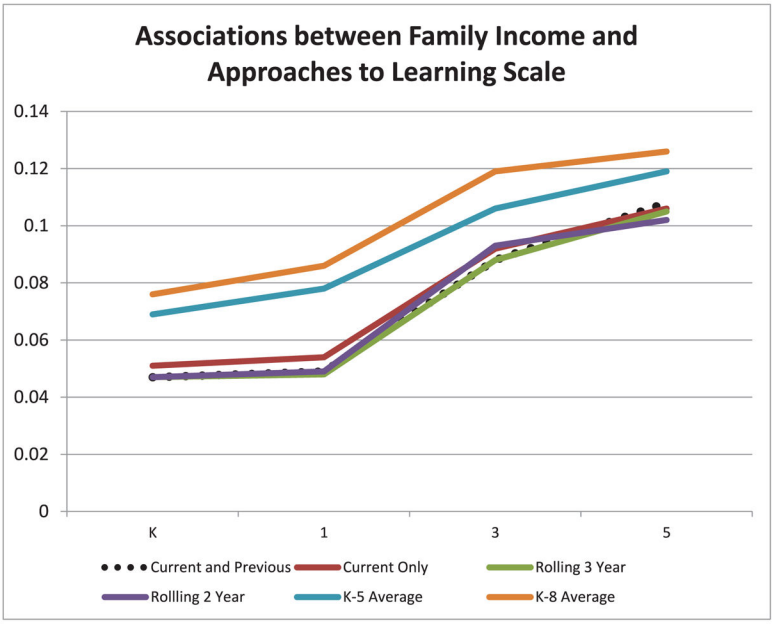

Fig. 1.

Differences in the Association between Family Income and Childhood Outcomes based on Income Measure.

Notes: Same income measures as Appendix Table B are shown.

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Table 1

Descriptive Statistics ECLS-K: Grades K and 5.

	Kindergarten			5th Grade		
Variable	**Obs**	**Mean**	**Std. Dev**	**Obs**	**Mean**	**Std. Dev**
Approaches to Learning Scale	7240	3.12	0.68	7172	3.05	0.69
Self-Control Scale	7199	3.18	0.61	7109	3.22	0.61
Interpersonal Scale	7175	3.13	0.62	7041	3.07	0.65
Externalizing Scale	7212	1.68	0.64	7128	1.68	0.60
Internalizing Scale	7182	1.56	0.49	7065	1.65	0.55
Special Education	7405	0.04	0.20	7525	0.10	0.30
Math Score	7385	51.08	9.81	7491	51.09	9.76
Reading Score	7144	51.05	9.74	7484	51.09	9.85
Poor Health	7431	0.17	0.37	7525	0.20	0.40
Child Health Rating	7431	4.33	0.83	7525	4.25	0.85
Log (Current Income)	7404	10.51	0.96	7525	10.59	0.88
Current Income	7430	52608.33	51303.95	7525	55451.82	43492.83
Permanent Income	7431	52663.35	51807.99	7525	54063.61	41301.97
Poverty Status	7431	0.21	0.41	7525	0.18	0.38
Parent Health	7411	2.26	0.79	7500	2.27	0.79
Parent Depressed	7395	1.34	0.52	7470	1.35	0.53
Male	7431	0.52	0.50	7525	0.52	0.50
Age (Yrs)	7426	6.23	0.38	7494	11.37	0.30
Black	7431	0.17	0.37	7525	0.16	0.37
Hispanic	7431	0.17	0.38	7525	0.18	0.39
Other Race	7431	0.04	0.20	7525	0.04	0.21
Birth weight	7290	7.38	1.32	7061	7.40	1.32
Maternal Education	7431	13.48	2.45	7525	13.44	2.43
Paternal Education	7431	13.53	2.50	7525	13.51	2.47
Maternal Age	7431	33.77	6.39	7525	39.32	6.74
Parents Married	7431	0.71	0.45	7525	0.70	0.46
Missing Family Information	7431	0.22	0.42	7525	0.24	0.43

	Kindergarten			5th Grade		
Variable	**Obs**	**Mean**	**Std. Dev**	**Obs**	**Mean**	**Std. Dev**
Missing 1 Wave	7431	0.21	0.41	7525	0.21	0.41
Missing 2 Waves	7431	0.07	0.26	7525	0.07	0.26
Missing 3 Waves	7431	0.02	0.13	7525	0.02	0.13
Missing 4 Waves	7431	0.00	0.05	7525	0.00	0.03
Missing Family Information	7431	0.02	0.15	7525	0.00	0.00

Table 2

Descriptive Statistics Approaches to Learning Subscales, Grades K and 5.

	Kindergarten			5th Grade		
Variable	**Obs**	**Mean**	**Std. Dev**	**Obs**	**Mean**	**Std. Dev**
Attention Scale	7229	3.04	0.86	7156	2.95	0.87
Attention= 1	7229	0.03	0.17	7156	0.04	0.19
Attention= 2	7229	0.26	0.44	7156	0.30	0.46
Attention= 3	7229	0.35	0.48	7156	0.35	0.48
Attention= 4	7229	0.36	0.48	7156	0.32	0.47
Organized Scale	7174	2.98	0.87	7140	2.91	0.95
Organized= 1	7174	0.04	0.20	7140	0.07	0.26
Organized= 2	7174	0.26	0.44	7140	0.27	0.44
Organized= 3	7174	0.38	0.48	7140	0.32	0.47
Organized= 4	7174	0.32	0.47	7140	0.33	0.47
Eager to Learn Scale	7224	3.27	0.80	7162	2.98	0.87
Eager= 1	7224	0.01	0.11	7162	0.03	0.18
Eager= 2	7224	0.18	0.38	7162	0.29	0.46
Eager= 3	7224	0.33	0.47	7162	0.34	0.47
Eager= 4	7224	0.48	0.50	7162	0.33	0.47
Independent Scale	7231	3.19	0.83	7168	3.16	0.81
Independent= 1	7231	0.02	0.16	7168	0.02	0.15
Independent= 2	7231	0.20	0.40	7168	0.20	0.40
Independent= 3	7231	0.34	0.47	7168	0.38	0.49
Independent= 4	7231	0.44	0.50	7168	0.40	0.49
Adapts Scale	7217	3.12	0.82	7120	3.02	0.82
Adapt= 1	7217	0.03	0.16	7120	0.03	0.17
Adapt= 2	7217	0.20	0.40	7120	0.23	0.42
Adapt= 3	7217	0.40	0.49	7120	0.42	0.49
Adapt= 4	7217	0.37	0.48	7120	0.31	0.46
Persists Scale	7222	3.14	0.87	7151	3.03	0.89
Persists= 1	7222	0.03	0.18	7151	0.05	0.21

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	Kindergarten			5th Grade		
Variable	**Obs**	**Mean**	**Std. Dev**	**Obs**	**Mean**	**Std. Dev**
Persists= 2	7222	0.22	0.41	7151	0.25	0.43
Persists= 3	7222	0.32	0.47	7151	0.34	0.47
Persists= 4	7222	0.43	0.49	7151	0.37	0.48

Table 3

Initial Differences in Socio-emotional Skills based on Family Income at School Entry.

Grade	K
	Approaches to Learning
Log Permanent Income	0.052***
	(0.018)
Log Permanent Income	Interpersonal
	0.044***
	(0.016)
Log Permanent Income	Self-Control
	0.036**
	(0.016)
Log Permanent Income	Externalizing
	−0.038*
	(0.021)
Log Permanent Income	Internalizing
	−0.035**
	(0.015)

Robust standard errors clustered at the school-level. 1% ***, 5% **, 10% *.

Control variables include male, age, 3 race dummies, birth weight, maternal education, paternal education, maternal age, whether parents are married and if there is missing parental information. 5th grade longitudinal sample weights provided in the ECLSK are used.

Table 4

Income Gradient in the Approaches to Learning Scale During K-5th Grade.

Outcome Grade	Approaches to Learning K	Approaches to Learning 1	Approaches to Learning 3	Approaches to Learning 5
Log (Perm Income)	0.052*** (0.018)	0.046* (0.024)	0.072*** (0.027)	0.115*** (0.027)
Male	−0.331*** (0.028)	−0.292*** (0.030)	−0.358*** (0.030)	−0.425*** (0.027)
Age	0.214*** (0.037)	0.222*** (0.040)	0.134*** (0.039)	0.049 (0.043)
Black	−0.079 (0.053)	−0.087 (0.058)	−0.086 (0.057)	−0.109** (0.054)
Hispanic	0.058 (0.036)	0.074* (0.041)	0.118*** (0.042)	0.048 (0.039)
Other Race	−0.033 (0.057)	0.003 (0.069)	−0.002 (0.072)	0.006 (0.059)
Birth weight	0.023** (0.011)	0.030*** (0.011)	0.002 (0.012)	−0.003 (0.012)
Maternal Education	0.018*** (0.006)	0.023*** (0.008)	0.026*** (0.008)	0.015** (0.007)
Paternal Education	0.017*** (0.007)	0.017** (0.007)	0.018** (0.008)	0.020*** (0.007)
Maternal Age	0.000 (0.002)	−0.002 (0.002)	−0.001 (0.003)	−0.001 (0.002)
Parents Married	0.120** (0.058)	0.137** (0.056)	0.188*** (0.055)	0.046 (0.045)
Missing Family Information	−0.068 (0.068)	−0.016 (0.068)	−0.028 (0.058)	−0.088* (0.051)
Constant	0.699** (0.304)	0.342 (0.386)	0.530 (0.467)	1.082** (0.550)
Observations	7078	6551	5907	6717
R-squared	0.133	0.116	0.155	0.184

Robust standard errors clustered at the school-level. 1% ***, 5% **, 10% *. 5th grade longitudinal sample weights provided in the ECLSK are used.

Table 5

Examination of Tie between Family Income and Sub-Scales of Approaches to Learning Measure.

Outcomes	Approaches to Learning	Attention	Organized	Eager to Learn	Independent	Adaptation	Persists
Permanent Income	0.047***	0.041**	0.045**	0.040**	0.026	0.071***	0.056***
	(0.016)	(0.020)	(0.022)	(0.019)	(0.020)	(0.021)	(0.020)
Income X 1st Grade	0.002	−0.006	0.022	−0.000	0.004	−0.000	−0.001
	(0.020)	(0.026)	(0.026)	(0.025)	(0.026)	(0.026)	(0.027)
Income X 3rd Grade	0.041*	0.039	0.047	0.040	0.088***	−0.004	0.057**
	(0.022)	(0.028)	(0.032)	(0.027)	(0.028)	(0.033)	(0.029)
Income X 5th Grade	0.061***	0.066**	0.082***	0.063**	0.073***	0.051*	0.083***
	(0.022)	(0.028)	(0.031)	(0.029)	(0.028)	(0.029)	(0.029)
Observations	26,253	26,199	26,135	26,208	26,222	26,116	26,162
R-Squared	0.143	0.115	0.114	0.095	0.085	0.072	0.113
1st vs. 3rd Grade	0.083	0.123	0.435	0.152	0.006	0.914	0.062
1st vs. 5th Grade	0.017	0.024	0.066	0.044	0.034	0.102	0.011
3rd vs. 5th Grade	0.376	0.368	0.301	0.449	0.614	0.108	0.402

Robust standard errors clustered at the school-level. 1% ***, 5% **, 10% *. Same controls as previous tables.

“Pays attention well”; “Keeps belongings organized”; “Shows eagerness to learn new things”; “Works independently”; “Easily adapts to changes in routine”; “Persists in completing tasks”. 5th grade longitudinal sample weights provided in the ECLSK are used. P-values of F-tests are listed for differences in coefficients across grades.

Table 6

Income Gradient in Socio-emotional Skills During K-5th Grade Additional Skill Domains.

Outcomes	Self-Control	Interpersonal Skills	Externalizing Scale	Internalizing Scale	Special Education	Non Cognitive Factor
Income Measure	0.035** (0.015)	0.036** (0.015)	−0.034* (0.018)	−0.030** (0.013)	−0.005 (0.006)	0.064*** (0.023)
Income X 1st Grade	−0.007 (0.018)	0.002 (0.020)	−0.008 (0.019)	−0.042** (0.016)	0.003 (0.006)	0.004 (0.027)
Income X 3rd Grade	0.048** (0.022)	0.027 (0.022)	−0.034 (0.023)	−0.054*** (0.018)	−0.006 (0.009)	0.069** (0.031)
Income X 5th Grade	0.031 (0.021)	0.042* (0.023)	−0.028 (0.022)	−0.058*** (0.019)	−0.025** (0.012)	0.099*** (0.033)
Observations	26,064	25,941	26,134	25,977	27,970	25,100
R-Squared	0.092	0.097	0.105	0.035	0.038	0.145
1st vs. 3rd Grade	0.013	0.277	0.187	0.513	0.240	0.041
1st vs. 5th Grade	0.104	0.102	0.365	0.424	0.011	0.008
3rd vs. 5th Grade	0.488	0.536	0.802	0.825	0.134	0.398

Robust standard errors clustered at the school-level. 1% ***, 5% **, 10% *. 5th grade longitudinal sample weights provided in the ECLSK are used. Additional Controls: Constant, Missing Family information indicator, Maternal Age. P-values of F-tests are listed for differences in coefficients across grades.

Table 7

Income Gradient of Selected Socio-emotional Skills Adding Controls for Cohort Level Skills.

		Income Measure	Income X 1st Grade	Income X 3rd Grade	Income X 5th Grade	P-Value
Approaches to Learning	Baseline	0.047***	0.002	0.041*	0.061***	
	Cohort Level Control	0.035**	0.005	0.031	0.062***	0.001
Special Ed	Baseline	−0.005	0.003	−0.006	−0.025**	
	Cohort Level Control	−0.005	0.001	−0.014	−0.035***	0.022
Self Control	Baseline	0.035**	−0.007	0.048**	0.031	
	Cohort Level Control	0.024	−0.008	0.023	0.046**	0.000
Interpersonal	Baseline	0.036**	0.002	0.027	0.042*	
	Cohort Level Control	0.023	0.001	0.017	0.059**	0.000
Externalizing	Baseline	−0.034*	−0.008	−0.034	−0.028	
	Cohort Level Control	−0.029	−0.004	−0.031	−0.036	0.371
Internalizing	Baseline	−0.030**	−0.042**	−0.054***	−0.058***	
	Cohort Level Control	−0.025*	−0.040**	−0.050***	−0.075***	0.064

Robust standard errors clustered at the school-level. 1% ***, 5% **, 10% *. Standard Errors not shown. 5th grade longitudinal sample weights provided in the ECLSK are used. Same controls as previous tables. P-values of F-tests are listed for differences in coefficients across specifications. Coefficients for cohort level control and additional outcomes presented in Appendix Table E.

Table 8

Income Gradient of Socio-emotional Skills Adding Controls for Child Health Status.

	VARIABLES	Income Measure	Income X 1st Grade	Income X 3rd Grade	Income X 5th Grade	P-Value
Approaches to Learning	Base	0.047***	0.002	0.041*	0.061***	
	Health Lag	0.047***	−0.001	0.031	0.051**	0.067
Special Ed	Base	−0.005	0.003	−0.006	−0.025**	
	Health Lag	−0.004	0.003	−0.008	−0.026**	0.018
Self-Control	Base	0.035**	−0.007	0.048**	0.031	
	Health Lag	0.035**	−0.008	0.044**	0.020	0.180
Interpersonal	Base	0.036**	0.002	0.027	0.042*	
	Health Lag	0.035**	0.001	0.021	0.037	0.118
Externalizing	Base	−0.034*	−0.008	−0.034	−0.028	
	Health Lag	−0.036**	−0.008	−0.028	−0.022	0.215
Internalizing	Base	−0.030**	−0.042**	−0.054***	−0.058***	
	Health Lag	−0.030**	−0.041**	−0.050***	−0.063***	0.001

Robust standard errors clustered at the school-level. 1% ***, 5% **, 10% *. Standard Errors not shown. 5th grade longitudinal sample weights provided in the ECLSK are used. Same controls as previous tables. P-values of F-tests are listed for differences in coefficients across specifications. The “health lag” variable for Kindergarten is measured as birth weight. Coefficients for health control and additional outcomes presented in Appendix Table F.