Maternal Beliefs and Long-Term Child Skill Development*

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Abstract

Parental beliefs significantly influence parental investment in children, yet their long-term impact on child development remains underexplored. We examine the enduring effects of a generalized maternal belief about returns on investment (Locus of Control, LoC) on child development by using a value-added model in a nationally-representative cohort study. Maternal LoC positively shapes socio-emotional skills from early childhood to adolescence, while it has null and milder impacts on cognitive skills and academic outcomes, respectively. The socio-economic gradient in maternal LoC contributes to socio-economic disparities in children's socio-emotional development. Parental investment acts as a mechanism through which parental beliefs affect child development.

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1 Introduction

Parents importantly shape their children's life outcomes (Baulos and Heckman, 2022).[1] Research indicates that nearly 50% of the variation observed across individuals in their lifetime earnings can be attributed to factors determined before reaching 18, underscoring the importance of parenting practices in shaping long-term outcomes (Attanasio et al., 2021; Cattan et al., 2022; Cunha et al., 2006; Huggett et al., 2011). One prominent explanation why parents differ in their investment in children, is that, lacking perfect information about the process underlying skill development, parents base their investment decisions on their beliefs about the expected returns of such investments (Cunha, 2014). There is indeed growing evidence that parental beliefs have a significant impact on actual parental behavior.[2]

Yet, there is a lack of clarity in the literature on how parental beliefs impact long-term outcomes of children.[3] Most of the literature studying parental beliefs on returns to investment remains silent about the direct impact of such beliefs on child development. Even when child outcomes are considered, they are measured contemporaneously with parental beliefs (e.g., Biroli et al., 2022) or in the short term (e.g., Carneiro et al., 2024). This is because most papers on parental beliefs gather data from *ad hoc* data collection methods, such as online surveys or intervention-based approaches, which do not provide information on individuals' skills and outcomes in the long-run. The fact that this data is often collected among a specific subset of the population further poses the issue of having small or non-representative samples, presenting challenges in implementing policies based on findings specific to particular contexts.

This paper advances previous literature on parental beliefs by directly examining the impact of maternal beliefs on long-run child development. We do so by leveraging the longitudinal nature of the Millennium Cohort Study, a UK nationally representative survey that covers socio-emotional and cognitive skills from early childhood to adolescence. This study allows us to surpass the limitations of short-term *ad hoc* surveys and observe the relationship between maternal beliefs and child development outcomes over an extended period, which encompasses

[1] See, for example, García and Heckman (2022); García et al. (2020); Gertler et al. (2021).

[2] For comprehensive references, see Attanasio et al. (2019, 2020a, 2022); Bhalotra et al. (2022); Biroli et al. (2022); Boneva and Rauh (2018); Carneiro et al. (2024); Conti et al. (2022); Cunha et al. (2013, 2022).

[3] Due to the existing evidence on the benefits of parental investment on children's outcomes (e.g., Del Bono et al., 2016), we can extrapolate that parental beliefs, through actual parental investment, positively affect child development. However, this requires making assumptions about the impact of parental investment, which is just one component of the broader human capital production function, complementing and interacting with other inputs (Attanasio et al., 2020c; Greaves et al., 2023; Nicoletti et al., 2023).

the most formative phases of development.

For parental beliefs, we focus on maternal Locus of Control (LoC), which represents a belief about returns to investment. LoC refers to an individual's belief in their ability to control the outcome of events in their life (Rotter, 1966). In this paper, we consider individuals to have a high LoC when they believe that their actions affect what happens in their life, as opposed to believing that the outcomes of events are beyond their control and depend on luck, fate, or other people. Hence, it is straightforward to see LoC as a generalized belief in returns on investment that accordingly affects individual behavior. This has already been supported by previous research. For example, Caliendo et al. (2015) show that newly unemployed individuals with a high LoC search more for jobs compared to individuals who believe that their future outcomes are determined by external factors. The latter have lower reservation wages and search less intensively for a job. Thus, job seekers with a higher LoC have a higher transition rate from unemployment to work.[4]

In the context of child development, Lekfuangfu et al. (2018) find that parents with a high LoC (measured at the 12th week of gestation) exhibit stronger maternal attitudes towards parenting styles (measured at the 32th week of gestation and when the child was 8 months old) and spend more time with the child in various activities (measured when the child was 6 moths old, 1.5 and 3.5 years old). This results in their children exhibiting better early language skills (measured at ages 2 and 3). Thus, maternal LoC is a crucial belief for understanding child development, as it might affect children's upbringing.[5]

In our data, maternal LoC is measured once, when children are 9 months old. We rely on previous literature that shows that LoC is a stable personality trait in adulthood. Cobb-Clark and Schurer (2013) show that life events, whether positive or negative, such as alterations in health status, employment, or familial circumstances, have no significant bearing on an individual's LoC.[6] We are thus confident that assuming that maternal LoC is stable in the period considered is a reasonable assumption.

We employ a Value-Added (VA) model to mitigate bias from unobserved variables due

[4]For more evidence on the impact of LoC on one's own outcomes in several dimensions, such as savings and health behaviors, see: Berger and Haywood (2016); Caliendo et al. (2022); Cobb-Clark et al. (2014); Salamanca et al. (2020).

[5]With the exception of Lekfuangfu et al. (2018), most research on parental beliefs tend to focus on specific topics or domains as these are thought to be more important for specific investments or outcomes, making their findings difficult to generalize.

[6]See also Cobb-Clark et al. (2014); Elkins and Schurer (2020); Sherman (1984).

to factors not accounted for in the skills production process and potential endogeneity bias. Including lagged skills as a control in the estimation equation enables us to account for unobservable inputs such as innate ability and unobserved parental inputs (Keane et al., 2022)[7] and to consider the self-productivity of skills (Cunha and Heckman, 2007). Furthermore, we control for a comprehensive set of mother, child, and household characteristics at baseline (measured when the child is 9 months old, which is when maternal LoC is assessed) and show that once these are included in the VA specification, the estimated effect of LoC on children skills is not altered. This suggests that including the one period lagged outcome as control efficiently captures unobserved characteristics.

Socio-emotional skills are derived from the Strength and Difficulty Questionnaire (SDQ), a standard questionnaire used in the literature (Goodman, 1997), and divided into internalizing, externalizing, and prosocial behaviors. These three dimensions refer to issues related to anxiety and depression, aggressive behavior, and being helpful, respectively. We show that maternal LoC significantly influences the socio-emotional skills of children, particularly during the pre-adolescent stage. Our analysis shows a positive impact of maternal LoC on internalizing, externalizing, and prosocial behaviors, extending up to age 14. For example, a one standard deviation increase in maternal LoC improves the internalizing score by 8.2, 5.7, 5.4 and 4.1% of a standard deviation at ages 5, 7, 11, and 14, respectively. These effects are notable: the impact at age 5 is equivalent to about 20% of the difference observed in internalizing behavior of children of mothers with and without a university degree. Another way to quantify the effect is to consider that the impact of maternal LoC is equivalent to about a quarter of the impact of the lagged skill on actual skill. This collection of findings suggests that maternal beliefs have a strong influence on children's socio-emotional skills, especially at early ages. This is consistent with the fact that maternal beliefs influence the relationship that parents have with their children and this is particularly important at early ages, while at later stages, such as adolescence, other interactions such as those with peers, become more relevant. Given the important and increasing role that socio-emotional skills have in determining later outcomes,[8] the fact that maternal beliefs can positively affect the development of these skills is a relevant finding.

The measure of socio-emotional skills is self-reported by children's mothers. To minimize the issue of idiosyncratic measurement error we derive the latent factor score from this questionnaire.

[7] See also Del Boca et al. (2017); Fiorini and Keane (2014); Todd and Wolpin (2007, 2003).

[8] For labor market outcomes see, for example, Aghion et al. (2021); Cortes et al. (2023); Deming (2017); Kosse and Tincani (2020).

Nevertheless, it might still be the case that maternal answers suffer from reporting bias, such that the measurement error in socio-emotional skills systematically correlates with the level of maternal LoC. To deal with this, we construct a measure of such skills where maternal LoC is allowed to affect maternal perception (and, hence, her reporting) of the child's skills. This approach is similar to the one implemented in intervention settings (Attanasio et al., 2020c; Heckman et al., 2022, 2013)[9], where the intervention itself might affect the way in which treated vs. control parents perceive and report their children's development. When using this method for extrapolating socio-emotional skills, results hold.

The study further reveals that maternal LoC has no significant effect on overall cognitive skills of children while exerting a modest influence on children's academic achievements as measured by standardized tests. There is a positive relationship between maternal LoC and English language outcomes at the age of 11. Specifically, a one standard deviation increase in maternal LoC results in a statistically significant increase of 1.4 percentage points in getting a good score in English at age 11. Furthermore, a higher maternal LoC is associated with a lower probability of experiencing unauthorized absences at both primary and secondary school. These findings resonate with established research, particularly the work of Cunha et al. (2010) and Cunha and Heckman (2008), which shows that maternal beliefs are more impactful on the behavioral aspects of child development. This suggests that socio-emotional skills, compared to cognitive skills, may be more susceptible to maternal influence, underscoring the multidimensional impact of parental beliefs on child development.

Our results have direct implications for understanding the origins of inequality in skills (Cattan et al., 2022) by uncovering heterogeneity in maternal beliefs across households of different socio-economic background. More specifically, given the relevance of maternal LoC on socio-emotional skills development of children, first, we show that high SES mothers tend to have higher LoC compared to low SES mothers. The difference in LoC between mothers with a degree and with a qualification lower than GCSE is about 54% of a standard deviation, even after controlling for several other characteristics. Next, by using a Kitagawa-Oaxaca-Blinder decomposition analysis, we demonstrate that the differential endowment of LoC across mothers of different socio-economic backgrounds partly contributes to the observed SES gap in children's socio-emotional skills until adolescence: differential endowment in maternal LoC by SES accounts for 18 to 14%, 9 to 4%, and 38 to 28% of the explained SES gap in internalizing, externalizing, and

[9]See Cattan et al. (2023) for an application in a non-intervention context.

prosocial behaviors, respectively at ages 5 and 14. This aligns with recent research indicating that low SES parents have lower expectations regarding the effects of their interactions with their children, resulting in reduced investment in parent-child interactions (Cunha et al., 2022; Attanasio et al., 2021).

Finally, our study benefits from a rich dataset that provides detailed insights into the mechanisms underlying the relationship between beliefs and child development. Mothers who believe that they can control the outcomes of events, might believe that the more they invest in their children, for example in terms of the amount and quality of time spent together, the better their children outcomes will be. Indeed, previous research, highlighted the importance of maternal LoC in shaping parental investments up to age 3.5 (Lekfuangfu et al., 2018). While our measures of parental investment differ from the one used in the cited paper, our findings align with theirs. We find that maternal LoC is positively associated with parenting beliefs and antenatal and early investments. By employing our VA model, we further find that maternal LoC has a positive and statistically significant impact on overall parental investments at age 11. When we unpack different types of investments, we find that maternal LoC increases educational investments when children enter primary school and approach standardized examinations at ages 5 and 11, respectively, while it increases recreational investment at age 7. Furthermore, at age 11, maternal LoC has a positive and statistically significant impact on parental discipline. These results suggest that maternal LoC plays a crucial role in investments, especially during high-stakes examination periods, which is consistent with the positive impact of maternal LoC on English performance at age 11.

The robustness of our findings is tested in several ways. A potential threat to our identification strategy would arise if the assumption of constant depreciation of skills and of inputs does not hold. We address the validity of this assumption by implementing two different additional specifications. First, we augment the baseline value added specifications by additionally including as controls all sets of past outcomes, not only the one-period lagged outcome. In this way we explicitly control for the contribution to current skills development of all observable past skills. In another specification, we instead include contemporaneous household and maternal characteristics on the RHS of the skills equation, so that we relax the assumption of constant returns of inputs. The stability of estimates across these different specifications reassures us of the unlikely existence of significant bias in the estimated impact of LoC on skill development of children in the VA model. Finally, results remain unchanged when including as

control variable a more sophisticated measurement of maternal cognitive skill (which is correlated to maternal LoC) and when we address measurement error in LoC by constructing this measure in alternative ways.

2 Empirical Framework

Assume there are two dimensions of skills θ^k: $k \in C, NC$ where C stands for cognitive and NC for non-cognitive or socio-emotional skills. For each individual i, the production function of skill k at age a depends on: household's characteristics $\boldsymbol{H_i(a)}$, time-invariant innate ability of child μ_i and age-specific shocks η_{ia}.

$$\theta^k_{i,a+1} = F^k_a(\boldsymbol{H_i(a)}, \mu_i, \eta_{ia}) \tag{1}$$

where $\boldsymbol{H_i(a) = (h_{i1}, ..., h_{ia})}$ is a vector of the history of observed and unobserved household inputs. If we assume a linear production function we can write the following two equations for $a = 1, 2$ (the k subscript is omitted for simplicity):

$$\theta_{i1} = \boldsymbol{h'_{i,1}}\beta^1_1 + \rho_1\mu_i + \eta_{i1} \tag{2}$$

$$\theta_{i2} = \boldsymbol{h'_{i,2}}\beta^1_2 + \boldsymbol{h'_{i,2}}\beta^2_2 + \rho_2\mu_i + \eta_{i2} \tag{3}$$

In such a setting, the main issue for identifying the impact of a particular household input on skills is endogeneity due to omitted variables: we do not observe the child's initial endowments or innate ability (μ_i), nor the entire history of parental and other inputs which determine skills ($\boldsymbol{H_i(a)}$), such as all parental relevant characteristics and time investment, school and neighborhood characteristics. Thus, there might be some variables not included in the model which are correlated with both the household characteristics and children's skills and not accounting for this could bias the estimated impact of the household input of interest on skills.

Value-added (VA) models have been proven to limit the issue of endogeneity due to omitted variables: by conditioning on the lagged skills, latent ability and lagged inputs are controlled for as long as the effect of lagged skills, observed, and unobserved inputs depreciate at the same rate over time (Todd and Wolpin, 2003, 2007). More specifically, the assumptions needed for

estimating a VA model are the following: (i) the effect of both observable and unobservable lagged inputs depreciates at rate γ so that $\beta_2^1 = \gamma\beta_1^1$ (ii) the effect of lagged skills also depreciate at the same γ rate, so that $\rho_2 = \gamma\rho_1$, and (iii) η_{ia} is serially correlated at the rate γ, so that $(\eta_{i2} - \gamma\eta_{i1})$ are independently and identically distributed shocks. Thus, by subtracting θ_{i1} from both sides of Eq. 3, and assuming that all mentioned assumptions hold, we obtain the following equation:

$$\theta_{i2} = \gamma\theta_{i1} + \boldsymbol{h}'_{\boldsymbol{i,2}}\beta_2^2 + \epsilon_{i2} \tag{4}$$

In our specific case, we are interested in estimating the impact of maternal beliefs about returns to investment, LoC, on the development of children's observed skills y_{ia}[10] within a VA model[11] such as:

$$y_{ia} = \alpha + \gamma y_{i,a-1} + \beta LoC_i + e_{ia}, \tag{5}$$

where $y_{i,a-1}$ represents the one-period lagged skill, and e_{ia} includes both age-invariant and age-specific unobserved shocks. LOC is a continuous standardized measure where a higher value means that the mother believes that the returns to her actions are higher.

Estimating the unbiased impact of maternal LoC on skill development requires controlling for all relevant inputs affecting skills, so that $E(e_{ia}|LoC_i = 0)$. As explained above, controlling for the one-period past skill in a VA setting embodies the effect of unobserved endowment and past inputs on skills development and, as a result, it deals with the omitted variable bias issue.

To further rule out some of the possible confounders in the relationship between skills and maternal LoC, we further augment the VA model in Eq. 5 by conditioning on several baseline characteristics of the mother, of the household, and of the child. These are all measured when the child is 9 months old and are listed in Appendix Table B1.[12] This new specification is illustrated in the equation below:

$$y_{ia} = \alpha + \gamma y_{i,a-1} + \beta LoC_i + X_i'\delta + e_{ia} \tag{6}$$

[10] Where $y_{ia} = \alpha + \beta\theta_{ia} + u_{ia}$ as we do not observe directly children's skills (θ_{ia}) but a proxy of them (y_{ia}) as they are assessed by parents or tests.

[11] This model has recently been implemented in several papers studying the relevance of a particular parental or childcare characteristic on the skill development of young people (Del Bono et al., 2016; Anderberg and Moroni, 2020; Morando and Platt, 2022).

[12] Appendix Table A2 shows that after including the comprehensive set of controls listed in Appendix Table B1, LoC has enough variation left to identify the effect of interest.

X_i represents a vector of household, maternal, and child's characteristics measured at 9 months which is the point in time when maternal LoC is measured.[13] Comparing the estimates obtained from Eq. 5 and Eq. 6 serves to check whether the identifying assumption for the VA model, i.e. $E(e_{ia}|Y_{i,a-1}, Loc_i = 0)$, holds.[14] Furthermore, controlling for maternal characteristics such as maternal physical and mental health it is important not only for decreasing the issue of omitted variable bias, but also to limit the issue of reporting bias. Certain outcomes, such as socio-emotional skills, are constructed from mother's responses and her health status could bias how she classifies, for example, her child's behavior (Del Bono et al., 2020; Kiernan and Huerta, 2008).

Finally, to identify the impact of maternal beliefs on children's skills development, we need LoC to be time-invariant in the period of life analyzed. This is because maternal LoC is measured exclusively when the child is 9 months old, i.e., we do not have repeated measures of it over time. If maternal LoC is stable, the fact that it is measured when the child was 9 months old, and that skills were measured onwards from when the children were 3-years-old (when the parents in our data were at least 21 years old), we do not expect to have any estimation issue due to simultaneity (maternal LoC and children's skills are affected simultaneously by some age-specific shocks), and reverse causality problem, or feedback effect (maternal LoC changes in response to changes in children's skills development). We believe that assuming stability of LoC over adulthood is not such an unreasonable assumption due to previous findings from the literature. Sherman (1984) shows that LoC changes at early ages, when individuals are between 8 and 13 years old. However, across adulthood, LoC has been shown to be stable over time (Elkins et al., 2017). Cobb-Clark and Schurer (2013) show that alterations of LoC over time are not large and are concentrated at early and very old ages, two groups which are excluded in our analysis. They also find that these changes are unrelated to demographic, health, or labor market shocks in individuals' lives.[15]

With the VA model we test whether the marginal returns of children's skills to maternal

[13] We do not include contemporaneous household characteristics in the RHS of the equation as we are wary that this might absorb the direct effect of LoC as variables measured over 9 months may act as mediators of the effect of LoC on child development. We nevertheless test the robustness of this specification in Section 8, and find that including contemporaneous household and maternal characteristics does not affect the results.

[14] We further challenge the validity of the assumption of constant depreciation of inputs and skills by implementing two different additional specifications as shown in Section 8.

[15] To provide some additional evidence of the stability of the LoC over time, we make use of the British Cohort Study 1970 where information on LoC is collected at ages 10 and 16. There is high persistence of the LoC with a correlation of 0.40. This correlation is especially important because between ages 10 and 16 individuals transition from childhood to adulthood and their traits are shaped and not completely stable yet.

LoC are heterogeneous across ages. We hypothesize that marginal returns to maternal LoC are always non-negative and increasing from early ages through schooling, up to reaching teenagehood where they remain stable, see Figure 1. This prediction derives from the expectation that maternal LoC affects child skills mainly through mother-to-child interactions. When children start interacting with their parents more frequently because of, for example, language development which gives them the possibility to better express their needs and feelings, parents may be more responsive to their children's needs. Hence, maternal LoC increases its effectiveness in this period. Furthermore, in the period coinciding with school entrance, parents have even more scope to influence their children's skills through an increasing number of channels. For example, parents may influence their children's skills when picking their school or other environments where socialization happens in a larger and more structured way compared to, for example, childcare settings. With children growing, there is a larger range of ways in which parents can interact with them and, hence, in which their LoC can affect their children's skills. However, this comes to a halt when other influences such as peers and other role models (e.g., teachers), become increasingly more relevant in impacting young people's outcomes.[16]

3 Data & Sample

We use data from the Millennium Cohort Study (MCS), a British cohort study that tracks the lives of more than 10,000 young people born across the UK in 2000/1. The MCS gathers information on children and their family approximately every other year, starting when the child is 9 months old and ending when they turn 17. By doing so, it covers all critical developmental stages. The dataset provides a wealth of information on cohort members' socio-emotional, cognitive, and behavioral development, as well as comprehensive data on economic circumstances, parenting, relationships, and family life. The extensive data on skills development makes MCS a perfect dataset to investigate the role of maternal characteristics, particularly LoC, in child development, and the mechanisms by which maternal LoC affects that development.

The MCS offers researchers the advantage of being able to link survey data to educational

[16]Furthermore, in early childhood, individuals form their own LoC and there is evidence of LoC being transmitted across generations (Zumbuehl et al., 2021). Given the relevance of one's own LoC in determining one's own outcomes, this could be a strong channel through which maternal LoC has increasing marginal returns to children's skills as the effect of maternal LoC is reinforced by the establishment of child's own LoC. However, we cannot test the inter-generational transmission of LoC hypothesis directly in our data as the LoC of cohort members is not available.

administrative data from the National Pupil Database which covers data from all students in England. As we are also interested in examining the educational outcomes of students and how they are influenced by maternal LoC, we first restrict our sample to include only those cohort members and their families who reside in England during the initial wave of the MCS.[17] We then exclude cohort members with twins, as this may affect parental investment. Additionally, we only include cases where the biological mother is the primary respondent, which accounts for 99% of the total sample. To account for potential confounding factors such as teen birth and late-stage motherhood, we further narrow our sample to include only those cases where the mother was aged 18-45 at the time of giving birth.

Lastly, to examine the effect of maternal LoC on children's development, we focus on children whose mothers have a measure of LoC in the data, resulting in a loss of 339 observations or approximately 4% of the sample which is ultimately composed of about 8,000 cohort members. In Appendix Table A1, we present the mean and standard deviation of maternal characteristics, which serve as primary controls in the analysis (see Appendix Table B1 for the full list of controls), measured when the cohort member is 9 months old, separated by the subsample for which we have and do not have maternal LoC. The subsample for which maternal LoC is known is positively selected in terms of socio-economic characteristics.[18] However, we do not observe any differences in the characteristics of the cohort members, such as gender, except that children of mothers with known LoC are, on average, less likely to be born pre-term and weigh around 242 grams more at birth than their counterparts. They are also more likely to have started childcare at 9 months of age.

We retain all cohort members observed from the first wave to the one in which the outcome is measured, creating an unbalanced panel. To account for attrition and maintain the representativeness of the sample, we use the overall weight provided in the longitudinal file in our analysis. This weight considers both sampling and attrition in the seventh wave for the core sample in England who participated since the first wave.[19]

[17] The findings that we present in this paper are unaltered by whether we consider England only or the entire UK sample. The estimates for the UK sample are available upon request.

[18] Mothers with known LoC are more likely to work in higher occupations, are slightly older, have higher education levels, and are less likely to be from an ethnic minority background. Additionally, in analysis not shown, we find that mothers with known LoC are more likely to be UK-born and to have conducted the interview in English.

[19] Results remain unchanged when replicating the analysis with wave-specific weights.

4 Main Variables

4.1 Maternal Locus of Control

LoC reflects an individual's beliefs about the degree of control they have over outcomes in their life (Rotter, 1966). It captures the extent to which individuals believe that their investment and behavior will have an effect; in other words, it represents a general measure of beliefs about the effectiveness of effort. It has been amply demonstrated that individuals with a high LoC perceive their actions as strongly influencing outcomes and thus behave accordingly (see Caliendo et al., 2022, and the literature cited therein).

Maternal LoC is derived from three questions about their ability to affect circumstances asked in the first sweep of the MCS when the child is 9 months old. These are reported in Table 1, which demonstrates that while most mothers believe they can control outcomes, there is enough variation to investigate the impact of maternal LoC on child development. We re-code the answers so that a high degree of LoC is assigned a value of 2, a low degree of LoC is assigned a value of 0, and "can't say" is assigned a value of 1. To create a one-dimensional measure of maternal LoC, we compute the average value of the answers given to the three questions. In Section 8, we show that the main findings of the paper remain unchanged when using other methods to construct the LoC variable from the three questions, such as by employing a latent factor model to deal with the issue of classical measurement error.

4.2 Outcomes

We consider several dimensions of child development. Each of them is described below. All continuous outcomes are standardized within each wave to have the mean equal to zero and standard deviation equal to one.

i) Socio-Emotional Skills

We measure socio-emotional skills using the Strengths and Difficulties Questionnaire or SDQ (Goodman, 1997), which is a parental report on five domains of a child's emotional-behavioral development. We only consider responses from biological mothers. Given that mothers report the socio-emotional skills of their children, we take some steps to minimize two main issues. First, to limit classical measurement error in measurement of skills, we follow the literature

(Achenbach, 1966; Attanasio et al., 2020b; Dickey and Blumberg, 2004; Weir and Duveen, 1981) and estimate three latent factor models to obtain three different dimensions of socio-emotional skills: externalizing behavior (composed of the conduct and peer sub-domains), internalizing behavior (composed of the hyperactivity and the emotional sub-domains), and pro-social behavior. The externalizing behavior category includes disruptive, hyperactive, and aggressive behavior, while the internalizing behavior category includes anxiety, depression, and somatic symptoms. Prosocial behavior refers to actions that benefit others or society, such as helping, sharing, and cooperating. To interpret all three behavioral dimensions in the same way, we reverse code the internalizing and externalizing behavior scores so that a higher score represents fewer problems or better socio-emotional adjustment.

For the internalizing and externalizing dimensions we have ten items and for the prosocial dimensions we have five items from which we can nonparametrically identify the distribution of the latent variables. The latent factor model that we estimate is the following:

$$s_{ika} = \alpha_k + \lambda_k \psi_{ia} + \epsilon_{ika}, \tag{7}$$

where k represents a sub-domain of socio-emotional skills, α_k is the intercept, λ_k are the factor loadings, and ϵ_{ika} is the measurement error. From this linear factor model we can predict a factor score s_{ia} which represents the error-free latent factor ψ_{ia} for each child. In the measurement models we set one factor loading to 1 and the mean of the latent factor to 0 to achieve location and scale normalization (Carneiro et al., 2003).

Another important issue related to the maternal assessment of children's skills is reporting bias related to LoC endowment. Indeed, Del Bono et al. (2020) show that parental assessments of child non-cognitive skills are directly affected by parents' characteristics. In our case, maternal assessment of their children's skills could be affected by maternal level of LoC.[20] If this is the case, we would have a correlation between the measurement error of the skill equation (e_{ia}) and the treatment variable (LoC_i) in Eq. 6 and $\hat{\beta}$ could not be interpreted as the average treatment effect in the OLS. This is because the estimated parameter would be confounding the effect of maternal LoC on children's socio-emotional skills, which is what we are interested in estimating, with the effect of maternal LoC on maternal *perception* of their children's socio-emotional skills.

[20] To establish whether there is any suggestion of maternal response to the SDQ being biased, we compare the scores obtained from the SDQ answered by mothers with the scores obtained by the SDQ answered by teachers. We find positive correlation between mother- and teacher-assessed SDQ scores to always be statistically significant at 1% level and ranging between 0.34 and 0.60.

To solve this issue we rely on previous literature which explicitly models children's reported skills (Attanasio et al., 2020c; Heckman et al., 2022, 2013). More precisely, we divide mothers into two groups, depending on whether they have a high/low LoC based on the median value of LoC.[21] We then allow the intercept α_j in Eq. 7 to depend on maternal LoC level to capture the fact that mothers with high LoC levels perceive their child's skills more positively compared to mothers with low levels of LoC. We also allow factor loadings λ_j to depend on LoC to deal with the fact that there is a higher likelihood of misreporting extreme behaviors - for example if children have very problematic emotional issues. We call this latent factor model of socio-emotional skills *restricted*.

ii) Cognitive Skills

The cognitive skills of participants in the MCS study are assessed using a variety of age-appropriate measures from ages 3 to 17 through well established tests administered by the surveys' interviewers, providing a wide range of data. For example, different British Ability Scales are employed at ages 5, 7, and 11. Appendix Table B2 lists the specific measures used at each age. To create age-specific cognitive indexes that account for all available measures, we utilize the method introduced by Anderson (2008).[22] This index groups the selected cognitive variables using an inverse covariance weighting scheme, which adjusts for highly correlated outcomes and ensures that measures across different scales can be compared in a consistent manner. In the analysis we further use alternative methods to group cognitive measures to test the robustness of our findings.

iii) Educational Outcomes

We have access to a wealth of information about students' academic progress through the English administrative data on education. We focus on students' performances in English and Mathematics courses. In the English system of education, different stages are labeled Key Stages (KS) and at the end of these there are standardized national tests to examine students' knowledge. These tests are anonimized and externally graded. Here, we focus on the national

[21] Testing for measurement invariance supports that there is at least one item with the same factor loading and intercept between the groups of mothers with high and low LoC within each dimension (internalizing, externalizing and prosocial behavior) and wave. In other words, we have partial metric invariance and partial scalar invariance so that the two distributions of children's skills reported by mothers with high/low LoC are comparable (Heckman et al., 2022).

[22] This index has been employed to measure skills in other economics studies, such as Baranov et al. (2020) and Delavande et al. (2022).

standardized exams in English and Mathematics taken at age 7, 11, and 16.[23] The grades obtained at age 11 are used for enrollment into selective schooling, and thus carry a influential effect on children's academic life. The grades obtained at 16, when mandatory formal education ends, are particularly important because they are used to predict A-Level grades which are required for university admissions. Some employers also require these exam grades when hiring. Grades at different KSs are coded as a standardized continuous variable. In addition, we also create a dummy variable for "Good Score" as defined by the Department for Education's guidelines.[24]

As an additional academic outcome, we examine unauthorized absences.[25] Although the overall attendance could be of interest, we are particularly interested in unauthorized absences as authorized absences might relate to health problems or other significant events that might happen in children's lives which are unlikely to relate to their behavior or that of their parents. Information on unauthorized absences is recorded yearly across KS2 and KS4 (between ages 7 and 16) and provides insight into a behavioral dimension (Gubbels et al., 2019) which is not reported by parents, at the contrary of the behavioral traits derived from the SDQ.

5 Results

5.1 Effect of LoC on the Children's Skills Development

Socio-Emotional Skills

We start by studying the effects of maternal LoC on children's socio-emotional skills. We focus on three dimensions here: internalizing, externalizing and prosocial behavior. Recall that internalizing and externalizing behaviors have been re-coded so that a higher value means lower problems. Figure 2 shows that the correlation of maternal LoC with socio-emotional skills is positive and strong across all dimensions and ages ("Correlation"). For example, a 1 standard deviation increase in maternal LoC predicts about a quarter of a standard deviation of internalizing and externalizing behavior from ages 5 to 14. When we implement a VA model

[23] These correspond to key stages (KS) 1, 2, and 4. More specifically, these exams are the Standardized Assessment Tests (SATs) in KS1 and KS2, which correspond to the beginning and the end of primary school, respectively, and the General Certificate of Secondary Education (GCSE) in KS4, at secondary school.

[24] Achieved level 3 or above in SATs at KS1, achieved level 5 or above in SATs at KS2, and obtained A*-C GCSE at KS4.

[25] These are instances of unexplained or unjustified absences from school, such as arriving late after the register has closed.

by introducing the lagged outcome as a control variable ("VA"), the effect size of maternal LoC shrinks to half or less of the magnitude of the initial correlation size and the impact of maternal LoC at age 17 is not statistically significant anymore in any dimension of socio-emotional skills. Finally, when implementing the VA specification with controls ("VA+controls (Baseline)"), which is when rich baseline characteristics measured when cohort members are 9 months of age are controlled for, the effect size slightly decreases, although not in a statistically significantly different manner from the simple VA model. This suggests that controlling for the one-period lagged skills effectively captures unobservable characteristics which are correlated with maternal LoC. As explained in Section 4, it might be the case that socio-emotional skills are affected by a reporting bias. To limit this concern, we re-estimate the VA specification with controls by using a restricted model to depict the latent socio-emotional skills ("Baseline Restricted"). By doing so, the magnitude and statistical significance of LoC estimates slightly increase, although the estimated coefficients derived from the unrestricted and the restricted latent models are not statistically different from each other.

Our preferred specification is the the VA model with controls and Table 2 reports the coefficients and standard errors of the LoC variable and of the lagged outcome of this specification to better analyze the effect size of the impact of LoC. We find that maternal LoC plays a crucial role in children's skills development until age 14. One standard deviation increase in maternal LoC increases the internalizing behavior of the children by 8.2, 5.7, 5.4 and 4.1% of a standard deviation at ages 5, 7, 11, and 14 respectively while it also positively correlates with age 3 behavior. When it comes to externalizing behavior, we find similar results. Table 2 shows that 1 standard deviation increase in maternal LoC increases externalizing behavior by 7.1, 4.6, 3, and 1.8% of a standard deviation at ages 5, 7, 11, and 14 (although the effect is not statistically significant at age 14), while it also positively correlates with age 3 outcome.

These results show that maternal LoC is useful in reducing the internalizing and externalizing issues that might affect a child's early and later life outcomes. This suggests that mothers with high levels of LoC might be more likely to help (or more effective at helping) their children with the way in which they cope with issues such as anxiety and depression, and to have good quality social relationships by, for example, adapting the way in which they interact with them. This would be consistent with mothers with high LoC believing that they can change things happening in their lives.

Finally, we look at prosocial behavior. Table 2 shows that maternal LoC positively affects

ages 5, 7, 11, and 14 prosociality outcomes. The effects are somewhat similar to those of internalizing behavior: we find that 1 standard deviation increase in maternal LoC increases prosociality by 7.5, 4.7, 3.7, and 6% of a standard deviation. Maternal LoC is an important factor to determine child prosociality, possibly by improving the quality of the mother-child relation. Indeed, previous literature shows that children's prosocial skills are positively affected by the intensity of mother-child interactions (Kosse et al., 2020).

There are some common patterns across all three dimensions of behavior. The effect of maternal LoC is particularly important at early ages. At age 17 maternal LoC does not show any statistically significant effect on any of the socio-emotional skills. This is not surprising given that during adolescence the direct impact of parental inputs becomes less important relatively to other societal inputs, such as from neighborhoods and school environments. This does not exclude that socio-emotional skills in teenager-hood are anyway *indirectly* affected by maternal LoC through the self-production of those skills over time; indeed, both the magnitude and statistical significance of the the lagged outcome coefficients remain important in explaining the socio-emotional skills at age 17. Finally, the magnitude of the impact of LoC is not negligible across all dimensions. For example, at age 5 the impact of LoC is 21%, 13%, and 23% of the direct effect of the lagged outcome at age 3 for internalizing, externalizing and prosocial behavior, respectively.

Socio-emotional skills are standardized within each age. This approach may potentially fail to detect variations in these skills across different age groups. For example, there might be a decline in a specific skill from ages 7 to 11. However, due to children with mothers exhibiting higher LoC experiencing a smaller decline in such skill (compared to children with mothers with lower LoC), we could mistakenly interpret a positive coefficient as a positive impact of LoC on such skill. To investigate this possibility, we plot the trajectories of the raw socio-emotional skill scores (which are derived directly from the SDQ tests before any standardization or creation of latent factors) from ages 3 to 17 , see Appendix Figure A1. The trajectories of socio-emotional skills seem to follow a similar pattern among children with mothers having high and low levels of LoC: the trajectories are parallel with children with mothers with high LoC consistently experiencing higher levels of skills across all ages. However, when we replicate the baseline VA model using the raw socio-emotional skill scores, see Appendix Table A6, the coefficient for maternal LoC

consistently shows a positive value.[26] This positive coefficient implies that when skills increase across different ages, the magnitude of improvement is greater for children whose mothers have higher LoC. Similarly, during ages characterized by decreases in skills, the reductions are less pronounced for the same group. Together, Appendix Table A6 and Appendix Figure A1, suggest that maternal LoC plays a significant role not only in instances of skill improvement but also when there is a decline. Maternal LoC has the ability to alleviate a portion of the reduction in child skills during such periods.

Cognitive Skills

We then study whether maternal LoC affects children's cognitive skills. As per socio-emotional skills, Table 3 shows the results of VA specification with controls. Maternal LoC does not affect the cognitive outcomes of children: the coefficients are all positive but they are not statistically significant.

However, our measure of cognitive skills pools the scores derived from different tests. The contents of the tests and the latent cognitive skills they retrieve could differ across and within ages. We then construct other indexes of cognitive skills by considering: i) the same test at different ages (i.e. all those derived with the British Association Scales), and ii) tests which are aimed at depicting the same type of cognitive skills (i.e. crystallized, visual, and quantitative ability). Panels B and C of Table 3 shows that while there is again evidence of a positive relation of LoC on cognitive skills, all estimates are not statistically significant but one: maternal LoC increases quantitative ability at age 7 by 4% of a standard deviation, statistically significant at 5% level. Overall, we conclude that there is no significant evidence of maternal LoC having a direct positive impact on cognitive skills.

5.2 Effect of LoC on Child Education

Table 4 shows the results of the VA model with controls applied to the educational outcomes. Panels A and B show that although maternal LoC does not have any effect on the Mathematics scores, there are some effects on English score at KS2. One standard deviation increase in maternal LoC is statistically significantly associated with 2.5% of a standard deviation higher English score at age 7. When implementing the VA model at age 11, one standard deviation increase in maternal LoC increases the English score by 1.5% of a standard deviation, although

[26] It is worth noting that we would have expected that, if the changes were genuinely parallel, we would have had an insignificant coefficient.

this is statistically significant at 10% level. We repeat the analysis where, to represent outcomes, we have dummies on whether the test scores are considered to be good. Results are consistent with the one where we investigate continuous scores, although the effect of LoC on KS2 English is now statistically significant at 5% level.

Additionally, we investigate attendance by using unauthorized absences every year from 2007 to 2017, when children are 6 to 17 years old. Our results of the VA model with controls show that maternal LoC statistically significantly and negatively impacts unauthorized absences. This is consistent throughout the years, with the exception of 2009, 2011, and 2017. A 1 standard deviation increase in maternal LoC decreases unauthorized attendance from a minimum of 0.5% to a maximum of 3.9% in the period considered.

Altogether the results on academic outcomes corroborate the previous results on socio-emotional and cognitive skills, showing that maternal LoC is more likely to affect the behavioral than the cognitive dimension. Success in educational outcomes is determined by both cognitive and non-cognitive skills (Heckman et al., 2006). Recent studies using interventions have highlighted the relevant role of, especially, non-cognitive skills in explaining academic outcomes (Alan et al., 2019). Indeed, we find that LoC has an effect on unauthorized absences and on English, which are both highly related to the socio-emotional dimension. On the one hand, while English emphasizes communication, interpretation, and critical thinking, Mathematics focuses on logical reasoning, problem-solving, and abstract thinking. Socio-emotional skills, such as motivation, self-regulation, and social awareness, may be more critical for success in English, compared to cognitive skills, such as numerical ability and spatial reasoning, which could be more relevant for succeeding in Mathematics.[27] On the other hand, attendance at school has also been found to positively relate to students' social competence and self-esteem (Henry et al., 2012). Thus, maternal LoC could positively impact English and attendance (indirectly) by enhancing children's socio-emotional skills and (directly) through parenting[28].

[27] Duckworth and Seligman (2005) find that socio-emotional factors, such as self-discipline, grit, and perseverance, are more strongly associated with grades in English than Mathematics. Similarly, Casey et al. (1997) find that verbal ability and self-esteem are better predictors of English grades, while mathematical ability is a better predictor of math grades.

[28] Parenting has been found to have a direct effect on truancy (Escario et al., 2022; Gubbels et al., 2019).

6 Can Maternal LoC Explain Part of the SES Gradient in Child Development in Socio-Emotional Skills?

There is an important socio-economic gradient in child development as found in many studies (e.g. Rubio-Codina et al., 2015). Understanding the relevance of maternal beliefs in determining this gradient is crucial for understanding the underlying process generating such inequality and hence for promoting social mobility through, for example, well-targeted interventions.

The psychological literature shows the existence of a socio-economic gradient in LoC: higher socio-economic status (SES) is associated with higher LoC.[29] The rationale behind this is that the more obstacles one encounters in life, the less likely they believe that they can change things around them.[30] Individuals from a low SES are more likely to experience obstacles in their lives since early years due to a lack of resources (e.g., financial, information, social network) and other factors (e.g., discrimination) that they face. It is very likely that this negatively affects their beliefs about their power to affect their destiny, and hence their LoC, compared to higher SES individuals.

Appendix Table A3 presents the differences in maternal LoC and gender of the child, socio-economic and ethnic backgrounds. It shows that there is an important SES gradient in LoC by ethnicity, socio-economic occupation, and level of education. For example, the higher the educational qualification, the higher the level of LoC. The difference between mothers with a degree and with a qualification lower than GCSE is about 79% (column 7) of a standard deviation in LoC which shows that the differences are non-negligible. Even after controlling for all the other characteristics (column 8), we see that this difference is only reduced to 54% of a standard deviation. Given the existence of an SES gradient in the LoC and the fact that the latter affects some dimensions of child development, as shown in the results above, we can test whether part of the SES gradient in child development can be attributed to differences in maternal LoC across

[29] Vasquez (1978); Schultz (1993); Robinson and Kelley (1998); Pedron et al. (2021).

[30] The learned helplessness theory in psychology (Seligman and Beagley, 1975; Maier and Seligman, 1976) states that individuals who are constantly faced with negative events beyond their control can feel as if their efforts are useless. They believe no matter what they do, it will not make a difference.

different SES groups.[31] Indeed, there is evidence of low SES parents underestimating the returns to child investment to a higher extent than high SES parents (Attanasio et al., 2021; Cunha et al., 2022).

To explore the role of maternal LoC in explaining the SES gap in children's socio-emotional skills, we implement a Kitagawa-Oaxaca-Blinder decomposition analysis (Blinder, 1973; Oaxaca, 1973; Elder et al., 2010). This allows us to measure how much of the SES gap comes from a different distribution of individual characteristics (the explained part) between low and high SES households and how much of it derives from low and high SES households differing in the returns to these characteristics (the unexplained part). For this analysis we consider the household to be of a high SES when the mother has a tertiary education qualification.[32] Table 7 shows the results of the decomposition analysis. Across all ages considered, there is a statistically significant SES gradient, so that children from high SES background have significantly better socio-emotional skills by a magnitude of 0.20 and 0.29 (0.36 to 0.44) of a standard deviation for internalizing (externalizing) behavior from age 5 to 17.

Interestingly, of all included variables, maternal LoC consistently and statistically significantly explains the SES gap across all dimensions of socio-emotional skills except for when the child is 17. Even when compared to other relevant and statistically significant determinants of the SES gradient, maternal LoC explains a higher proportion of the explained gap. For example, conditional on several characteristics,[33] maternal LoC explains the SES gradient as much as double as having the father who is a full-time resident at home. Maternal LoC accounts for a non-negligible part of the *explained gap* in internalizing (18-14%), externalizing (9-4%), and prosocial (38-28%) behaviors from age 5 to 14. The estimates on the unexplained part of the SES gap (not reported in Table 7) are not statistically significant in explaining the overall SES

[31] Here note that while LoC has a strong SES gradient, there is still enough variation in LoC within each SES category. This makes us confident that the two dimensions, SES and LoC, are only partially overlapping. The R2 in the regression of LoC against SES (columns 3 and 4 in Appendix Table A3) is only about 5%. Furthermore, the standard deviation in LoC goes from 1 to 0.97 once we control for maternal education and it goes from 1 to .94 when we control for all SES variables available (maternal education, maternal occupation, maternal and paternal activity status, and household equivalized income). That the LoC variable contains enough variation to identify the effect of interest was also shown in Appendix Table A2.

[32] Given that maternal LoC could be endogenous to maternal education, we implement an additional decomposition analysis, where maternal SES is defined by whether one of the parents of the mother, i.e. the cohort member's grandparents, has a degree qualification. Results are shown in Appendix Table A4 and are consistent with the one reported in Table 7. The coefficients of LoC are highly statistically significant at predicting the difference in the explained part of the SES gradient in socio-emotional skills. Their magnitude is approximately half of the one found when using maternal education to identify SES.

[33] Maternal age, maternal ethnicity, maternal cognitive skills, child sex, whether living in London, and lagged skill.

gradient, suggesting that what drives the SES gradient in the development of socio-emotional skills is the different endowment in maternal LoC (and not different returns to maternal LoC) between families of low and high SES.

7 Maternal LoC and Parental Investments

Parents who believe that they can control the outcomes of events, i.e. parents with a high LoC, might believe that the more they invest in their children the better their outcomes will be. In this section we test, firstly, whether higher maternal LoC positively correlates with antenatal, early, and late investment, and, secondly, whether it predicts higher intensity parent-to-child activities (parent-child interactions, parental discipline, and household environment).

In columns 1-4 of Table 5 we report the coefficients of the correlation between maternal LoC and antenatal and early year investments when controlling for the usual set of characteristics. We find that maternal LoC predicts investments. For example, a one standard deviation higher LoC is associated with a 2.3ppt (5% relative to the mean) higher probability of having attended antenatal classes and a 1.4ppt (16% relative to the mean) lower probability of consuming alcohol more than twice per month during pregnancy. The coefficient on whether they tried to breastfeed is negative, although to not an important magnitude (1% relative to the mean) and statistically insignificant. However, among the mothers who breastfed, the higher the maternal LoC, the longer the baby was breastfed, which is statistically significant at 1% level. These results are important as they show that parents who believe that they can control the outcomes of events are more likely to invest more in their children by attending antenatal classes which can improve the knowledge of mothers about parenting practices to improve child development. There is also evidence on the positive effects of breastfeeding on child development (Borra et al., 2012; Del Bono and Rabe, 2012; Fitzsimons and Vera-Hernández, 2022). Our results show that maternal LoC by affecting the length of breastfeeding could impact child development through this channel, although due to the setting of our dataset, we cannot claim causality.

We also focus on parenting beliefs and attachment in Table 5. Columns 5 and 6 report the correlation between maternal LoC and these indexes. Appendix B3 offers a detailed description of how these indexes are constructed. One standard deviation increase in maternal LoC is associated with 5% of a standard deviation increase in beliefs that parents should be actively engaging with and supporting the baby to help their development which is statistically significant

at 1% level. This result suggests that mothers with high LoC believe that their actions matter more for their child and, thus, we should expect them to exert more effort to support their development. Furthermore, maternal LoC is associated with stronger mother-baby attachment score, although this is not statistically significant.

We then turn into investigating the impact of maternal LoC on parental investments, parental discipline, and home environment, by implementing the VA model with controls on such outcomes which are measured at each wave. As we do have several measures of parental inputs which reflect both the amount of time and the type of activities parents engage with their children (see Table B4), we construct indexes as in Anderson (2008), making use of all the information available. In addition, we implement a principal component analysis to separate these activities into educational and recreational investment. The rationale being that maternal LoC can be important for different types of activities depending on the age of the child (Del Boca et al., 2017). When children get older, parents might be less likely to be able to help with their education if they do not have the specific knowledge required for their children's courses and might put more effort in recreational activities. Similarly, parents might see their educational investment as a substitute to formal education once the child starts school, and they might change the allocation of activities dedicated to education vs. recreation. Indeed, Greaves et al. (2023) provide evidence of this substitution effect. For parental investments, we consider activities done by *both* parents. This is because, for example, mothers might spend less tune on engaging in recreational activities with their child if their husbands engage in enough recreational time with the child.

Table 6 shows that maternal LoC is a significant predictor of overall parental time spent with the children when they are 3. Moving beyond age 3, when we can study the impact of LoC on investments with a VA model, we see that a one standard deviation increase in maternal LoC results in a statistically significant increase in general parental investment at age 11 only, by a 5.3% of a standard deviation. In Panel A2 of Table 6, we present the results on parental investments in children separately for educational and recreational activities. Maternal LoC plays a crucial role in educational activities at age 5 and 11 while it does not affect the time that parents spend with their children in educational activities at age 7. On the other hand, maternal LoC positively impacts recreational activities at age 7. One standard deviation increase in maternal LoC increases educational activities at ages 5 and 11 by 4.4 and 6.5% of a standard deviation and recreation activities at age 7 by 4.6% of a standard deviation. Overall these

findings point to an increasing influence of maternal LoC on parental investment over time.

In addition to parental investments, it could also be that maternal LoC affects the strictness of parenting which has been found to be important in affecting children's behavioral, cognitive, and non-cognitive outcomes (Doepke et al., 2019). In order to study this, we make use of the information about parental discipline. As in parental investments, we create an index (Anderson, 2008) to capture parental discipline at home. In the last part of Panel A2 of Table 6, we see that maternal LoC positively predicts discipline at home at age 3 and positively affects discipline at age 11. One standard deviation increase in LoC results in 4.4% of a standard deviation increase in parental discipline at home at age 11.

Age 11 is when most children experience puberty and have behavioral issues (DelGiudice, 2018). The finding that maternal LoC affects age 11 discipline is not surprising as parental discipline serves to limit children's disruptive behavior. Interestingly, age 11 also seems to be an age where parents value more educational activities and discipline. This could be related to the fact that at this age KS2 exams take place which are a milestone in the English educational system. Indeed, the only statistically significant effect of maternal LoC on exams is found at age 11 in English.

Parental inputs are reported by parents themselves, thus we use an additional measure that we derive from the interviewer observations which we label *home environment*. The interviewers who went to cohort members' homes to conduct the survey were asked to take notes about the environment that children were exposed to. We make use of this unusual set of information and create a home environment measure. Here, our dependent variable is a noisy environment. As Panel B of Table 6 shows, maternal LoC coefficients are negative across all ages, signaling a more positive environment the higher the maternal LoC. For example, a one standard deviation increase in maternal LoC corresponds to a 3% decrease of a standard deviation in negative home environment at age 11. Nevertheless, none of the estimated coefficients is statistically significant at the standard level.

Concluding, this section suggests that the positive impact of maternal LoC on child development could partly be explained by parental investment. More specifically, the VA model estimates marginal returns of children's skills to maternal LoC. If parental investment is one of the mechanisms at play through which maternal LoC affects child development, we would expect that different levels of maternal LoC correspond to different levels of parental investment. Indeed, our analysis shows a positive impact of maternal LoC on parental investment. This, however,

does not exclude the existence of increasing returns of skills to maternal LoC through other channels than parenting, such as through intergenerational transmission of LoC (Zumbuehl et al., 2021).[34] These findings are important as they shed new light on the relationship between parental beliefs and child development in the long-term: parental investment seems to be one mechanism through which parental beliefs operate. At the same time, they underlie the importance of investigating other possible channels.

8 Robustness Checks

The estimated impact of maternal LoC on child development could be biased if the regression is incorrectly specified and fails to control for all relevant variables. In this section, we provide several robustness checks to study the sensitivity of the results of our VA model across different specifications and ways of constructing the maternal LoC measure.[35]

Relaxing the Constant Depreciation Assumption

For the VA model to take care of the omitted variable issue we need (i) latent skills and (ii) lagged observed and unobserved inputs to geometrically depreciate at the same rate. To test the robustness of our findings to these assumptions, we implement two different specifications where in the one-period lagged VA model with controls, we additionally condition on all sets of observed lagged skills and on current inputs. Given the reciprocity of unobservable to observable characteristics (Altonji and Mansfield, 2018), if results are not affected, we can assume that the constant depreciation assumption is reasonable also for unobservable characteristics.

(i) Controlling for All Past Skills

We report the estimates of maternal LoC when explicitly controlling for all past skills in Figure 3 ("Baseline+All Outcomes"). This specification is used to test the constant depreciation assumption of outcomes in the VA one-period lagged outcome model with controls. Augmenting the VA specification with all past observable skills further allows us to consider that there might be some unobservable characteristics that are important in determining earlier and later outcomes but do not directly affect the one-period lagged outcome. For example, there could be some unobservable characteristics that are important for skills at ages 5 and 11, but not for skills

[34] See footnote 16.

[35] Results are shown for socio-emotional skills outcomes as these are the outcomes where we find the strongest findings. When we repeat the checks on the other outcomes, the main findings hold.

at age 7. When estimating the impact of maternal LoC on skills at age 11 while conditioning on skills age 7 does not allow us to control for these unobservable variables, including all the lagged outcomes available allows us to actually account for these unobservable variables.

As we could expect, the precision of the estimated coefficient decreases when we have the entire observable story of past skills, especially at certain ages, such as age 7. However, the magnitude of the impact of maternal LoC is not importantly affected and none of the new estimates is statistically different from the baseline estimates, so the main findings of the baseline VA model are robust to this specification. We take this as a suggestion that omitted variables should not be a relevant concern in the VA model and that the constant depreciation assumption holds.

Finally, the inclusion of all observed lags allows us to study the indirect effect of lagged outcomes of skill development. In Appendix Table A5 we report the estimates of past skills. For most of the outcomes, the one-lagged outcome as well as the previous lags are important predictors of current skills. In fact, for nearly all ages, *all* the previous lags are statistically significant, suggesting that child development does not follow an AR1 process. Even when we find no direct statistically significant effect of maternal LoC for socio-emotional skills at certain ages, given that such outcomes are affected by lagged outcomes, which are impacted by maternal LoC, highlights the relevance of maternal LoC in child development in the long-run.

(ii) Controlling for Contemporaneous Inputs

In our main specification, we control for a rich set of household and maternal characteristics that are measured when children were 9 months old. We do so to minimize the probability of having unobservables which are correlated to both LoC and child development. However, it is possible that some of these characteristics changed over time, such as maternal activity status. These changes might also affect the skills accumulation of children. As changes in such characteristics could act as mediators of the direct effect of LoC on child development, we do not include them in the main specification. By replicating the baseline VA model and additionally controlling for maternal and household characteristics at the time where the outcome variable is measured, we aim to test whether the constant depreciation assumption of inputs holds. Results are shown in Figure 4 ("Baseline+Cont. Inputs"). The new estimates of maternal LoC are not statistically different from those obtained in the baseline VA specification.

Possible Confounders

We might be concerned that given the positive association of LoC with cognitive ability, failing to control for it in an appropriate way could result in biasing the estimated effect of LoC. However, there is evidence that LoC is a separate determinant in, for example, job search behavior and performance in the job, above individual cognitive skills (see Caliendo et al., 2015, and literature cited therein). In our baseline specification we control for some measures of cognitive skills of mothers when the child is 9 months old. These are dummies on whether the mother has low reading and maths skills. As this is a crude measure with limited variation across the sample, we additionally include another measure of maternal cognitive skills collected when child is 14 years old.[36] This is the vocabulary test which consists in understanding the meaning of words. More specifically it is a shortened version (20 of original 75 items) of Closs (1976). We re-run the baseline VA model by additionally controlling for the score achieved in the cognitive assessment.[37] Figure 3 ("Baseline+Mat. Cogn.") shows that including maternal cognitive skills as a control does not qualitatively affect the main findings.

Alternative Measures of Maternal LoC

We further test whether the way in which the LoC measure is constructed could affect our findings. We build other two measures of maternal LoC, one by using the index proposed by Anderson (2008) and the other one through a latent factor model. We present the result of this robustness check in Figure 4. Across the three dimensions of socio-emotional skills, none of the new estimates of maternal LoC is statistically different from the the ones obtained when using the average score LoC measure at all waves.

9 Conclusion

In this paper, we study the effect of a parental generalized belief about returns to investment, specifically maternal Locus of Control (LoC), on child development. We focus on several

[36] Even if maternal cognitive skills are measured at a later time than LoC, there is evidence that cognitive skills do not change over time (Almlund et al., 2011; Attanasio et al., 2020c). The correlation between maternal cognitive skills and LoC is 0.25.

[37] This is available for 73.3% of the final analysis sample. Repeating the baseline estimates for the sample in which this cognitive score is available shows that findings are not affected by this sample selection. We also include an indicator on whether the task was impaired by some personal or external circumstances assessed by the interviewer (e.g., whether person has visual impairment) which affects 4.5% of mothers taking this test.

dimensions of child development and implement a Value-Added model to study the impact effect of maternal LoC on child development. We study its effect on children's socio-emotional skills, cognitive skills, and academic outcomes.

Our results show that maternal LoC is an important driver of children's socio-emotional skills from age 5 to 14. The effects are similar in all three domains of our socio-emotional skills measure: internalizing, externalizing, and prosocial behavior. Yet, there is no important effect on cognitive outcomes. When we investigate academic outcomes, we find that there is some positive effect of maternal LoC on English score at age 11, but no longer-term impact nor on Mathematics score is found. Yet, we see that maternal LoC negatively and significantly affects unauthorized absences which confirms that the effect of maternal LoC exists for behavioral outcomes. Additionally, we provide evidence that differential endowment of maternal LoC by socio-economic status can explain part of the SES differences in socio-emotional skill development by implementing the Kitagawa-Oaxaca-Blinder decomposition method.

We, study one of the possible mechanisms through which maternal LoC might affect child development: parenting. Our results show that maternal LoC positively affects parental investments in children until the age of 14 yet the domain of these investments vary by the age of the child. For example, while maternal LoC is important for predicting educational investment at ages 5 and 11, it affects recreational investment at age 7, and parental discipline at age 11. To weaken the connection between maternal LoC and parental investments, interventions that inform about the significance and cost-effectiveness of such investments for child development (Edwards et al., 2007; Hutchings et al., 2007) hold promise. Past evidence from the beliefs and expectations literature supports the idea that certain beliefs can be influenced (Delavande et al., 2022; Haaland and Roth, 2022; Haaland et al., 2023). This strategy seeks to diminish the impact of maternal LoC on child development, ensuring that variations in maternal LoC do not perpetuate inequality in children's skill development.

Our research provides evidence that a single parental generalized belief regarding returns on investment significantly shapes long-term child development. Further exploration is needed to comprehend how various generalized beliefs, such as growth mindset, and domain-specific beliefs, influence child development, as well as to understand the enduring effects of parental beliefs on life outcomes, such as university participation and labor market success. This paper advances the research field by examining the prolonged influence of maternal LoC on a range of children's skills, which crucially contribute to shaping individuals' educational and labor market outcomes.

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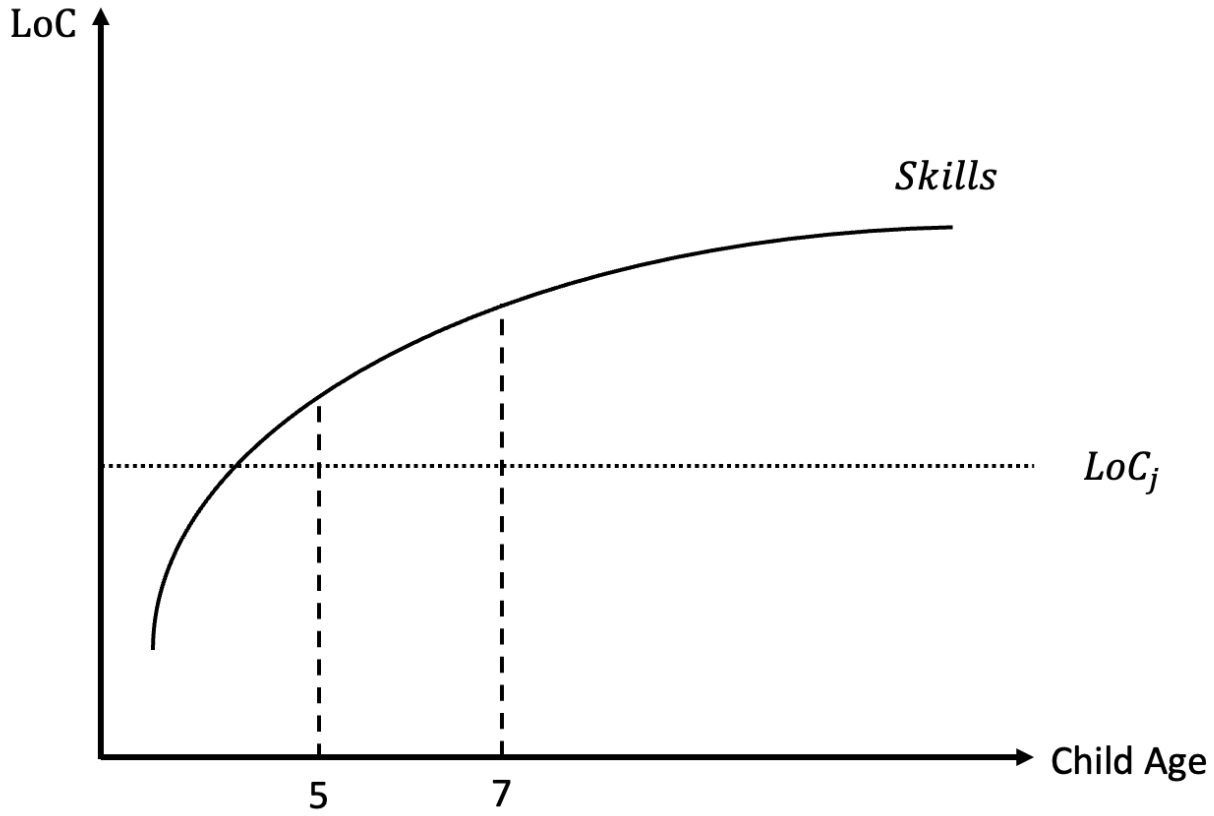
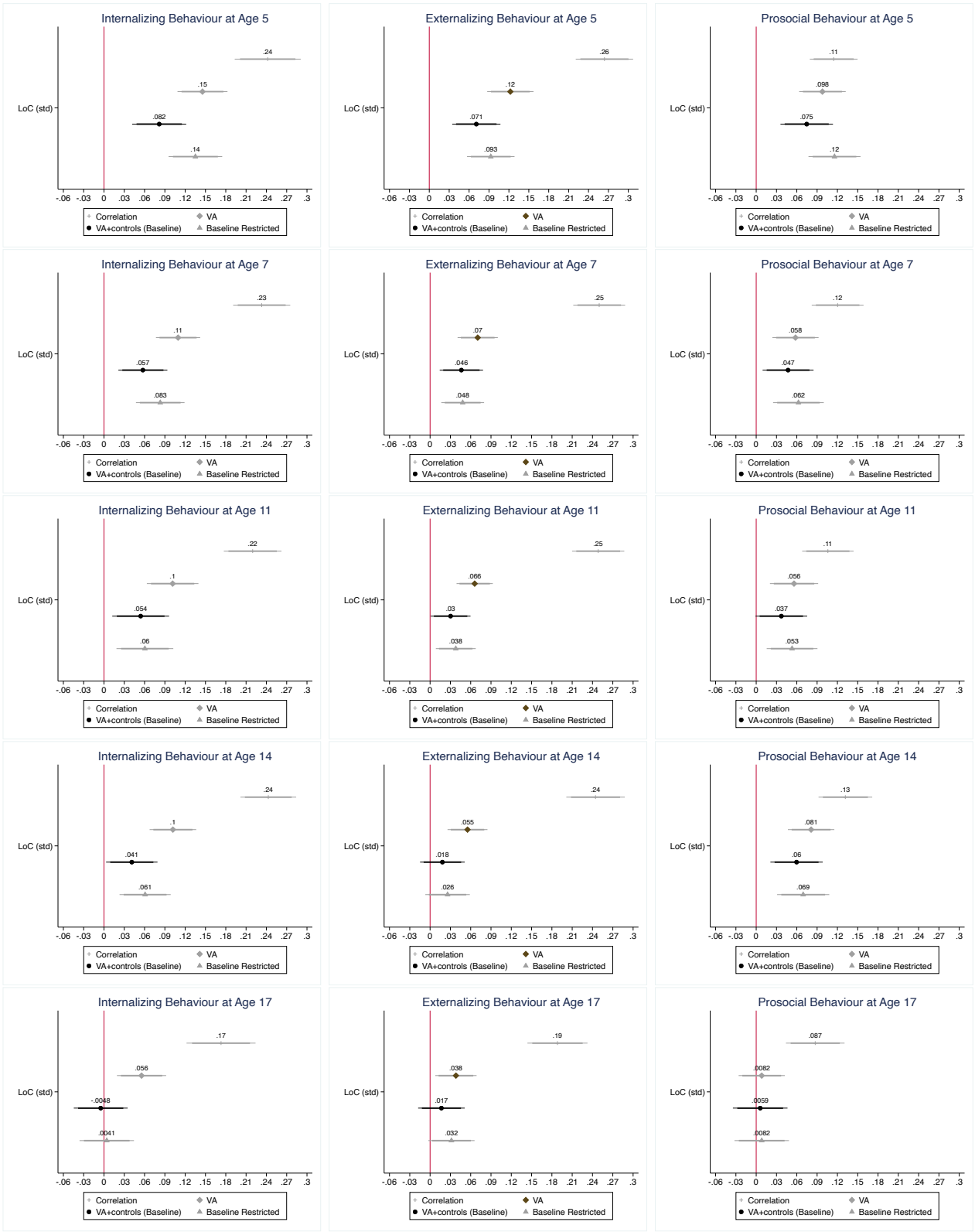
Figures

Figure 1: Marginal Returns of Skills to LoC by Child Age



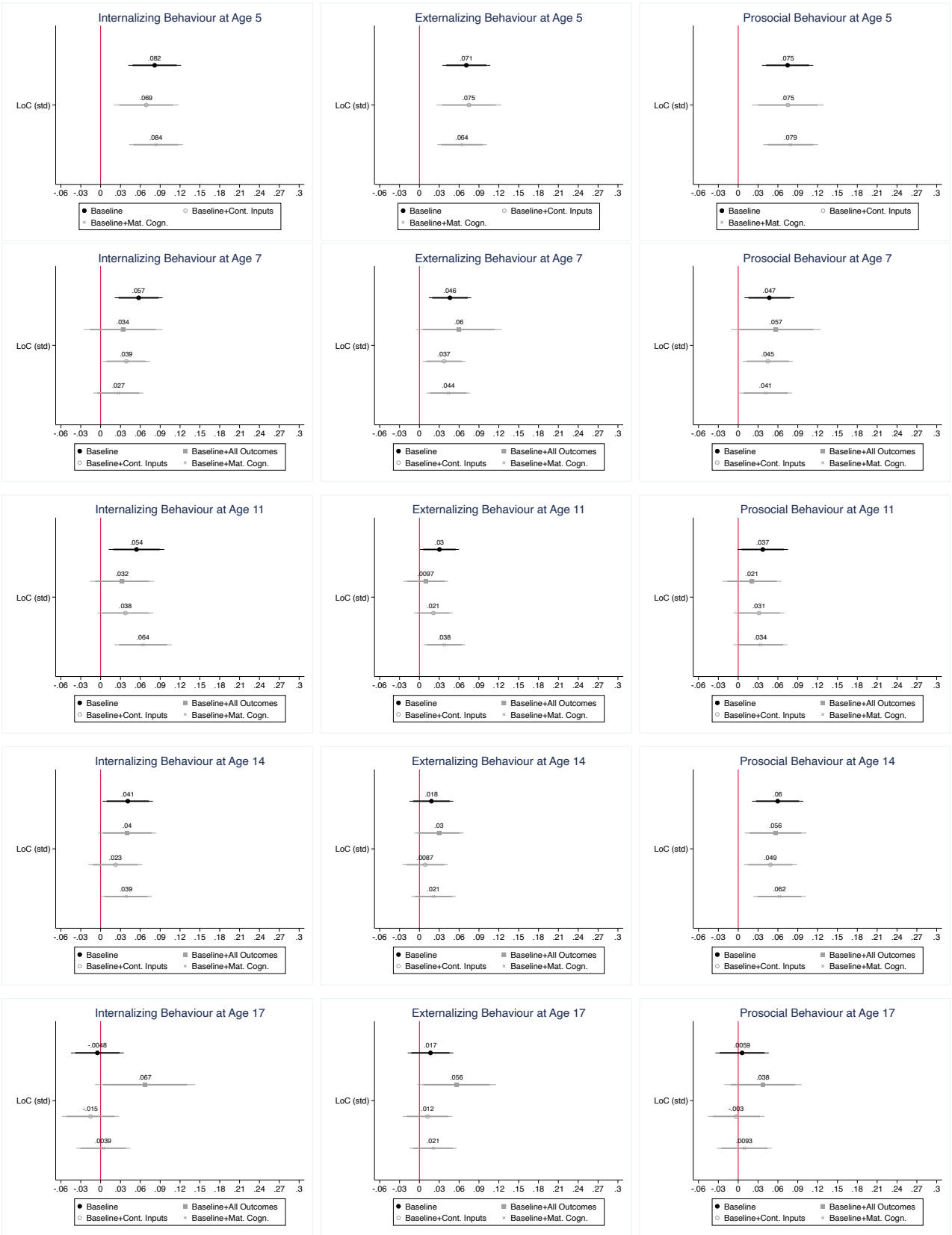
Notes: This figure shows that, while maternal LoC is stable in the period considered, its marginal returns to children's skills are increasing from early ages up to a point, around teenagerhood, when its marginal returns stabilize.

Figure 2: Socio-Emotional Skills
Main Results



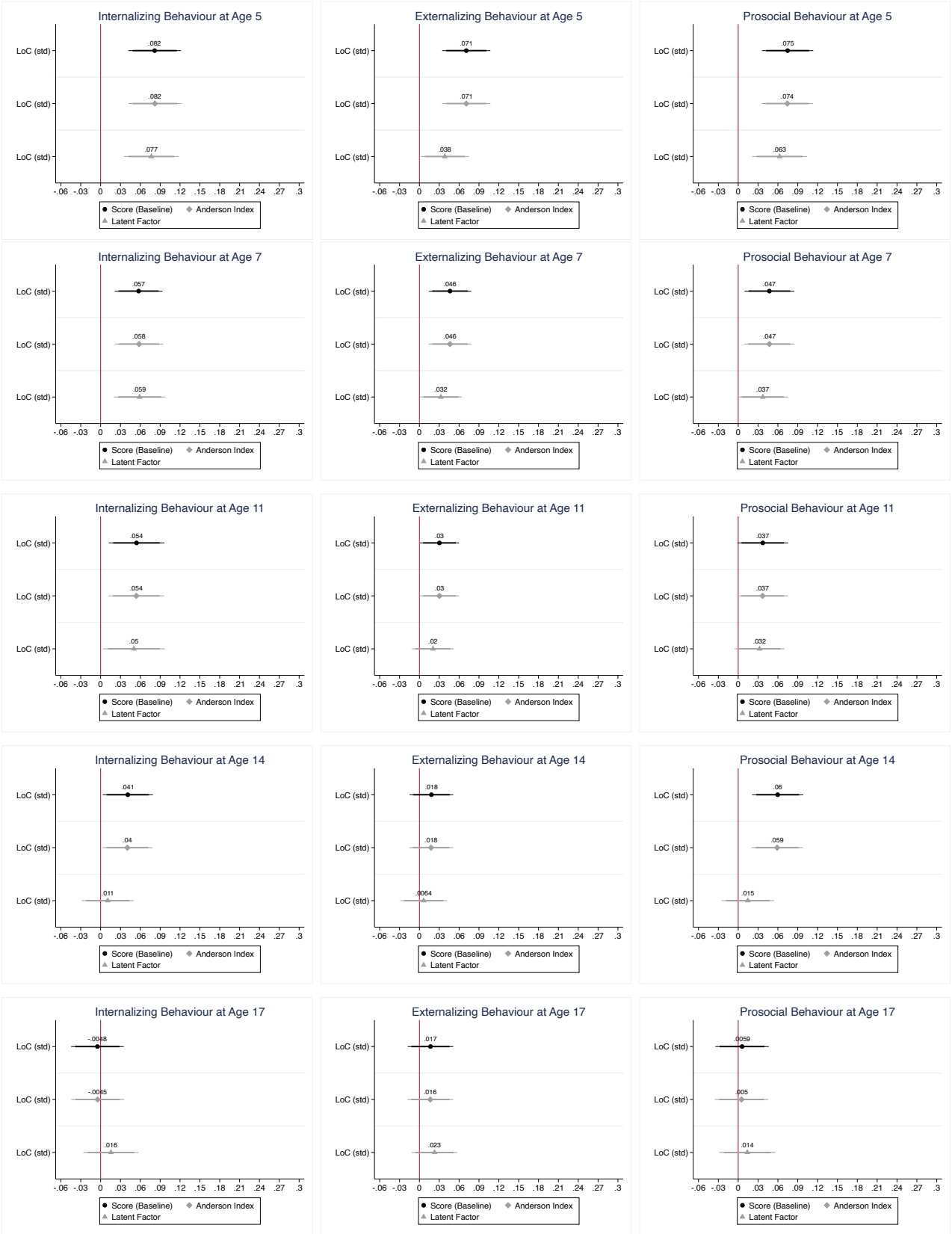
Notes: 90% and 95% confidence intervals. 'Correlation' includes only LoC in the RHS; 'VA' includes LoC and the 1-period lagged outcome (as shown in Equation 5); 'VA+controls' is the baseline specification (as shown in Equation 6) and it controls for 1-period lagged outcome and the full set of controls measured at 9 months of child age; 'Baseline Restricted' is the baseline specification where socio-emotional skills are derived from a latent factor model where parameters are restricted to be the same for mothers with a high/low LoC.

Figure 3: Socio-Emotional Skills
Robustness Checks: Different Specifications



Notes: 90% and 95% confidence intervals. The 'Baseline' specification is the one shown in Equation 6. The other point estimates of LoC are derived from the baseline specification additionally controlling: for all past outcomes ('Baseline+All Outcomes'), for contemporaneous inputs ('Baseline+Cont. Inputs'), and for a more accurate measure of maternal cognitive skills ('Baseline+Mat. Cogn.'), respectively.

Figure 4: Socio-Emotional Skills
Robustness Checks: Different LoC Indexes



Notes: 90% and 95% confidence intervals. The specification used is the 'Baseline' specification as shown in Equation 6. However, the LoC index is derived in different ways: 'Score (Baseline)' is the average value of the three questions on LoC and it is the main variable used in the analyses, 'Anderson Index' is the LoC index derived using the method proposed in Anderson (2008), and 'Latent Factor' is the index derived from a latent factor model used to extrapolate the underlying LoC from the three relevant questions.

Tables

Table 1: Variables Used to Derive Maternal Locus of Control

	(1)
Category: Want	
I never really seem to get what I want	0.112
	(0.315)
I usually get what I want out of life	0.734
	(0.442)
Can't say	0.154
	(0.361)
Category: Run My Life	
Usually I can run my life more or less as I want to	0.840
	(0.367)
I usually find life s problems just too much for me	0.064
	(0.245)
Can't say	0.096
	(0.294)
Category: Control	
I usually have a free choice and control over my life	0.773
	(0.419)
Whatever I do has no real effect on what happens to me	0.100
	(0.300)
Can't say	0.126
	(0.332)
Observations	7,932

Notes: Means (and standard deviations) of each possible answer across the three questions of the Locus of Control (LoC) section titled "Want", "Run", and "Control". These questions have been asked in wave 1, when the cohort member was 9 months old, and are used to create the maternal LoC variable.

Table 2: Socio-Emotional Skills

	SDQ - int (Std)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 17
LOC (Std)	0.126***	0.082***	0.057***	0.054**	0.041**	-0.005
	(0.027)	(0.020)	(0.018)	(0.021)	(0.019)	(0.020)
Lagged		0.386***	0.495***	0.533***	0.563***	0.590***
		(0.023)	(0.020)	(0.021)	(0.018)	(0.017)
Observations	5179	4843	4646	4502	4289	3794

	SDQ - ext (Std)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 17
LOC (Std)	0.113***	0.071***	0.046***	0.030**	0.018	0.017
	(0.022)	(0.019)	(0.016)	(0.015)	(0.017)	(0.018)
Lagged		0.537***	0.648***	0.660***	0.687***	0.690***
		(0.017)	(0.015)	(0.014)	(0.015)	(0.015)
Observations	5179	4843	4646	4502	4289	3794

	SDQ - pro (Std)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 17
LOC (Std)	0.040*	0.075***	0.047**	0.037*	0.060***	0.006
	(0.021)	(0.020)	(0.019)	(0.019)	(0.020)	(0.021)
Lagged		0.325***	0.485***	0.446***	0.511***	0.563***
		(0.017)	(0.018)	(0.018)	(0.018)	(0.019)
Observations	5179	4843	4646	4502	4289	3794

Notes: Lagged variables corresponds to the variable in the previous wave. All the regressions control for maternal characteristics: marital status, mental health, physical health, level of education, age, age-squared, ethnicity, socio-economic status, whether the interview is conducted in English, reading skills, mathematical skills, whether received fertility treatment, whether had any illness during pregnancy, whether labor induced, and the type of delivery; household characteristics: natural father resident/in contact, number of siblings, number of people in the HH, parental combined labor market status, standardized OECD income score, language spoken at home, and region of residence; and child characteristics: sex, year and month of birth, birth weight, whether preterm, main childcare, childcare start time, and childcare hours. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. Robust standard errors are shown in parenthesis.

Table 3: Cognitive Skills

Panel A: Cognitive Skills Index

	Cognitive Ability: Composite Index (Std)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 17
LOC (Std)	0.007	0.024	0.022	0.019	0.000	0.026
	(0.016)	(0.017)	(0.015)	(0.017)	(0.018)	(0.019)
Lagged		0.434***	0.587***	0.326***	0.303***	0.236***
		(0.017)	(0.019)	(0.015)	(0.017)	(0.015)
Observations	5395	5197	5431	5314	4988	4850

Panel B: British Abilities Scale and Visual

	BAS				Visual		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Age 3	Age 5	Age 7	Age 11	Age 3	Age 5	Age 7
LOC (Std)	0.017	0.015	0.017	0.021	-0.011	0.026	-0.001
	(0.017)	(0.018)	(0.016)	(0.017)	(0.018)	(0.019)	(0.016)
Lagged		0.329***	0.550***	0.304***		0.300***	0.556***
		(0.016)	(0.019)	(0.016)		(0.019)	(0.016)
Observations	5303	5109	5431	5314	5015	4840	5396

Panel C: Crystallized Ability and Quantitative Ability

	Crystallized					Quantitative	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 3	Age 7
LOC (Std)	0.007	0.010	0.029	0.020	0.000	-0.011	0.040**
	(0.016)	(0.015)	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)
Lagged		0.471***	0.329***	0.277***	0.303***		0.371***
		(0.015)	(0.018)	(0.015)	(0.017)		(0.017)
Observations	5395	5197	5414	5297	4988	5015	4716

Notes: See appendix for a list of variables that are included in cognitive ability index in each wave. All the regressions control for maternal characteristics: marital status, mental health, physical health, level of education, age, age-squared, ethnicity, socio-economic status, whether the interview is conducted in English, reading skills, mathematical skills, whether received fertility treatment, whether had any illness during pregnancy, whether labor induced, and the type of delivery; household characteristics: natural father resident/in contact, number of siblings, number of people in the HH, parental combined labor market status, standardized OECD income score, language spoken at home, and region of residence; and child characteristics: sex, year and month of birth, birth weight, whether preterm, main childcare, childcare start time, and childcare hours. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. Robust standard errors are shown in parenthesis.

Table 4: Academic Outcomes

Panel A: Scores

	Scores					
	English			Mathematics		
	(1) KS1	(2) KS2	(3) KS4	(4) KS1	(5) KS2	(6) KS4
LOC (Std)	0.025**	0.015*	0.006	0.018	0.012	-0.001
	(0.012)	(0.009)	(0.009)	(0.012)	(0.008)	(0.008)
Lagged		0.731***	0.590***		0.730***	0.705***
		(0.011)	(0.010)		(0.009)	(0.008)
Observations	6,938	6,710	6,430	6,938	6,740	6,456

Panel B: Good Score

	Good Score					
	English			Mathematics		
	(1) KS1	(2) KS2	(3) KS4	(4) KS1	(5) KS2	(6) KS4
LOC (Std)	0.007	0.014***	0.004	0.006	0.008	0.008
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Lagged		0.482***	0.413***		0.537***	0.512***
		(0.012)	(0.012)		(0.011)	(0.011)
Observations	7,247	6,852	6,706	6,943	6,764	6,726

Panel C: Attendance

	Unauthorized Absences										
	(1) 2007	(2) 2008	(3) 2009	(4) 2010	(5) 2011	(6) 2012	(7) 2013	(8) 2014	(9) 2015	(10) 2016	(11) 2017
LoC	-0.009	-0.027**	0.025*	-0.039***	0.010	-0.028**	-0.027**	-0.029*	-0.005*	-0.036*	-0.007
	(0.014)	(0.014)	(0.013)	(0.014)	(0.014)	(0.014)	(0.013)	(0.016)	(0.011)	(0.014)	(0.011)
Lagged		0.400***	0.434***	0.394***	0.434***	0.382**	0.294***	0.610***	0.602***	0.463***	0.659***
		(0.062)	(0.046)	(0.037)	(0.040)	(0.037)	(0.039)	(0.078)	(0.052)	(0.0548)	(0.047)
Observations	6,947	6,924	6,907	6,875	6,833	6,810	6,649	6,682	6,649	6,619	6,589

Notes: KS corresponds to Key Stage. KS1 exams are taken at age 7, KS2 exams are taken at age 11 and KS4 exams (GCSEs) are taken at age 16. All the regressions control for maternal characteristics: marital status, health, level of education, age, age-squared, ethnicity, socio-economic status, whether the interview is conducted in English, reading skills, mathematical skills, whether received fertility treatment, whether had any illness during pregnancy, whether labor induced, and the type of delivery; household characteristics: natural father resident/in contact, number of siblings, number of people in the HH, parental combined labor market status, standardized OECD income score, language spoken at home, and region of residence; and child characteristics: sex, year and month of birth, birth weight, whether preterm, main childcare, childcare start time, and childcare hours. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. Standard errors (in parenthesis) are clustered at cohort member level.

Table 5: Correlation of Maternal LoC with Antenatal and Early Life Investment, Beliefs about Parenting, and Attachment

	(1) Antenatal Classes	(2) Alcohol Pregnancy	(3) Tried Breastfeeding	(4) Lenght Breastfeeding	(5) Parenting Beliefs Index (Std)	(6) Attachment Index (Std)
LOC (Std)	0.026**	-0.013*	-0.002	0.169***	0.056***	0.027
	(0.010)	(0.008)	(0.011)	(0.053)	(0.020)	(0.023)
Mean	0.37	0.10	0.77	3.17	0.02	-0.03
Observations	5,889	6,103	6,103	3,790	6,103	6,103

Notes: All outcomes are measured when the CM in the first sweep (9 months old). All the regressions control for maternal characteristics: marital status, mental health, physical health, level of education, age, age-squared, ethnicity, socio-economic status, whether the interview is conducted in English, reading skills, mathematical skills, whether received fertility treatment, whether had any illness during pregnancy, whether labor induced, and the type of delivery; household characteristics: natural father resident/in contact, number of siblings, number of people in the HH, parental combined labor market status, standardized OECD income score, language spoken at home, and region of residence; and child characteristics: sex, year and month of birth, birth weight, whether preterm, main childcare, childcare start time, and childcare hours. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. Robust standard errors are shown in parenthesis.

Table 6: Parental Inputs

Panel A1: Parental Activities

	All Activities (Std)				
	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11	(5) Age 14
LOC (Std)	0.024	0.029	0.030	0.053**	0.028
	(0.019)	(0.022)	(0.020)	(0.021)	(0.022)
Lagged		0.307***	0.440***	0.308***	0.227***
		(0.016)	(0.019)	(0.016)	(0.017)

Panel A2: Parental Activities - Sub-Categories

	Education Activities (Std)				
LOC (Std)	0.053***	0.044**	0.006	0.065***	
	(0.019)	(0.021)	(0.021)	(0.021)	
Lagged		0.259***	0.152***	0.102***	
		(0.017)	(0.018)	(0.014)	
	Recreation Activities (Std)				
LOC (Std)	0.002	0.025	0.046***	-0.024	
	(0.019)	(0.020)	(0.017)	(0.018)	
Lagged		0.241***	0.574***	0.361***	
		(0.016)	(0.015)	(0.015)	
	Parental Discipline (Std)				
LOC (Std)	0.064***	0.008	-0.019	0.044**	
	(0.019)	(0.021)	(0.022)	(0.021)	
Lagged		0.328***	0.156***	0.070***	
		(0.017)	(0.019)	(0.017)	
Observations	5548	5021	4525	4574	4599

Panel B: Home Environment

	Negative Home Environment (Std)				
	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11	(5) Age 14
LOC (Std)	-0.028	-0.028	-0.029	-0.030	-0.010
	(0.024)	(0.021)	(0.019)	(0.022)	(0.019)
Lagged		0.107***	0.249***	0.146***	0.168***
		(0.019)	(0.017)	(0.017)	(0.019)
Observations	5262	4792	4703	4748	4620

Notes: All the regressions control for maternal characteristics: marital status, mental health, physical health, level of education, age, age-squared, ethnicity, socio-economic status, whether the interview is conducted in English, reading skills, mathematical skills, whether received fertility treatment, whether had any illness during pregnancy, whether labor induced, and the type of delivery; household characteristics: natural father resident/in contact, number of siblings, number of people in the HH, parental combined labor market status, standardized OECD income score, language spoken at home, and region of residence; and child characteristics: sex, year and month of birth, birth weight, whether preterm, main childcare, childcare start time, and childcare hours. Home environment measures come from interviewer observations. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. Robust standard errors are shown in parenthesis.

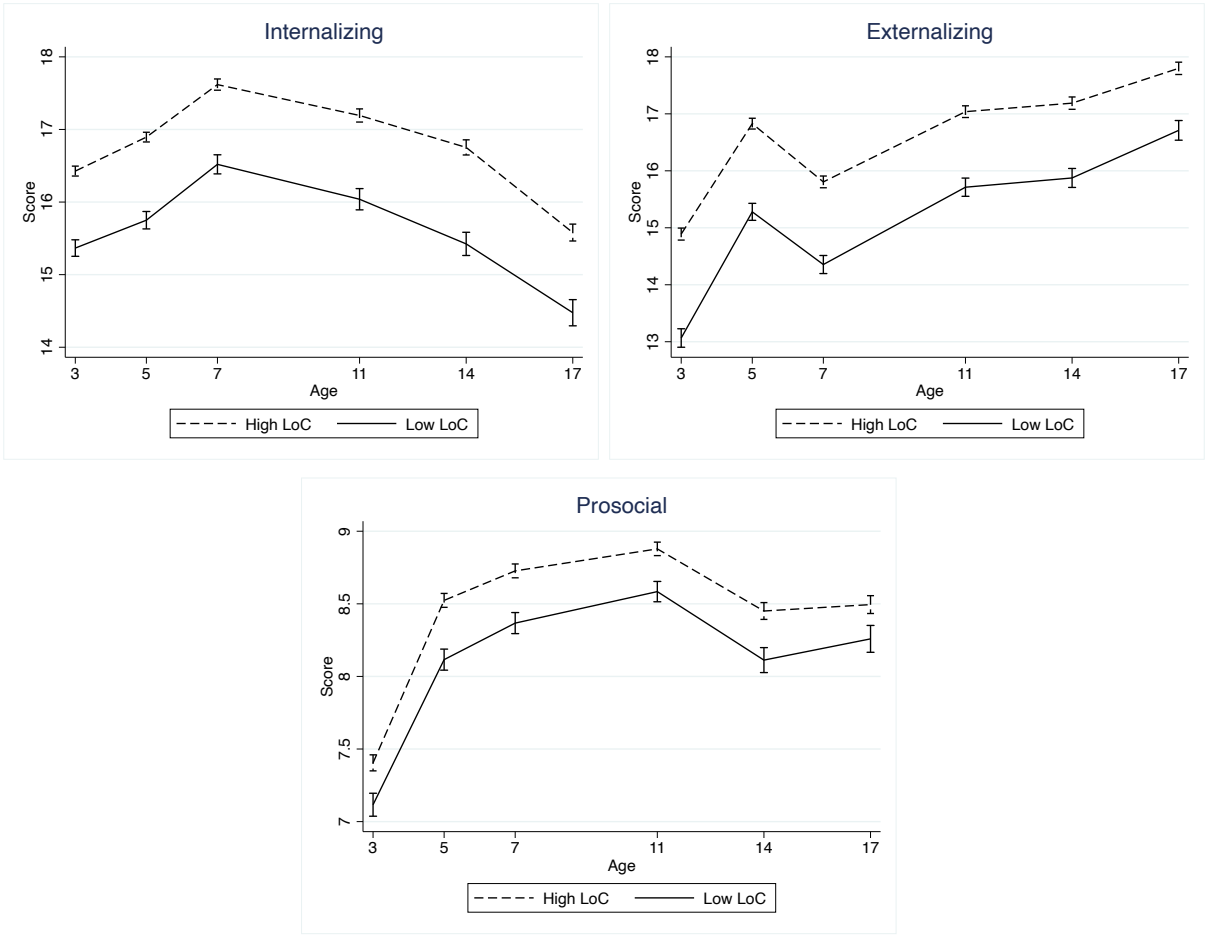
Table 7: Decomposition Analysis:
How Much of the SES Gap in Socio-Emotional Skills is Explained by SES Gradient in Maternal LoC?

	Internal					External					Prosocial				
	(1) Age 5	(2) Age 7	(3) Age 11	(4) Age 14	(5) Age 17	(6) Age 5	(7) Age 7	(8) Age 11	(9) Age 14	(10) Age 17	(11) Age 5	(12) Age 7	(13) Age 11	(14) Age 14	(15) Age 17
overall															
Low_SES	0.053***	0.034*	0.001	-0.020	-0.046**	-0.022	-0.022	-0.028	-0.019	-0.052**	0.001	0.009	0.023	0.029	0.011
	(0.019)	(0.018)	(0.018)	(0.019)	(0.020)	(0.020)	(0.019)	(0.018)	(0.019)	(0.021)	(0.019)	(0.018)	(0.018)	(0.018)	(0.020)
High_SES	0.260***	0.275***	0.226***	0.269***	0.239***	0.416***	0.395***	0.391***	0.376***	0.310***	0.074**	0.035	0.051	0.044	0.036
	(0.026)	(0.026)	(0.029)	(0.029)	(0.031)	(0.026)	(0.026)	(0.026)	(0.029)	(0.028)	(0.031)	(0.032)	(0.031)	(0.034)	(0.035)
Difference	-0.207***	-0.240***	-0.225***	-0.290***	-0.285***	-0.438***	-0.417***	-0.419***	-0.395***	-0.363***	-0.074**	-0.026	-0.028	-0.014	-0.025
	(0.032)	(0.032)	(0.035)	(0.035)	(0.037)	(0.032)	(0.032)	(0.032)	(0.035)	(0.035)	(0.037)	(0.037)	(0.036)	(0.038)	(0.040)
Explained	-0.185***	-0.176***	-0.178***	-0.192***	-0.243***	-0.318***	-0.349***	-0.319***	-0.338***	-0.306***	-0.084***	-0.069***	-0.072***	-0.068***	-0.018
	(0.021)	(0.021)	(0.021)	(0.024)	(0.026)	(0.024)	(0.025)	(0.025)	(0.026)	(0.028)	(0.021)	(0.023)	(0.021)	(0.023)	(0.026)
Unexplained	-0.022	-0.064**	-0.046	-0.098***	-0.042	-0.120***	-0.067***	-0.100***	-0.058**	-0.057**	0.011	0.042	0.044	0.053*	-0.007
	(0.029)	(0.027)	(0.031)	(0.029)	(0.029)	(0.027)	(0.024)	(0.023)	(0.025)	(0.027)	(0.034)	(0.031)	(0.031)	(0.032)	(0.033)
explained															
Lagged	-0.121***	-0.111***	-0.131***	-0.141***	-0.182***	-0.256***	-0.303***	-0.275***	-0.293***	-0.279***	-0.046***	-0.033*	-0.009	-0.019	-0.006
	(0.016)	(0.017)	(0.018)	(0.022)	(0.024)	(0.020)	(0.022)	(0.023)	(0.025)	(0.027)	(0.016)	(0.019)	(0.017)	(0.019)	(0.023)
LOC (Std)	-0.034***	-0.018***	-0.026***	-0.026***	-0.004	-0.027***	-0.016***	-0.016***	-0.013**	-0.004	-0.032***	-0.019***	-0.012**	-0.019***	-0.003
	(0.007)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)
CM: female	-0.000	0.000	-0.000	-0.001	-0.001	-0.002	0.000	0.000	0.000	0.000	-0.002	-0.000	0.000	0.001	0.001
	(0.001)	(0.000)	(0.000)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)
M: age	-0.011	-0.020***	0.000	-0.008	-0.026***	-0.016*	-0.022***	-0.012*	-0.026***	-0.009	0.000	-0.004	-0.033***	-0.021**	-0.009
	(0.010)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.007)	(0.007)	(0.008)	(0.008)	(0.010)	(0.008)	(0.009)	(0.008)	(0.009)
M: white	0.003*	0.001	-0.002	-0.000	-0.001	0.000	-0.001	-0.001	-0.000	0.000	-0.000	-0.001	-0.000	-0.000	-0.001
	(0.002)	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
M: reading	0.003	0.000	-0.000	-0.000	-0.000	0.001	-0.000	-0.000	-0.000	-0.000	0.002	-0.002	0.001	0.001	-0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
M: understanding	-0.006**	-0.005*	-0.004	0.001	-0.007**	-0.004	-0.001	-0.003	-0.001	-0.007**	0.000	-0.001	-0.005	-0.001	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
M: maths	-0.001	0.001	0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.000	0.000	-0.001	-0.000	0.000	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
F: at home	-0.018**	-0.017***	-0.012**	-0.011**	-0.017***	-0.012**	-0.008	-0.011**	-0.007	-0.011**	-0.007	-0.008	-0.012**	-0.009*	0.001
	(0.007)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.005)	(0.005)	(0.005)	(0.007)
London	0.001	-0.006*	-0.003	-0.005	-0.004	-0.002	0.002	-0.002	0.003	0.003	0.002	-0.002	-0.003	0.000	0.002
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	4899	4751	4627	4437	4251	4895	4752	4634	4427	4248	4945	4794	4652	4441	4258

Notes: 'CM' stands for cohort member, 'M' for mother, and 'F' for father. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Appendix Figures

Figure A1: Socio-Emotional Skills Trajectories by Age



Notes: Trajectories of nominal scores of the Strengths and Difficulties Questionnaire across ages 3, 5, 7, 11, 14 and 17.

Appendix Tables

Table A1: LoC unknown vs LoC known

Variable	Unknown Mean/SD	Known Mean/SD	Total Mean/SD	P-value (1)-(2)
M Age	27.982	28.871	28.834	0.005***
	(5.563)	(5.632)	(5.632)	
M Marital: Seperated	0.059	0.030	0.031	0.002***
	(0.236)	(0.169)	(0.173)	
M Marital: Married	0.772	0.574	0.582	0.000***
	(0.420)	(0.494)	(0.493)	
M Marital: Remarried	0.024	0.044	0.043	0.072*
	(0.152)	(0.205)	(0.203)	
M Marital: Single	0.133	0.305	0.298	0.000***
	(0.340)	(0.461)	(0.457)	
M Marital: Divorced	0.006	0.046	0.044	0.000***
	(0.077)	(0.208)	(0.205)	
M Marital: Widowed	0.006	0.002	0.002	0.054*
	(0.077)	(0.039)	(0.041)	
M Health: Excellent	0.231	0.293	0.290	0.014**
	(0.422)	(0.455)	(0.454)	
M Health: Good	0.574	0.528	0.530	0.101
	(0.495)	(0.499)	(0.499)	
M Health: Fair	0.163	0.150	0.150	0.506
	(0.370)	(0.357)	(0.357)	
M Health: Poor	0.033	0.029	0.029	0.704
	(0.178)	(0.168)	(0.168)	
M Qualification: None	0.598	0.163	0.181	0.000***
	(0.491)	(0.370)	(0.385)	
M Qualification: Other	0.175	0.030	0.036	0.000***
	(0.380)	(0.170)	(0.185)	
M Qualification: GCSE	0.130	0.456	0.443	0.000***
	(0.337)	(0.498)	(0.497)	
M Qualification: A-Level	0.038	0.089	0.087	0.001***
	(0.193)	(0.285)	(0.282)	
M Qualification: Diploma	0.012	0.090	0.087	0.000***
	(0.108)	(0.286)	(0.282)	
M Qualification: Degree	0.047	0.172	0.167	0.000***
	(0.213)	(0.377)	(0.373)	
M Ethnicity: White	0.175	0.783	0.759	0.000***
	(0.380)	(0.412)	(0.428)	
M Ethnicity: Black	0.118	0.051	0.054	0.000***
	(0.323)	(0.220)	(0.225)	
M Ethnicity: Asian	0.639	0.141	0.162	0.000***
	(0.481)	(0.348)	(0.368)	
M Ethnicity: White	0.068	0.024	0.026	0.000***
	(0.252)	(0.154)	(0.160)	
M SES: High Mangerial	0.003	0.050	0.048	0.000***
	(0.054)	(0.217)	(0.213)	
M SES: Low Managerial	0.015	0.156	0.150	0.000***
	(0.121)	(0.362)	(0.357)	
M SES: Intermediate	0.018	0.102	0.099	0.000***
	(0.132)	(0.303)	(0.298)	
M SES: Small Employer	0.015	0.025	0.024	0.241
	(0.121)	(0.156)	(0.154)	
M SES: Low Sup/Technic	0.003	0.024	0.023	0.012**
	(0.054)	(0.153)	(0.150)	
M SES: Semi Routine	0.038	0.086	0.084	0.002***
	(0.193)	(0.281)	(0.278)	
M SES: Routine	0.027	0.039	0.039	0.240
	(0.161)	(0.194)	(0.193)	
N	338	7932	8270	
F-test of joint significance (F-stat)				50.243***
F-test, number of observations				8270

Notes: Maternal characteristics (mean and standard deviations) among the subsample for which LoC is unknown, LoC is known, and for the entire sample of mothers. The last column reports the p-value of the difference in mean of each characteristic between the subsamples of mothers with unknown and known LoC.

Table A2: Identifying Variation in LoC

	Mean	SD	Min	Max
Maternal LoC	1.691	0.487	0.000	2.000
net of maternal characteristics	-0.000	0.424	-1.842	1.187
net of household characteristics	0.000	0.420	-1.872	1.223
net of child characteristics	0.000	0.419	-1.881	1.241
N	7,932			

Notes: The first row summarizes our measure of maternal Locus of Control (LoC). Rows 2–4 summarize the residuals obtained by regressing the LoC on: maternal characteristics; plus household characteristics; plus child characteristics, respectively.

Table A3: Correlation of Maternal Locus of Control with Demographic Characteristics

	Internal Locus of Control							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CM Female	0.011							0.009
	(0.022)							(0.021)
Mother's Ethnicity								
Black			-0.421***					-0.362***
			(0.055)					(0.052)
Asian			-0.447***					-0.292***
			(0.036)					(0.037)
Other-Mixed			-0.276***					-0.193**
			(0.082)					(0.078)
Mother's Socio-Economic Status								
Lo manag/prof					-0.072**			-0.015
					(0.032)			(0.033)
Intermediate					-0.278***			-0.116***
					(0.041)			(0.044)
Small emp and s-emp					-0.147**			-0.013
					(0.060)			(0.061)
Low sup and tech					-0.311***			-0.110
					(0.069)			(0.070)
Semi routine					-0.423***			-0.199***
					(0.046)			(0.049)
Routine					-0.546***			-0.305***
					(0.064)			(0.065)
Mother's Education								
GCSE or Other							0.406***	0.267***
							(0.036)	(0.037)
A Level							0.664***	0.461***
							(0.039)	(0.041)
University							0.793***	0.538***
							(0.037)	(0.041)
Observations	7951	7951	7951	7951	7951	7951	7951	7951
R^2	0.000	0.030	0.031	0.049	0.055	0.024	0.063	0.097

Notes: Base level for ethnicity is White, for SES is SES Category 1, for education is None. SES levels are as follows: 1: High Managerial/Professional, 2: Low Managerial/Professional, 3: Intermediate, 4: Small Employer, 5: Low Supervision/ Technical, 6: Semi-Routine, 7: Routine, 8: NA.

Table A4: Decomposition Analysis: Using Grandparents Education To Define Maternal SES

	Internal					External					Prosocial				
	(1) Age 5	(2) Age 7	(3) Age 11	(4) Age 14	(5) Age 17	(6) Age 5	(7) Age 7	(8) Age 11	(9) Age 14	(10) Age 17	(11) Age 5	(12) Age 7	(13) Age 11	(14) Age 14	(15) Age 17
overall															
Low_SES	7.663***	7.187***	6.892***	5.455***	6.478***	5.677***	4.705***	5.149***	5.610***	5.415***	0.008	0.044*	0.039*	0.049**	0.021
	(0.021)	(0.020)	(0.023)	(0.024)	(0.025)	(0.023)	(0.023)	(0.022)	(0.023)	(0.024)	(0.024)	(0.023)	(0.023)	(0.024)	(0.025)
High_SES	7.781***	7.251***	6.965***	5.560***	6.570***	5.814***	4.835***	5.271***	5.732***	5.527***	0.033	0.035	0.083***	0.074**	0.020
	(0.026)	(0.028)	(0.032)	(0.032)	(0.035)	(0.029)	(0.029)	(0.030)	(0.031)	(0.032)	(0.032)	(0.032)	(0.030)	(0.033)	(0.035)
Difference	-0.118***	-0.064*	-0.073*	-0.105***	-0.092**	-0.137***	-0.130***	-0.122***	-0.122***	-0.112***	-0.024	0.009	-0.044	-0.025	0.000
	(0.034)	(0.035)	(0.039)	(0.040)	(0.043)	(0.037)	(0.037)	(0.037)	(0.038)	(0.041)	(0.040)	(0.039)	(0.038)	(0.040)	(0.043)
Explained	-0.099***	-0.097***	-0.063***	-0.039	-0.089***	-0.112***	-0.111***	-0.100***	-0.082***	-0.114***	-0.000	-0.016	-0.013	-0.028	-0.006
	(0.016)	(0.019)	(0.021)	(0.025)	(0.029)	(0.022)	(0.027)	(0.027)	(0.028)	(0.029)	(0.016)	(0.021)	(0.020)	(0.022)	(0.026)
Unexplained	-0.019	0.033	-0.010	-0.066**	-0.003	-0.024	-0.018	-0.022	-0.040	0.002	-0.024	0.025	-0.031	0.003	0.006
	(0.030)	(0.029)	(0.034)	(0.032)	(0.033)	(0.031)	(0.026)	(0.026)	(0.028)	(0.030)	(0.037)	(0.034)	(0.033)	(0.035)	(0.036)
explained															
Lagged	-0.071***	-0.077***	-0.043**	-0.023	-0.065**	-0.093***	-0.104***	-0.090***	-0.076***	-0.104***	0.007	-0.017	-0.003	-0.018	-0.005
	(0.013)	(0.018)	(0.020)	(0.024)	(0.027)	(0.020)	(0.025)	(0.025)	(0.027)	(0.028)	(0.013)	(0.019)	(0.018)	(0.021)	(0.025)
LOC (Std)	-0.013***	-0.006**	-0.010**	-0.009**	-0.005*	-0.009***	-0.006**	-0.004*	-0.004	-0.004	-0.011**	-0.004*	0.002	-0.009**	-0.000
	(0.005)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)	(0.003)
CM: female	-0.000	0.001	-0.001	-0.004	-0.002	0.002	0.003	0.002	0.002	0.001	0.004	0.003	0.003	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.001)	(0.005)	(0.003)	(0.004)	(0.002)	(0.003)
M: age	-0.007**	-0.004*	-0.003	0.001	-0.003	-0.003	-0.005**	-0.001	-0.004*	-0.002	0.002	-0.002	-0.007**	-0.001	-0.001
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
M: white	0.001	0.001	-0.001	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000	-0.001	-0.000	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
M: reading	0.001	0.000	0.000	-0.000	-0.000	0.001	0.000	0.000	-0.000	-0.000	0.001	-0.000	-0.001	0.000	-0.000
	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.002)	(0.001)	(0.000)
M: understanding	-0.002	-0.000	0.000	0.001	-0.000	-0.001	-0.000	-0.000	0.000	-0.001	-0.000	0.001	-0.000	0.000	-0.001
	(0.003)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
M: maths	-0.002	-0.000	0.003	0.001	-0.001	-0.001	0.001	0.001	0.000	-0.000	0.001	0.004	-0.000	0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
F: at home	-0.004	-0.006**	-0.006*	-0.006*	-0.005*	-0.006**	0.001	-0.006**	-0.003	-0.003	-0.003	-0.001	-0.007**	-0.004	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)
London	-0.001	-0.005	-0.002	-0.001	-0.007**	-0.002	0.000	-0.002	0.003	-0.001	0.001	-0.001	-0.001	0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	3137	3056	3007	2920	2663	3137	3056	3007	2920	2663	3137	3056	3007	2920	2663

Notes: This table replicates the decomposition analysis shown in Table 7. In this table, however, maternal SES is defined by the education of the parents of the mother, instead of maternal education. More specifically, a mother is defined to be of a high socio-economic status if one of her parents, who are the grandparents of the cohort member, had a university degree. Note that given the high level of missing information on grandparents education, we imputed the likelihood of having a degree qualification for those with missing information. 'CM' stands for cohort member, 'M' for mother, and 'F' for father. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level.

Table A5: Socio-Emotional Skills - Cumulative VA Model

	Internal				External				Prosocial			
	(1) Age 7	(2) Age 11	(3) Age 14	(4) Age 17	(5) Age 7	(6) Age 11	(7) Age 14	(8) Age 17	(9) Age 7	(10) Age 11	(11) Age 14	(12) Age 17
LOC (Std)	0.039**	0.038*	0.023	-0.015	0.037**	0.021	0.009	0.012	0.045**	0.031	0.049**	-0.003
	(0.018)	(0.021)	(0.021)	(0.022)	(0.016)	(0.015)	(0.017)	(0.019)	(0.019)	(0.019)	(0.020)	(0.022)
MCS2	0.174***	0.077***	0.009	-0.030	0.186***	0.027	-0.001	-0.014	0.130***	0.035**	0.023	0.008
	(0.021)	(0.022)	(0.021)	(0.020)	(0.016)	(0.016)	(0.016)	(0.018)	(0.016)	(0.017)	(0.016)	(0.018)
MCS3	0.436***	0.173***	0.058***	0.063***	0.554***	0.208***	0.081***	0.040*	0.443***	0.156***	0.049**	0.043**
	(0.021)	(0.026)	(0.022)	(0.023)	(0.018)	(0.020)	(0.021)	(0.024)	(0.019)	(0.019)	(0.020)	(0.021)
MCS4		0.426***	0.150***	0.074***		0.515***	0.120***	0.032		0.363***	0.225***	0.064***
		(0.026)	(0.023)	(0.023)		(0.019)	(0.022)	(0.024)		(0.020)	(0.021)	(0.022)
MCS5			0.486***	0.137***			0.581***	0.183***			0.403***	0.198***
			(0.022)	(0.024)			(0.021)	(0.026)			(0.021)	(0.025)
MCS6				0.479***				0.528***				0.414***
				(0.023)				(0.022)				(0.025)
Observations	4554	4247	3805	3233	4554	4247	3805	3233	4554	4247	3805	3233

Notes: All the regressions control for maternal characteristics: marital status, mental health, physical health, level of education, age, age-squared, ethnicity, socio-economic status, whether the interview is conducted in English, reading skills, mathematical skills, whether received fertility treatment, whether had any illness during pregnancy, whether labor induced, and the type of delivery; household characteristics: natural father resident/in contact, number of siblings, number of people in the HH, parental combined labor market status, standardized OECD income score, language spoken at home, and region of residence; and child characteristics: sex, year and month of birth, birth weight, whether preterm, main childcare, childcare start time, and childcare hours. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. Robust standard errors are shown in parenthesis.

Table A6: Socio-Emotional Skills - Nominal Scores

	SDQ - Internal (Std)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 17
LOC (Std)	0.260***	0.207***	0.081	0.119*	0.119*	-0.083
	(0.053)	(0.050)	(0.050)	(0.065)	(0.063)	(0.061)
Lagged		0.425***	0.569***	0.616***	0.620***	0.645***
		(0.020)	(0.022)	(0.021)	(0.018)	(0.016)
Observations	5268	4899	4751	4627	4437	4251

	SDQ - External (Std)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 17
LOC (Std)	0.502***	0.211***	0.133**	0.101*	0.036	0.023
	(0.082)	(0.063)	(0.056)	(0.053)	(0.058)	(0.054)
Lagged		0.494***	0.712***	0.662***	0.686***	0.655***
		(0.014)	(0.014)	(0.013)	(0.015)	(0.014)
Observations	5263	4895	4752	4634	4427	4248

	SDQ - Prosocial (Std)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age 3	Age 5	Age 7	Age 11	Age 14	Age 17
LOC (Std)	0.096**	0.142***	0.090***	0.050*	0.074**	-0.001
	(0.039)	(0.031)	(0.030)	(0.029)	(0.035)	(0.035)
Lagged		0.355***	0.507***	0.447***	0.616***	0.570***
		(0.013)	(0.016)	(0.016)	(0.021)	(0.017)
Observations	5289	4945	4794	4652	4441	4258

Notes: All the regressions control for maternal characteristics: marital status, mental health, physical health, level of education, age, age-squared, ethnicity, socio-economic status, whether the interview is conducted in English, reading skills, mathematical skills, whether received fertility treatment, whether had any illness during pregnancy, whether labor induced, and the type of delivery; household characteristics: natural father resident/in contact, number of siblings, number of people in the HH, parental combined labor market status, standardized OECD income score, language spoken at home, and region of residence; and child characteristics: sex, year and month of birth, birth weight, whether preterm, main childcare, childcare start time, and childcare hours. * denotes significance at 10% level, ** denotes significance at 5% level and *** denotes significance at 1% level. Robust standard errors are shown in parenthesis.

Appendix B: Variables

Table B1: Control Variables

Control Variables
Maternal Characteristics
Marital Status
Physical Health
Mental Health (Rutter Malaise Scale)
Level of Education Acquired
Age
Age-squared
Ethnicity
Socio-Economic Classification
Whether the interview is conducted in English
Reading Skills
Mathematical Skills
Whether Received Fertility Treatment
Whether Had any Illness During Pregnancy
Whether Labor was Induced
Type of Birth Delivery
Household Characteristics
Natural Father Resident/In Contact
Number of Siblings
Number of People in the Household
Parental Labor Market Status Combined
Equalized OECD Income Score
Language Spoken at Home
Region of Residence
Cohort Member Characteristics
Sex
Year and Month of Birth
Birth Weight
Whether Preterm
Main Childcare
Childcare Start Date
Childcare Hours

Table B2: Cognitive Skills Scales by Age

		Crystallized Ability	Visual Processing	Quantitative Knowledge
Age 3	BAS II Naming Vocabulary	x		
	Bracken School Readiness Assessment-Revised	x	x	x
Age 5	BAS II Naming Vocabulary	x		
	BAS II Pattern Construction		x	
	BAS II Picture Similarities			
Age 7	BAS II Word Reading	x		
	BAS II Pattern Construction		x	
	NFER Progress in Maths (adapted)			x
Age 11	BAS II Verbal Similarities	x		
Age 14	APU Vocabulary Test	x		
Age 17	Number Analogies			

Notes: Further information on each of these tests is contained in Moulton et al. (2020). The grouping of tests under the three categories (crystallised, visual and quantitative abilities) is based on the work reported here: https://closer.ac.uk/cross-study-data-guides/cognitive-measures-guide/mcs-cognition/.

Table B3: Content of Age 9 Months Indexes

Parental Beliefs Index
Picked up the baby whenever they cried
baby has regular sleeping and eating times
Importance of stimulation for development
importance of talking
Importance of cuddling
Parental Attachment Index
Feelings of annoyance of irritation with the baby
Thinking about the baby when apart from the baby
Feelings when you leave the baby
Feelings when caring for the baby
Feelings of patience when with the baby
Feelings about giving up things because of the baby
Development Index
Smiles
Sits up
Stands up holding on
Holds hands together
Grabs objects
Holds small objects
Passes a toy
Gives toy
Waves bye-bye
Extends their arms for being picked up
Nodes for yes
Moves from place to place

Table B4: Parental Inputs

		Activity Types			
		All	Educational	Recreational	Parental
Age 3	Freq anyone else read to the child	x	x		
	Freq you read to the child	x	x		
	Freq child taken to library	x	x		
	Freq teach child songs/poems/rhymes	x		x	
	Anyone at home help child to learn sport etc	x		x	
	Freq CM paint/draw at home	x		x	
	Freq help child learn alphabet	x		x	
	Freq at home try to teach child counting	x		x	
	Strictness of parenting style				
	Family has lots/not many rules				x
	Rules strictly/not strictly enforced				x
	CM eats at regular times				x
	How important for family to eat meals together				x
	CM has regular bedtimes				x
	Hours a day child watches tv/videos				x
	Parenting Style				x
Age 5	Freq you read to CM	x	x		
	Freq CM receives help with reading	x	x		
	Freq CM helped with writing	x	x		
	Freq CM helped with maths	x	x		
	Anyone has attended parents evening	x	x		
	Freq tells stories to CM	x		x	
	Freq musical activities with CM	x		x	
	Freq CM paint/draw at home	x		x	
	Freq you play physically active games with CM	x		x	
	Freq play INDOOR games with child	x		x	
	Freq take child to park or playground	x		x	
	Strictness of parenting style				
	Regular bedtime on term-time weekdays				x
	CM eats at regular times				x
	Hours per term-time weekday watching tv/dvd				x
	Hours per term-time weekday playing on computer				x
Age 7	Freq CM receives help with reading?	x	x		
	Freq CM helped with writing	x	x		
	Freq CM helped with maths	x	x		
	Freq tells stories to CM	x		x	
	Freq musical activities with CM	x		x	
	Freq CM paint/draw at home	x		x	
	Freq you play physically active games with CM	x		x	
	Freq play indoor games with child	x		x	
	Freq take child to park or playground	x		x	
	Freq you read to CM	x		x	
	Strictness of parenting style				
	Regular bedtime on term-time weekdays				x
	Rules about hours watching TV				x
	Rules about timed watching TV				x
	Hours per term-time weekday playing on computer				x
Age 11	Freq talks to CM about things inportant to them	x	x		
	Freq anyone at home help with CM's homework	x	x		
	Freq anyone at home make sure CM s HW is complete	x	x		
	Anyone has attended parent evening at CM school	x	x		
	Freq you play physically active games with CM	x		x	
	Freq play INDOOR games with child	x		x	
	Strictness of parenting style				
	Have rules about when CM can watch?				x
	Have rules about what CM can watch?				x
	Regular bedtime on term-time weekdays				x
	Hours per weekday spent watching TV/ videos on computer				x
	Hours per weekday spent on computer or games				x
Age 14	Amount of time spent with CM	x			
	Freq talks with CM	x			

Table B5: Negative Home Environment

Age 3
Noise from tv/radio
Background conversation
Anyone entering/leaving home
Interruptions by another child
Interruptions by another adult
Age 5 to 17
Background noise from conversation
Background noise from other children
Background noise from people entering/leaving room
Background noise from people entering/leaving house
Interruption of cognitive assessment from another child
Interruption of cognitive assessment by an adult