WORKING PAPER NO. 65

Psychosocial Status and Cognitive Achievement in Peru

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Young Lives
An International Study of Childhood Poverty

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First published by Young Lives in December 2010

ISBN: 978-1-904427-71-1

A catalogue record for this publication is available from the British Library.

Available from:
Young Lives
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Oxford OX1 3TB, UK
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Printed on FSC-certified paper from traceable and sustainable sources.

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Abstract

The aim of this paper is to assess the importance of psychosocial status in the accumulation of cognitive skills during the transition from mid to late childhood. We use longitudinal data from a cohort of 700 Peruvian children drawn from a very rich dataset, the Young Lives survey, to test the impact of children's perception of respect at the age of 8 on cognitive achievement four years later, controlling for cognitive skills at the age of 8, lagged child and household characteristics, and community fixed effects. This empirical specification is akin to estimating a conditional demand function for cognitive skills, which deals with some of the main pitfalls of skill endogeneity. We find that poorly respected children are linked to a lower rate of cognitive accumulation than their better-respected counterparts. A child's perception of respect increases later cognitive achievement by about 7 per cent of a standard deviation, a substantial effect given the marginal contribution of other cognitive determinants. As expected, we also find that previously accumulated cognitive skills enable higher subsequent cognitive skill accumulation. We go one step further by testing and finding evidence of complementarities across skills. We show that cognitive differences amplify over time between children with low and high psychosocial skills. Overall, our results suggest that psychosocial status, an aspect little studied in the context of developing countries, plays an important role in the acquisition of cognitive skills during childhood.

Keywords: Child development, Psychosocial status, Cognitive skills, Non-cognitive skills

JEL classification: J13, 015

Acknowledgements

Jere Behrman, Laura Camfield and Santiago Cueto provided helpful comments on an earlier draft. All remaining errors are our responsibility.

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About Young Lives

Young Lives is core-funded from 2001 to 2017 by UK aid from the UK Department for International Development (DFID) for the benefit of developing countries, and co-funded by the Netherlands Ministry of Foreign Affairs from 2010 to 2014. Sub-studies are funded by the Bernard van Leer Foundation, the Inter-American Development Bank (in Peru), the International Development Research Centre (in Ethiopia), the Oak Foundation.

1. Introduction

Although long understood by other disciplines, it is only recently that economists have begun to view the accumulation of human capital as a complex, multidimensional process whereby different types of skills are shaped over time through parental investments and environmental factors. Examining the role of psychosocial competences in the process of human capital formation is an essential task in this setting. Recent empirical research highlights the importance of personality traits such as perseverance, self-control and self-esteem in determining both educational attainment and labour market outcomes (Cunha and Heckman 2008; Feinstein 2000; Heckman et al. 2006; Duncan et al. 2004; Bowles et al. 2001, Carneiro et al. 2006). These results suggest that psychosocial skills may play an important role in the accumulation of human capital.

In this paper, we assess the role of psychosocial competencies in the formation of cognitive skills during the childhood period, specifically in the transition from mid to late childhood. To assess this relationship, we follow a standard human capital accumulation approach, whereby current and past cognitive inputs are combined to produce cognitive skills. In such a framework, past psychosocial skills can be treated as an input in the production of cognitive skills. The aim of the paper is twofold: we first seek to test the effect of psychosocial skills on cognitive skill accumulation; and secondly, investigate the existence of complementarities across skills.

We test these concepts empirically using data from a cohort of 700 Peruvian children drawn from the Young Lives survey. The longitudinal dimension of the study allows us to observe each child twice, first at the age of 8 and again at the age of 12. Firstly, we estimate the impact of cognitive and psychosocial skills at the age of 8 on cognitive skills four years later, controlling for child, household and community characteristics. This empirical specification, which can be derived from the skills formation model proposed by Cunha and Heckman (2008), is akin to the estimation of a conditional demand function for cognitive skills, whereby child, household and community characteristics act as determinants of cognitive inputs.

Secondly, we explore the existence of skill complementarities. In particular, we test whether psychosocial status plays an additional role in the formation of cognitive skills by enhancing the returns to previously accumulated cognitive skills. For this purpose, we use both parametric and semi-parametric methods. We first apply differencing methods, as in Yatchew (1998), to allow for a non-parametric relation between cognitive and non-cognitive skills at the age of 8 and cognitive achievement four years later. As a robustness check, we augment our main parametric model to allow for non-linearities in the returns to skill as well as interactions across skills.

In our empirical specifications, we use the Peabody Picture Vocabulary Test (PPVT) and Raven's Progressive Matrices test scores as indicators of current and past cognitive skills respectively, and a child's perception of respect as an indicator of past psychosocial skills. Our so-called 'Respect' variable, is based on a child's response to the question: *Do you think people in this area treat you well or badly?* We interpret the answer as a subjective assessment of the child's sense of inclusion and respect in their local community, which is the result of the continued interplay between the child's innate character and life experiences, as well as the social and material environmental conditions – in the home, school and neighbourhood – the child has been exposed to over his lifetime. We show evidence that confirms this indicator is correlated to measurements of self-esteem and perceptions of respect four years later, suggesting that 'Respect' captures a 'real' psychosocial attribute of the child and that this personal trait is stable over time.

The fact that our psychosocial indicator was measured at an early age works to our advantage. Based on the insights of child development literature that suggest feedbacks from cognitive skills to psychosocial skills only start at later ages (Thompson and Nelson 2001), we can rule out the possibility that a child's poor psychosocial status at the age of 8 is the result of early revelations of her own poor innate cognitive ability.[1]

The longitudinal aspect of the Young Lives dataset allows us to estimate a model where skills and other confounding characteristics are measured four years before the cognitive tests are administered. This set-up rules out simultaneity bias, a major endogeneity concern. Another key advantage of the Young Lives survey is that it provides a wealth of information on parental behaviour and attitudes usually unobserved in other samples. By expanding our model specification to account for these dimensions, we reduce the remaining endogeneity bias.

Our empirical findings can be summarised as follows. Firstly, estimates of our main model specification suggest that a child's perception of respect has a large and significant effect on the accumulation of cognitive skills four years later. We find that, keeping other factors constant, a one standard deviation increase in 'Respect' improves later cognitive achievement by about 7 per cent of a standard deviation – a substantial effect given the marginal contribution of other cognitive determinants.

Secondly, we find our baseline estimates to be robust to the inclusion of a large number of additional controls, indicating that endogeneity bias might have been modest in the first place. Both the significance and magnitude of the effect of respect remain stable after adding as controls indicators of parental investments and household environment (of both a cognitive and non-cognitive nature), among other factors.

Thirdly, we not only find estimates of the impact of 'Respect' to be robust, but analysis of its determinants suggests that few of the variables important in the determination of cognitive outcomes are important in the determination of 'Respect' itself. Arguably if unobservables follow a similar pattern to observables, this evidence would suggest that any remaining unobservables in the cognitive equation are likely to be only weakly correlated with our measure of respect. On balance, we believe that our estimates of the cognitive effect of 'Respect' are subject to only modest endogeneity bias.

Finally, applying semi-parametric methods, we explore the existence of non-linearities in skill accumulation as well as skill complementarities. On the one hand, we find that returns to early cognitive investments are concave. On the other hand, poorly respected children not only have lower rates of return in the accumulation of cognitive skills, but the onset of concavity takes place at lower levels of cognitive achievement. In other words, the benefits of early cognitive investments appear to be dampened by the negative effects of psychosocial disinvestments. This evidence is also corroborated when we apply more standard parametric models.

The paper contributes to the growing literature on the role of non-cognitive skills in the accumulation of human capital (Cunha and Heckman 2008; Heckman, Stixrud and Urzua 2006; and Helmers and Patnam 2009). In their landmark paper, Cunha and Heckman (2008) estimate the parameters of the production function of cognitive and non-cognitive skills in a

1 Recent evidence in the literature on human capital formation (Cunha and Heckman 2008) provides empirical support for this assumption.

structural system of equations which allows for self-productivity and skills complementarities, applying a latent factor approach to correct for imperfect measures of accumulated skills.

Their analysis uncovers a positive linkage from non-cognitive to cognitive skills and later labour market outcomes for a cohort of children in the United States. Our results resemble those obtained by Cunha and Heckman. However, to the best of our knowledge, this paper is the first to quantify the strength of this channel of cognitive development in the context of a developing country.[2]

We consider that the mapping of cognitive inputs available in our dataset – and, to some extent, in most of longitudinal surveys available – is not sufficient to warrant the consistent estimation of the parameters of the production function. We therefore follow Glewwe and King (2001) and Glewwe and Miguel (2008) and estimate a conditional demand function, using child, household and community characteristics as determinants of the missing cognitive inputs.

Although we are unable to implement the latent factor methodology with our data, the conditional demand function approach allows us to exploit the unique wealth of information available in the Young Lives survey. By controlling for otherwise typically unmeasured determinants of cognitive investments, we are able to reduce to a minimum the remaining bias due to unobserved heterogeneity.

A further contribution of this paper is that we test and find evidence in support of the existence of skill complementarities. Our semi-parametric method establishes that cognitive returns to early cognitive skills are enhanced when early psychosocial skills are high, beyond the effect of other confounders. This is consistent with Heckman, Stixrud and Urzua (2006), who find evidence of skill complementarities on US labour market outcomes applying a latent factor methodology.

The remainder of this paper is organised as follows. Section 2 presents our theoretical and empirical framework. Data issues and sample characteristics are discussed in Section 3. In Section 4, we present our main empirical results evidence on the cognitive effect of psychosocial skills. We also discuss a number of robustness checks. Section 5 discusses our findings on complementarities across cognitive and non-cognitive skills, while Section 6 provides an assessment on the relative importance of different determinants of cognitive achievement. Finally, Section 7 offers conclusions.

2. Theoretical and empirical framework

2.1 Theoretical framework

To set up ideas, we sketch a standard human capital model where parents invest in a child subject to preferences, budget constraints and initial conditions – that is, child and household exogenous characteristics. Our interest lies in understanding the effect that psychosocial

2 Recent work by Helmers and Patnam (2009) implements a production function approach – not dissimilar from Cunha and Heckman (2008) – using Young Lives data from India. However, their findings provide little support for linkages from non-cognitive to cognitive skills.

skills might have on the acquisition of later cognitive skills. Accordingly, we follow Cunha et al. (2005) and Cunha and Heckman (2008) and formalise the production of cognitive skills in the following way:

$$s_t^c = f^c(s_{t-1}^c, s_{t-1}^{ps}, I_t^c) \quad (1)$$

where I_t^c denotes cognitive inputs in period t, s_{t-1}^c, s_{t-1}^{ps} are the stocks of cognitive and psychosocial skills accumulated in the previous period, respectively, and $t = 1,...,T$. It is assumed that the child is born with an endowment of skills, which we denote as s_0^c and s_0^{ps}, respectively. Thus the stock of cognitive skills at any point in time is a function of innate skills and the history of cognitive inputs. An analogous equation can be defined for the production of psychosocial skills in period *t*,

$$s_t^{ps} = f^{ps}(s_{t-1}^c, s_{t-1}^{ps}, I_t^{ps}) \quad (2)$$

where I_t^{ps} denotes psychosocial inputs. Equations (1) and (2) are built on the assumption that both cognitive and psychosocial skills are self-reinforcing over time (see Cunha et al. 2005). Naturally a substantial part of the set of cognitive and non-cognitive inputs will be determined by parental choices. For simplicity, the optimal allocation of inputs can therefore be modelled as a maximisation problem faced by the household. In particular, consider the situation where parents face a trade-off between own consumption (C_t) and investing in child skills (I_t^c and I_t^{ps}) for all $t = 1,...,T$ at prices P_c **,** P^{ic} and P^{ips} respectively, subject to initial level of wealth (W_0).

The household derives utility from own consumption as well as from investing in the child. The latter can happen either in the form of a future transfer – once the child starts earning a wage in the labour market – or in a purely altruistic way, i.e., when parents derive pleasure from raising intelligent, highly motivated children. For simplicity, we focus on the latter case only. Household utility can be then defined as:

$$u = g(C_t,...,C_T; s_t^c,...s_T^c; s_t^{ps}...s_T^{ps}) \quad (3)$$

Assuming f^c, f^{ps} and u satisfy the usual regularity conditions, the maximisation process yields optimal allocations for consumption and investments – denoted as C_t^*, I_t^{c*} and I_t^{ps*} for all $t = 1,...,T$ – that are a function of prices, initial wealth and child and household exogenous characteristics.

2.2 Empirical framework

The primary aim of the paper is to analyse the relationship between cognitive skills and previously accumulated cognitive and non-cognitive skills. However, the consistent estimation of the parameters of the production function – equation (1) – is notoriously problematic (see, for example, Glewwe and King 2001; Todd and Wolpin 2003; Todd and Wolpin 2004; and Glewwe and Miguel 2008). Empirically, the main problem is that any unobserved cognitive input could lead to an omitted variable bias in the estimation of the parameters of the technology. Unless a near-perfect mapping of cognitive inputs (I_t^c) is available, the estimation of equation (1) by ordinary least squares (OLS) is otherwise likely to be biased. This is a requirement that few samples are likely to meet, particularly when considering parental investments in the home environment (Glewwe and King 2001).

Even though our data fails in this account, we can still consistently estimate the relationship between lagged skills and current cognitive skills by replacing the set of cognitive investments, I_t^c, in equation (1) with its determinants. In doing so, we estimate a demand function for cognitive skills conditional on previously lagged skills,

$$s_t^c \mid s_{t-1}^c, s_{t-1}^{ps} = g^c(s_{t-1}^c, s_{t-1}^{ps}; X_{t-1}) \qquad (1')$$

where vector X_{t-1} includes household wealth and, more generally, child, household and community characteristics that affect the rate of returns of parental investments devoted to educate the child.

Although equations (1) and (1’) both estimate the cognitive effect of previously cumulated lagged skills, the interpretation of the parameters differs in some crucial respects. To illustrate, consider the relationship between lagged psychosocial skills and current cognitive skills. Equation (1) measures the technological relationship between these two variables through biological or mental processes. On the other hand, equation (1') incorporates both the biological effect as well as adjustments in cognitive investments allocated by the parents as a consequence of the initial increase in lagged psychosocial skills. For instance, some parents might choose to invest more in educating a child as a consequence of an exogenous improvement in lagged psychosocial skills.

Additionally, although specification (1') does not allow us to isolate the technological relationship from the behavioural adjustments, the results arising from the specification are all that matters from a policy point of view. That is, if a government were to implement a programme to enhance child cognitive skills, by virtue of including both the behavioural as well as the biological effect, equation (1'), not (1), measures the net effect of the policy on ensuing cognitive achievement. Hence the term 'policy effect' coined by Todd and Wolpin (2004) in reference to equation (1').

2.3 Econometric specifications

Following the above discussion, we approximate equation (1') by estimating the following econometric specification,

$$s_{it}^c = \beta_1 s_{it-1}^c + \beta_2 s_{it-1}^{ps} + X_{t-1}\delta + u_{it} \qquad (1'')$$

where β_1 and β_2 measure the cognitive returns to lagged cognitive and psychosocial skills. The parameters sign the so-called own- and cross-demand elasticities for cognitive skill, respectively.

Estimates of β_1 and β_2 in (1’’) will be subject to biases if lagged skill variables are correlated with the error term (u_{it}). Unobservable determinants of cognitive inputs – in particular, heterogeneity in parental preferences for child skills, as well as child heterogeneity – are likely to lead to endogeneity problems in this set-up. In Section 4, we discuss in detail how we deal empirically with these possible sources of endogeneity.

Besides estimating the sign of the skill elasticities, we use (1'') as a basis to investigate the existence of skills complementarities. In particular, we test whether the value of β_1 remains constant for different ranges of psychosocial skills accumulated up to period t-1. Since we anticipate significant non-linearities in the impact of lagged cognitive skills on current cognitive skills, we follow a two-prong strategy. Firstly, we apply semi-parametric estimation techniques, where we allow for a non-parametric relation between both lagged cognitive and non-cognitive skills and cognitive skill attainment four years later. For this purpose, we apply differencing methods developed by Yatchew (1998), which we describe in more detail in Section 5. Secondly, we check for the robustness of the non-parametric analysis employing standard parametric methodologies. On the one hand, we re-estimate equation (1'') for different quartiles of cognitive skill distribution in (t-1) separately. On the other hand, we augment the model specification (1'') by allowing interaction effects between cognitive and psychosocial measures. To allow for non-linearities and interaction effects, we replace the continuous measure of cognitive skills in (t-1) with quartiles dummies.

$$s_{it}^{c} = \sum_{j=1}^{3} Q_j s_{it-1}^{c} + \sum_{j=1}^{3} \lambda Q_j s_{it-1}^{c} * s_{it-1}^{ps} + \delta X_{t-1} + u_{it} \qquad (4)$$

where $Q_j S_{it-1}^{c}$ refers to the quartile dummies of the cognitive skills in period (t-1).

3. Data issues

In our analysis, we make use of the Young Lives Peru survey, a longitudinal sample of children. The survey includes information on a cohort of children and their families for two survey waves: the baseline round in 2002, when the younger cohort children were aged 7 to 8, and a first follow-up four years later (2006-2007), when they were 11-12 years of age.[3] The sample is cluster stratified, with 20 districts randomly selected across the country. The baseline survey sampled 714 children, but only 685 were traced and re-interviewed in the second round.[4,5]

In what follows, we present and discuss the characteristics of the selected psychosocial indicator and of the cognitive measure used in this paper. We then report key characteristics of the data relevant to our analysis.

3.1 The psychosocial indicator

Different psychosocial indicators can be constructed using data from the Young Lives survey. In particular, data collected in 2006 allows us to construct indexes of child competencies in the areas of self-efficacy, self-esteem and sense of inclusion. Recent work by Dercon and Krishnan (2009) discusses the validity of these indicators. Unfortunately, these indexes are not available for the first round of data. Instead, we use information collected on children’s perceptions of respect as our indicator of psychosocial skills accumulated up to the age of 8.

Specifically, we use answers to the question ‘*Do you think people in this area treat you well or badly?*’ to construct our psychosocial indicator. Our ‘Respect’ variable is thus a binary variable that takes the value of one if the child feels poorly respected in his or her local area and zero otherwise. We interpret the answer as a subjective assessment of the child’s sense of inclusion and the appreciation he or she receives in their local area. We see this attribute as the result of the continued interplay between their innate character and life experiences, as well as the material and environmental conditions – in the home, school and neighbourhood – they have been exposed to over her lifetime.

While it is unusual to use a psychosocial indicator based on one item – when, typically, psychological tests are constructed on the basis of respondents’ answers to a number of statements – we find justification for this approach on the following basis.

3 The Young Lives project collects information on two separate cohorts of children: a Younger Cohort (aged 6-24 months in 2002) and an Older Cohort (aged 7-8 years in 2002). For our analysis, we only use the Older Cohort.

4 See Escobal et al. (2003) for a more detailed description of the sample design.

5 Attrition is relatively small by international standards, accounting for 4.1 per cent of the initial sample. A recent assessment suggests that Young Lives attrition is mostly a random phenomenon (Outes-Leon and Dercon 2008), although attrition on unobservables cannot be ruled out.

Firstly, we observe that perceptions of respect vary substantially among children living in the same community, as well as among children of the same socioeconomic status (see Figures A1 and A2 in Appendix A).[6] The observed within-community variation suggests that perceptions of respect are not just purely determined by geographical location and the quality of the neighbourhood. At the same time, variation within socioeconomic groups shows that the perceptions are not necessarily linked to socioeconomic status, since even children from the highest deciles perceive themselves as poorly respected. This supports the idea that our psychosocial indicator measures a specific child attribute.

Secondly, when we correlate against the aforementioned Round 2 psychosocial indexes, we find that 'Respect' captures a psychosocial attribute that is consistent over time. Table 1 shows that perceptions of respect at the age of 8 (expressed in negative terms, i.e., the score is higher when the child perceives themselves to be poorly respected), significantly correlates with self-esteem and sense of inclusion as well as self-efficacy four years later (which in turn are expressed in a positive way, so that a higher score is desirable). In particular, 'Respect' correlates highly with items measuring aspects related to pride and shame (e.g., 'I am ashamed of my clothes', 'I am ashamed of my shoes', 'I am worried that I don't have the correct uniform', 'the job I do makes me feel proud') and perceptions of respect at school (e.g., 'other pupils in my class tease me at school', 'the other children in my class treat me with respect'). We take particular comfort from the fact that 'Respect' is strongly correlated with the 'sense of inclusion' index. While not surprising, as the questions included in this index are designed to measure perceptions of respect and social inclusion, thus making the index conceptually similar to our variable 'Respect', it provides strong support for the stability of the measured child attribute.

Table 1. *Correlations between child perception of respect at 8 years and psychosocial indicators measured at 12 years*

Indicator	Items	Pairwise correlation with Respect	
Self-efficacy		**-0.07**	*****
AG1	If I try hard I can improve my situation in life	-0.06	
AG3	I like to make plans for my future studies and work	-0.03	
AG4	If I study hard at school I will be rewarded by a better job in future	-0.07	*
Sense of inclusion		**-0.10**	******
SD1	When I am at shops/market I am usually treated by others with fairness and with respect	-0.07	*
SD2	Adults in my community treat me worse than other children my age (inverted)	-0.01	
SD3	The other children in my class treat me with respect	-0.07	*
SD4	Other pupils in my class tease me at school (inverted)	-0.11	***
SD5	My teachers treat me worse than other children (inverted)	0.03	
Self-esteem		**-0.14**	*******
PS1	I feel proud to show my friends or other visitors where I live	-0.01	
PS2	I am ashamed of my clothes (inverted)	-0.11	***
PS3	I feel proud of the job done by the head of household	-0.02	
PS4	I am often embarrassed because I do not have the right books, pencils or other equipment for school (inverted)	-0.07	*
PS5	I am proud of my achievements at school	-0.05	
PS6	I am embarrassed by/ashamed of the work I have to do (inverted)	-0.14	*
PS7	I am ashamed of my shoes (inverted)	-0.13	***
PS8	I am worried that I don't have the correct uniform (inverted)	-0.08	**
PS9	The job I do makes me feel proud	-0.18	**

Asterisks denote that correlations are significant at 10% (*), 5% (**) and 1% (***), respectively.

6 Figure A1 in Appendix A shows mean and variation of 'Respect' across communities ordered according to their position in the Peru official poverty map. Figure A2 shows analogous information by wealth deciles.

A limitation of our methodology is that, on the basis of our chosen indicator, we are equipped only to infer correlations between one specific psychosocial dimension and the accumulation of cognitive skills. In practice, it could be the case that other psychosocial dimensions are significantly more important than perception of respect in terms of cognitive impact.

Another, more conceptual, limitation lies in the validity of our indicator; the fact that we cannot be sure the question is measuring what it is supposed to measure. While a formal validation of the indicator is beyond the scope of this paper, it is important to note that the psychosocial indicators at the age of 12 to which 'Respect' is significantly correlated (Table 1) are adapted versions of psychological tests, some of which have been extensively validated in the literature (see Dercon and Krishnan 2009). The fact that 'Respect' correlates well with validated psychosocial indicators suggests that it does indeed measure a specific psychosocial attribute.

3.2 Cognitive indicator

To measure the cognitive impact of our selected psychosocial indicator, we use the Peabody Picture Vocabulary Test (PPVT) standardised scores as a measure of cognitive skills accumulated up to the age of 12.[7] The PPVT is a test of receptive vocabulary. Children were asked to select from four pictures that which best represented the meaning of a word presented to them orally by the enumerators. The number and the level of difficulty of questions differ according to child's age (see Cueto et al. 2009 for details of the test and its properties).

It is worth discussing a number of data issues of this – our main outcome variable. First, the PPVT being a picture-vocabulary test, concerns could be raised regarding the validity of the tests when administered to those whose mother tongue is not Spanish, such as Quechua, Aymara and Amazonic languages. Even though respondents were given the option to carry out the test in their native languages – the test was offered in Quechua and Spanish, Quechua being the largest minority language – it is not unreasonable to think that some of the words in the test might not necessarily be familiar to children coming from minority ethnic groups, which implies a potential bias in the result.[8] However, it is particularly difficult to assess whether the fact that native Spanish speakers perform better than non-native Spanish speakers can be considered to be a sign of cultural bias or a sign of the poverty experienced by minorities and its subsequent effect on cognitive skill accumulation. We cannot reject any of these hypotheses. Our analysis addresses the issue in two ways: firstly, our results control for the native tongue of the child; secondly, we carry out robustness checks by re-estimating our baseline empirical model for the sub-sample of native Spanish speakers only.

A second concern is that the PPVT might suffer from censoring. According to its design, the PPVT standardised score can only take values between 55 and 150. While there is little evidence of top-censoring, there is a large clustering of children reporting a score of 55 (see Figure A3 in Appendix A). The test will therefore fail to discriminate between low-achievers, i.e., there might be differences in the ability and/or in the word knowledge of children who score 55, but we cannot see these because of the design of the test. Due to this inability to discriminate, estimates based on censored variables can suffer from potential bias. We

7 Specifically, the Young Lives survey administered the Hispanic version of the PPVT-R.

8 As Champion et al. (2003) point out, 'word knowledge is defined by cultural experience'. Also, it is possible that caregivers might have chosen to let the children do the test in Spanish for honour or status reasons, putting their non-native Spanish-speaking children at a greater potential disadvantage.

report two types of results: OLS results excluding all children with a PPVT score of 55 and censoring-corrected regression results (Tobit model) using data from the whole sample.

3.3 Data characteristics

Table 2 reports summary statistics for a number of key variables. Overall, the sample is a relatively poor one: households are constituted on average by more than five members; children generally have height-for-age z-scores close to stunting (defined by a value of –2); 16 per cent are involved in child work at the age of 8; and 27 per cent are non-native Spanish speakers.

Table 2 also shows that almost one in five, or 109, children have a perception of being poorly respected in their local area. Comparisons between well- and poorly respected children illustrate the differences between the two groups. Poorly respected children live in larger households with lower scores in the wealth index and less-educated caregivers. They are also more likely to belong to a minority community and are less likely to have enrolled in pre-school. However, as mentioned before, these differences are not as large as one would have expected.

It is also noteworthy that poorly respected children constitute a substantial percentage in all socioeconomic groups, even among those children positioned in the highest socioeconomic status (see Figure A2 in Appendix A). This matters empirically, as it raises the issue of common support. In other words, it indicates that any comparisons between well- and poorly respected children will include children from both relatively poor and relatively rich households. This feature will later allow us to disentangle the cognitive effect of material living circumstances from the cognitive effect of perceived respect.

Table 2. *Descriptive statistics, well- vs. poorly respected children*

	All	Well-respected	Poorly respected
% of poorly respected children	0.188	-	-
Child's characteristics			
Average PPVT score, Round 2	97.646	99.136	91.220***
Average height-for-age z-score, Round 1	-1.326	-1.310	-1.396
Average Raven's test, Round 1	21.332	21.417	20.963
% enrolled in pre-school	0.889	0.906	0.817**
% involved in child work	0.159	0.149	0.202
% of male	0.458	0.453	0.477
Average age (in years), Round 2	12.322	12.325	12.311
Household's characteristics (Round 1)			
Average household size	5.617	5.453	6.321***
Average caregiver's years of education	7.584	7.726	6.972***
% of caregivers without a partner	0.180	0.177	0.193
% of caregivers that are non-native Spanish speakers	0.271	0.245	0.385***
Average wealth index	0.524	0.534	0.482***
Number of observations	**579**	**470**	**109**

Note: *, ** and *** in Column 3 imply that differences in mean between well- and poorly respected children are significant at 10%, 5% and 1%, respectively. All variables reports, except PPVT score (Round 2), are measured in Round 1. Sample size according to data availability and restricted to PPVT values above 55 – bottom censoring.

Differences in cognitive skills and nutritional investments up to the age of 8 between the two groups appear to be only marginal. Poorly respected children tend to be shorter and do less well in the Raven's test, but differences are not significant (see Table 2). However, differences in PPVT measured at the age of 12 appear to be substantial. Poorly respected children obtain a significantly lower score - on average, nine points below their well-respected counterparts. Uncovering how much of this difference in cognitive achievement is explained by other confounders and how much can be causally allocated to poor psychosocial investments is the aim of our empirical exercise. However, it is interesting to note that cognitive differences between well- and poorly respected children are significant at the age of 12, but not at the age of 8, suggesting that the effect of psychosocial skills on the accumulation of cognitive skills might only materialise at an older age.

4. The cognitive effect of respect

To test the role of psychosocial competencies in later acquisition of cognitive skills, we regress cognitive skills (s^c_{it}) – as measured by the PPVT at the age of 12 – on a range of household and child characteristics measured four years earlier, including skills accumulated in the previous period,

$$s^c_{it} = \beta_1 s^c_{it-1} + \beta_2 s^{ps}_{it-1} + X_{t-1}\delta + u_{it} \qquad (5)$$

where s^c_{it-1} refers to the Raven's test score as a measure of cognitive skills accumulated up to the age of 8 – in period ($t-1$); s^{ps}_{it-1} stands for a child's self-reported perception of respect, our selected psychosocial indicator; and the vector X_{t-1} stands for child, household and community characteristics that can act simultaneously as either inputs or determinants of the rate of investment in child cognitive development.

Model estimates based on equation (5) address some of the main aspects of potential endogeneity bias. We avoid contemporaneous reverse causation by using explanatory variables measured four years before the dependent variable. Also, since the psychosocial indicator was measured at an early age, it is unlikely to be the result of early feedbacks from cognitive to non-cognitive skills. The child development literature suggests that, while the critical stages of brain development happen during early childhood, the development of higher functions – such as social functioning, self-control and other non-cognitive capacities – extend well into the teenage years (see, for example, Thompson and Nelson 2001 and Grantham-McGregor et al. 2007). Additionally, recent empirical evidence in Cunha and Heckman (2008) provides support for this hypothesis. Cunha and Heckman estimate the parameters of the cognitive and non-cognitive production functions and find that, while early childhood non-cognitive skills affect later cognitive attainment, higher early cognitive skills do not appear to effect a significant increase in the child's psychosocial status in later stages of childhood. In our setting, we can therefore rule out the possibility that a child's poor psychosocial status at the age of 8 might be the result of early revelations of their own poor cognitive ability.

Additionally, while certainly an important measure of cognitive attainment, the Raven's test may not be a perfect measure of cognitive skills. In order to address concerns that components of cognitive skills not captured by the Raven's test might be correlated with our psychosocial variable – i.e., a deficient early cognitive performance might reduce child perception of respect – we expand the set of cognitive skills controls to include further variables on educational attainment and school performance. Finally, we include an extensive set of control variables in X_{t-1} aimed at reducing the possibility of any remaining unobservables (u_t) being correlated with our measures of past skills.

Table 3 reports our baseline estimates of equation (5). Column A controls for a core set of Round 1 child and household characteristics. Beyond the two measures of skill – perceptions of respect and Raven's test score – it includes, among others, information on child's nutrition and health and parents' education, as well as household composition, household consumption per capita and socioeconomic status. As a robustness check, Column B expands the set of cognitive skill controls to include age of school enrolment and current school grade, as well as reading and writing skills at the age of 8. Additionally, in Columns C and D, we address concerns of language and cultural biases in PPVT scores by replicating the models in Columns A and B for children that are native Spanish speakers only. Finally, Column E reports Tobit estimates – of model A – that eliminate potential OLS biases due to bottom-censoring of PPVT scores.[9,10]

Table 3 shows that both the stock of cognitive and non-cognitive skills has a significant effect on PPVT test scores four years later. These results are robust to both the expansion of the set of cognitive skill controls as well as the restriction of the sample to native Spanish speakers. Similarly, controlling for censoring bias does not alter the results.

Table 3 also provides interesting insights into other determinants of cognitive achievement. Here again, results are robust to changes in the vector of controls, sample restrictions and estimation methods. Specifically, we find a child's long-term nutritional status (height-for-age), writing skills, school grade, birth order, household size and service index all to be important determinants of PPVT scores.

Table 3. *Determinants of cognitive achievement, Round 2*

	OLS full sample		OLS – only Spanish speaker		Tobit full sample
	A	B	C	D	E
Poorly respected, Round 1	-4.296** (0.012)	-3.744** (0.024)	-4.622*** (0.007)	-4.049** (0.016)	-5.276*** (0.005)
Raven's test, Round 1	0.401*** (0.008)	0.333** (0.022)	0.417*** (0.009)	0.341** (0.028)	0.537*** (0.000)
Height-for-age z-score, Round 1	1.922*** (0.006)	1.423* (0.070)	1.977*** (0.007)	1.443* (0.081)	1.743** (0.031)
Child attended pre-school	2.002 (0.292)	1.360 (0.420)	1.926 (0.315)	1.348 (0.433)	0.616 (0.802)
Child's Work in last year, Round 1	-0.622 (0.685)	-1.549 (0.325)	-0.410 (0.816)	-1.326 (0.457)	-0.448 (0.828)
Child's sex (0 if male, 1 if female)	-1.161 (0.468)	-1.637 (0.295)	-1.132 (0.480)	-1.649 (0.296)	-1.827 (0.207)
Birth order: child has one older sibling	-3.445 (0.253)	-2.885 (0.344)	-3.535 (0.260)	-3.177 (0.315)	-2.329 (0.255)
Birth order: child has two or more older siblings	-8.778*** (0.000)	-7.511*** (0.000)	-8.686*** (0.000)	-7.610*** (0.000)	-8.602*** (0.000)

continued overleaf

9 As an alternative that eliminates the main aspect of the censoring bias, previous OLS results presented in Table 3 already exclude those children with a score of 55.

10 The Tobit model considers the hybrid nature of the dependent variable between a binary variable (whether the test score is greater than 55 or not, for which one would normally use a binary model) and a continuous variable (for those values that exceed 55, for which the lineal model is appropriate).

	OLS full sample		OLS – only Spanish speaker		Tobit full sample
	A	B	C	D	E
Household size, Round 1	-0.894***	-0.884**	-0.798**	-0.809**	-1.028**
	(0.009)	(0.021)	(0.026)	(0.039)	(0.014)
Biological mother's age, Round 1	0.329***	0.305***	0.335***	0.324***	0.188
	(0.002)	(0.002)	(0.002)	(0.001)	(0.233)
Caregiver's highest grade of schooling, Round 1	0.466*	0.435	0.478*	0.437	0.587**
	(0.060)	(0.103)	(0.053)	(0.102)	(0.017)
Child's language (0 if Spanish, 1 otherwise)	-8.066***	-6.459***	-6.655**	-4.642*	-11.794***
	(0.002)	(0.010)	(0.013)	(0.082)	(0.005)
Mother's language (0 if Spanish, 1 otherwise)	3.421*	3.203	3.285*	3.011	2.907
	(0.085)	(0.142)	(0.098)	(0.166)	(0.222)
Log hh. consumption per capita, Round 2	0.783	0.616	0.789	0.706	0.795
	(0.372)	(0.504)	(0.417)	(0.489)	(0.394)
Housing quality index (0-1), Round 1	2.172	0.133	1.711	-0.127	1.527
	(0.692)	(0.981)	(0.755)	(0.982)	(0.676)
Consumer durables index (0-1), Round 1	-0.356	-1.063	-0.599	-1.190	2.701
	(0.922)	(0.751)	(0.869)	(0.726)	(0.591)
Services index (0-1), Round 1	9.463***	9.995***	10.624***	10.807***	9.263**
	(0.006)	(0.002)	(0.001)	(0.001)	(0.023)
Reading level of child, Round 1		-2.333		-1.883	
		(0.173)		(0.316)	
Writing level of child, Round 1		3.739**		3.731**	
		(0.020)		(0.029)	
Child's grade at school, Round 1		5.148***		4.799***	
		(0.001)		(0.003)	
Age child started school		0.245		0.165	
		(0.870)		(0.914)	
Core controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Other cognitive controls	**Yes**	**No**	**Yes**	**No**	**No**
Number of observations	579	558	555	536	612
Adjusted R2	0.381	0.378	0.366	0.361	0.075

Note: OLS regressions with clustered standard errors robust to heteroskedasticity. P-values reported in brackets; *, ** and *** denote rejection of null hypothesis at 10%, 5% and 1% level of significance, respectively. **'Core controls'** include the following Round 1 variables: child perception of respect, Raven's test, height-for-age Z-score, child's sex, birth order, birth year, child's health, whether the child was breastfed, whether the child's caregiver is the biological mother, household size, caregiver's education, biological mother's age, father's age, if caregiver has a partner, child's native language, PPVT language, mother's native language, household consumption per capita, housing quality index, consumer durables index, service index, rural residency, quality of water supply in the area, community fixed effects, whether child attended pre-school, whether child did any paid work in last year. **'Other cognitive controls':** child's writing level, child's reading level, child's grade, age of school enrolment. Sample restricted to values of PPVT above 55. Sample in Tobit regression (Column E) includes all children. No marginal effects report in Tobit estimates.

Our estimates suggest that poorly respected children score on average 4.4 points less in the PPVT than their well-respected counterparts. Similarly, we find that the stock of cognitive skill accumulated up to the age of 8 is positively associated with a child's cognitive achievement four years later. An additional point in the Raven's test is related to an increase of approximately 0.4 in the PPVT score. Both results suggest positive cognitive returns to the previously accumulated stock of skills.

In summary, our baseline estimates suggest that after controlling for cognitive skills at the age of 8, as well as a wide range of child, household and location controls, perceptions of respect are positively correlated with cognitive achievement four years later. This relation remains robust to changes in the model specification, sample and estimation methods. However, the extent to which this evidence is free of biases due to unobserved heterogeneity remains questionable.

4.1 Addressing endogeneity of psychosocial status

While our baseline model specification addresses the main aspects of the endogeneity problem, substantial endogeneity bias might remain. In order to be able to interpret the coefficient on 'Respect' in the conditional demand function as the cognitive returns to the stock of psychosocial skills, we require any unobserved determinants of the PPVT to be uncorrelated with a child's perception of respect. Violations of this identifying assumption would lead to inconsistent estimates.

However, it is plausible that a number of such violations remain. Both 'Respect' and cognitive outcomes can be correlated with unobserved household predetermined characteristics related to the household educational and psychosocial environment. Similarly, heterogeneity in parental preferences towards skill accumulation could drive both outcomes. In addition, child unobserved characteristics might also play a role. Children with health problems might perform poorly in cognitive tests while at the same time having low levels of psychosocial skills. Parents might adjust investments in children with such characteristics.

While aware that, ultimately, these concerns can only be fully dispelled using instrumental variable techniques – which are difficult to implement due to the nature of the endogenous variable – our approach is to further explore the extent of the remaining potential bias. Firstly, we aim to eliminate any potential confounders of 'Respect' that might be in the unobserved term of the cognitive skill equation. Secondly, later in this section, we explore the extent to which any remaining unobservables might be correlated with 'Respect'.

Uniquely, the Young Lives sample includes a wide range of information on parental behaviour, other household environmental conditions, and child and household perceptions. This feature allows us to control for otherwise unobserved variables and tackle directly the problem of unobserved heterogeneity in the cognitive skills equation. Table 4 reports the results of this exercise. For comparison purposes, Column A reproduces the initial specification from Table 3, using the 'core' set of controls.[11] Column B expands the set of cognitive skill measures beyond the Raven's test to include age of school enrolment, age of pre-school enrolment, current school grade, reading and writing skills at the age of 8 and parental evaluation of child school performance at the age of 8.

A major concern in studies of cognitive skill accumulation is the issue of unobservable parental investments. Parents particularly concerned with the education of their children might behave differently to less school-oriented parents. If, at the same time, education-conscious parents are also more concerned for the psychosocial well-being of their children, we might find that not controlling for such parental heterogeneity could create a spurious correlation between 'Respect' and PPVT scores.

In Column C, we report results that control for parental attitudes towards education as well as proxies of the educational culture that might prevail in a household. We include information on parental participation in school activities, such as whether parents work or carry out fundraising for their children's schools, and whether they attend parental association meetings as well as group or individual teacher meetings. We also include information on hours of home study undertaken by the child and a set of dummies on who provides homework support in the household (e.g., mother, father, siblings, etc). Evidence presented in Column C indicates that the effect of perceived respect is robust to the inclusion of all of these variables. Both significance and point estimates remain largely unchanged.

The Young Lives survey also collects information on paternal violence and drinking habits, which can be taken as proxies of parental attitudes towards a child's well-being. Controlling for such household characteristics appears to be crucial for understanding the cognitive effect of 'Respect'. On the one hand, there is likely to be a link between household violence

11 Results are slightly different to those in Table 1 because here the sample is restricted according to data availability as we add further controls.

and drinking habits and poor psychosocial well-being among children.[12] At the same time, children living in such environments are also likely to perform poorly, as their concentration and ability to study at home might be diminished. Column D expands the set of controls to include the child's mother's responses as to whether her partner gets drunk and if, when drunk, he beats the child, as well as her evaluation of the overall violence in her own childhood household and whether she was beaten as a child. We find that point estimates of perceptions of respect become smaller in magnitude, although the reduction is only modest.

Table 4 includes two further sets of controls: a set of variables on children's self-reported perceptions and social attitudes, and a set of variables on the psychosocial status of the child's mother or caregiver. Column E reports results after the inclusion of self-reported information on whether illness prevents the child from going to school and playing with friends. The inclusion of these variables aims to eliminate the possibility that the effect of perceived respect is due to any illness that might prevent a child's natural interaction with friends and at school and which might also affect his or her cognitive performance. This model's specification also includes information on how often a child plays with friends and whether he or she has someone to turn to when in need. These additional indicators proxy for other psychosocial abilities. Column E shows that estimates remain largely unchanged.

Finally, Column F turns to the psychosocial status of the mother. So far, we have interpreted 'Respect' as an indicator of the child's psychosocial status and its effect on cognitive skill accumulation. However, it is equally plausible that our estimates are driven by the psychosocial status of household members. Caregivers and mothers with poor psychosocial status might not only pass on their psychosocial status to their children but might also provide fewer cognitive investments. This is particularly true for our measure of cognitive skill, the PPVT: mothers with poor psychosocial status might interact with and speak less to their children, potentially affecting their PPVT score. The specification in Column F includes psychosocial indexes of a mother's agency, perception of respect and self-esteem. As with the earlier set of additional controls, the inclusion of the mother's psychosocial status has little impact on previous estimates.

12 As we discuss later in the paper, we find a positive correlation between perceptions of being poorly respected and drinking and violence in the household (see Appendix B).

Table 4. *Determinants of cognitive achievement, Round 2: robustness check*

	A	B	C	D	E	F
Poorly respected, Round 1	-3.722**	-3.475*	-3.578**	-3.863**	-3.779**	-3.912**
	(0.033)	(0.055)	(0.035)	(0.034)	(0.035)	(0.031)
Raven's test, Round 1	0.392***	0.277*	0.267*	0.273*	0.289**	0.286**
	(0.009)	(0.050)	(0.069)	(0.055)	(0.035)	(0.037)
Height-for-age z-score, Round 1	1.861**	1.500**	1.586**	1.557**	1.566*	1.610**
	(0.013)	(0.049)	(0.049)	(0.049)	(0.050)	(0.040)
Child attended pre-school	2.626	1.106	4.326	4.240	3.577	2.973
	(1.917)	(1.640)	(3.284)	(3.433)	(3.367)	(3.256)
Child worked in last year, Round 1	-1.002	-1.752	-2.622	-2.629	-2.857*	-2.768
	(0.533)	(0.258)	(0.123)	(0.112)	(0.093)	(0.117)
Child's sex (0 if male, 1 if female)	-1.141	-1.783	-1.833	-1.740	-1.486	-1.218
	(0.490)	(0.255)	(0.198)	(0.230)	(0.304)	(0.372)
Birth order: child has one older sibling	-3.571	-2.364	-2.811	-2.683	-2.402	-2.580
	(0.244)	(0.421)	(0.341)	(0.375)	(0.432)	(0.418)
Birth order: child has two or more older siblings	-8.490***	-7.398***	-7.564***	-7.046***	-7.257***	-7.571***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household size, Round 1	-0.981**	-0.854**	-0.923***	-0.862**	-0.795**	-0.804**
	(0.012)	(0.028)	(0.010)	(0.030)	(0.046)	(0.045)
Biological mother's age, Round 1	0.318***	0.313***	0.318***	0.307***	0.313***	0.322***
	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.003)
Caregiver's highest grade of schooling, Round 1	0.452*	0.433	0.535*	0.504*	0.542*	0.542*
	(0.081)	(0.106)	(0.072)	(0.087)	(0.058)	(0.069)
Child's language (0 if Spanish, 1 otherwise)	-9.551***	-7.328***	-6.778***	-7.245***	-7.452**	-7.010**
	(0.003)	(0.004)	(0.010)	(0.007)	(0.010)	(0.020)
Mother's language (0 if Spanish, 1 otherwise)	2.945	2.995	2.309	2.044	2.418	2.649
	(0.169)	(0.144)	(0.219)	(0.256)	(0.166)	(0.109)
Log hh. consumption per capita, Round 2	0.632	0.325	0.066	0.171	0.333	0.446
	(0.503)	(0.725)	(0.940)	(0.843)	(0.691)	(0.583)
Housing quality index (0-1), Round 1	2.143	-0.646	-0.096	-0.039	-0.633	-1.024
	(0.711)	(0.906)	(0.985)	(0.995)	(0.913)	(0.856)
Consumer durables index (0-1), Round 1	-0.576	-0.331	-1.395	-1.754	-1.363	-0.642
	(0.869)	(0.926)	(0.660)	(0.620)	(0.731)	(0.861)
Services index (0-1), Round 1	9.820***	9.883***	8.942***	8.350**	8.384**	8.457**
	(0.005)	(0.003)	(0.008)	(0.018)	(0.021)	(0.019)
Core controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Schooling controls	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Parental school investment controls	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
History of violence controls	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**
Other child psychosocial controls	**No**	**No**	**No**	**No**	**Yes**	**Yes**
Household psychosocial controls	**No**	**No**	**No**	**No**	**No**	**Yes**
Number of observations	551	551	551	551	551	551
Adjusted R2	0.357	0.384	0.388	0.390	0.389	0.390

Note: OLS regressions with clustered standard errors robust to heteroskedasticity. P-values reported in brackets; *, ** and *** denote rejection of null hypothesis at 10%, 5% and 1% level of significance, respectively. **'Core Controls':** child perception of respect, Raven's Test, height-for-age z-score, child's sex, birth order, birth year, child's health, child was breastfed, if the child's caregiver is the biological mother, household size, caregiver's education, biological mother's age, father's age, if caregiver has a partner, child's native language, PPVT language, mother's native language, housing quality index, household consumption per capita, consumer durables index, service index, rural residency, quality of water supply in the area, community fixed effects, child attended pre-school, child did paid work in last year; **'Schooling controls':** child's writing level, child's reading level, child's grade, age of school enrolment, age of pre-school enrolment, parental evaluation of child school performance; **'Parent school investment controls':** hours of child home study, parents work for school, parents attend PA meetings, parents attend group meetings, parents attend Individual meetings with teacher, parents fundraising for school, who helps child with homework; **'History of violence controls':** partner gets drunk, partner beats child, mother was beaten as a child, violence in mother's household; **'Other child perceptions controls':** how often does the child play with friends, illness that prevents child from attending school/work, illness that prevents child from playing with friends; whether child has someone to turn to when there is a problem. '**Household psychosocial controls':** caregiver's self-esteem index, caregiver's respect index, caregiver's self-efficacy index. Sample restricted in all columns to data availability in the full control version (Column F). Sample restricted to values of PPVT above 55.

In summary, Table 4 provides extensive evidence of the robustness of the cognitive effect of perceptions of respect. In spite of the inclusion of multiple sets of controls designed to address potential sources of estimation bias in our baseline specification, the magnitude of the estimated coefficient of ‘Respect’ remains remarkably stable, suggesting that the remaining unobserved heterogeneity was relatively modest.

While unobserved heterogeneity can never be fully eliminated, endogeneity bias will only arise if the unobservables are correlated with our variable of interest. The process of over-parametrising the model specification reported in Table 4 can be described as an attempt to reduce the size of the unobserved term in our model specification. We now turn to the issue of the correlation between the remaining error term and ‘Respect’. Although we cannot test for the size of that correlation, we can draw inferences on its probable size by analysing the correlates of ‘Respect’. To the extent that observable cognitive determinants at the age of 8 are not contemporaneously correlated with ‘Respect’, it could be argued that the likelihood that any remaining cognitive unobservable is correlated with perceptions of respect should be small.

The table in Appendix B reports probit estimates of the determinants of ‘Respect’ following the same set of model specifications applied in Table 4, above. Our focus is on the explanatory power of cognitive determinants. The table shows that perceptions of respect are most strongly correlated with variables which are relatively cognitive skill neutral, such as household size, birth order, non-native Spanish speaking and pre-school enrolment. However, variables primarily linked to parental and cognitive investments appear to have no significant effect on perceptions of respect. These include the Raven’s test and caregiver’s education, the age of the biological mother and height-for-age z-scores, as well as the index of public services available to the household.

Taken as a whole, the evidence presented in this section provides a compelling story. On the one hand, we find that after controlling for a large number of typically unobserved factors, not only does ‘Respect’ maintain its significance, but the magnitude of the point estimates remains largely unchanged. On the other hand, probit regressions indicate that cognitive skill determinants are not strongly correlated with ‘Respect’. In other words, the evidence suggests that any remaining unobserved determinants of PPVT are likely to be only weakly correlated with our measure of perceptions of respect. This evidence leads us to conclude that any remaining unobserved heterogeneity bias is likely to be negligible.

4.2 Channel of impact of perceptions of respect

In Section 3, it was shown by means of simple pairwise correlations that ‘Respect’ at the age of 8 is associated with other psychosocial indicators measured at the age of 12 (self-efficacy, self-esteem and sense of inclusion).[13] Since some of the latter set of indicators are adapted versions of psychological tests already validated in the literature, this evidence helps us to reinforce the argument that perceptions of respect do indeed measure a child’s psychosocial dimension that is stable over time. To check the robustness of this result, we now carry out a more formal analysis. Specifically, we analyse the extent to which our Round 1 measure of perceptions of respect is correlated with such indicators after controlling for child, household and community characteristics.

13 For more details about the construction of these psychosocial indexes in Round 2, see Appendix B.

Empirically, we do this by estimating by OLS an analogous version of equation (5) with the three different psychosocial indicators at the age of 12 as outcome variables: the self-esteem index, the self-efficacy (agency) index and the sense of inclusion (perceptions of respect) index. We also estimate a Linear Probability Model (LPM) of the probability of a child being 'teased at school' – one of the three individual questions that constitute the sense of inclusion index. Table 5 reports the results of these regressions.

Results show that 'Respect' is significantly correlated to sense of inclusion at the age of 12, explaining 8 per cent of the index variation.[14] This result supports the notion that 'Respect' measures a stable psychosocial attribute, as it helps to explain variation in a conceptually related measure, which includes statements related to perception of respect at the age of 12. In addition, we also find that 'Respect' is significantly correlated with self-esteem at the age of 12, explaining 6 per cent of the index variation. This result was not entirely unexpected, as the self-esteem index is constructed on the basis of statements related to issues of pride and shame, some of which are similar to those explored in the sense of inclusion index.

Overall, these results confirm what simple correlations in Section 3 suggested, clarifying the fact that the estimated impact of perceptions of respect on PPVT scores is of a psychosocial nature.

Table 5. *Determinants of psychosocial status, Round 2*

	Self-esteem index	Agency index	Respect index	Teasing at school index
Poorly respected, Round 1	-0.046**	-0.020	-0.061**	-0.200**
	(0.034)	(0.481)	(0.036)	(0.014)
Raven's test, Round 1	0.001	0.005***	0.001	0.007
	(0.740)	(0.001)	(0.469)	(0.178)
Height-for-age z-score, Round 1	0.028	-0.002	0.008	0.054*
	(0.108)	(0.909)	(0.496)	(0.081)
Child attended pre-school	-0.042	-0.027	0.019	0.091
	(0.396)	(0.485)	(0.662)	(0.504)
Child worked in last year, Round 1	-0.002	0.036	0.021	0.076
	(0.959)	(0.184)	(0.562)	(0.446)
Child's sex (0 if male, 1 if female)	-0.030	0.061***	0.073***	0.249***
	(0.217)	(0.003)	(0.000)	(0.000)
Birth order: child has one older sibling	-0.005	-0.027	-0.004	-0.043
	(0.881)	(0.506)	(0.899)	(0.668)
Birth order: child has two or more older siblings	0.002	0.017	0.003	0.152
	(0.955)	(0.662)	(0.935)	(0.221)
Household size, Round 1	-0.009	-0.005	-0.019**	-0.037*
	(0.171)	(0.308)	(0.047)	(0.065)
Biological mother's age, Round 1	-0.001	-0.001	-0.000	-0.010
	(0.629)	(0.773)	(0.946)	(0.187)
Caregiver's highest grade of schooling, Round 1	0.011***	0.004	0.003	0.017
	(0.002)	(0.277)	(0.348)	(0.147)
Child's language (0 if Spanish, 1 otherwise)	-0.122*	0.020	0.001	-0.281
	(0.086)	(0.625)	(0.989)	(0.115)
Mother's language (0 if Spanish, 1 otherwise)	-0.006	0.018	-0.052*	-0.088
	(0.906)	(0.532)	(0.090)	(0.366)

14 This result is obtained from using the marginal effect reported in Table 4 to calculate the effect of a 1 standard deviation increase in perceived respect on sense of inclusion (or any other Round 2 index) expressed as a proportion of the sense of inclusion index standard deviation. An analogous procedure is followed in the case of the other psychosocial indicators.

	Self-esteem index	Agency index	Respect index	Teasing at school index
Log hh. consumption per capita, Round 2	0.049***	-0.011	-0.013	-0.122***
	(0.005)	(0.304)	(0.258)	(0.004)
Housing quality index (0-1), Round 1	-0.109*	0.065	-0.066*	-0.244**
	(0.061)	(0.144)	(0.070)	(0.047)
Consumer durables index (0-1), Round 1	0.060	-0.092**	0.084	0.173
	(0.304)	(0.024)	(0.269)	(0.548)
Services index (0-1), Round 1	0.151	-0.013	0.037	0.131
	(0.110)	(0.790)	(0.666)	(0.509)
Core controls	**Yes**	**Yes**	**Yes**	**Yes**
Number of observations	611	611	611	606
Adjusted R2	0.237	0.070	0.061	0.114

Note: OLS regressions with clustered standard errors robust to heteroskedasticity. P-values reported in brackets; *, ** and *** denote rejection of null hypothesis at 10%, 5% and 1% level of significance, respectively. **'Core Controls':** child perception of respect, Raven's test, height-for-age z-score, child's sex, birth order, birth year, child's health, child was breastfed, child's caregiver is the biological mother, household size, caregiver's education, biological mother's age, father's age, caregiver has a partner, child's native language, PPVT language, mother's native language, household consumption per capita, housing quality index, consumer durables index, service index, rural residency, quality of water supply in the area, community fixed effects, child attended pre-school, child did paid work in last year. Sample restricted to values of PPVT above 55.

5. Testing for skill complementarities

Having found evidence of a positive effect of psychosocial skills on cognitive skill accumulation in the conditional demand function, we now turn to the issue of skill complementarities. In the case at hand, the concept of skill complementarities implies that differences in initial psychosocial status can lead to diverging cognitive accumulation paths. Empirically we investigate the interplay between our two measures of skill, the Raven's test and perception of respect. We analyse how the rates of return to the accumulation of cognitive skills may vary between well- and poorly respected children.

To do this, we could augment our earlier model specification by allowing interaction effects between the Raven's test and our psychosocial measure. However, since it is plausible to expect significant non-linearities in both the elasticity of cognitive skills and in complementarities between cognitive and non-cognitive skills, we choose instead to apply semi-parametric estimation techniques. These methods allow for a set of variables to have a non-parametric effect while others affect the outcome linearly. We apply differencing-methods developed in Yatchew (1998)[15] in estimating the alternative equation

$$y = f(z) + X\delta + u \qquad (6)$$

15 The differencing method is a simple methodology that isolates the effect of a specific variable – posited to have a non-linear effect – on the other linear variables. The estimator implements the following steps. First, the sample is sorted by the non-linear variable and cross-sectional differences are computed for each variable included in the model. Secondly, 'consistent' estimates of the coefficients are obtained by regressing the differenced controls against the differenced outcome variable. Thirdly, the residual outcome, y – xb (diff), is computed and analysed using Lowess Kernel smoothing methods.

whereby the Z vector of variables – i.e. the Raven's test and perception of respect – are allowed to enter the equation non-parametrically. In the parametric component of equation (6), we include a parsimonious set of control variables.[16]

In that sense, Figure 1 plots the non-parametric relation between residual PPVT – net of parametric effects – and the Raven's test. The figure depicts Lowess Kernel smoothing estimates of mean and 90 per cent confidence intervals. Further, Figure 2 depicts the kernel density of the distribution of the Raven's test. The figures show that the relation between the Raven's test and PPVT four years later is positive and highly linear for most of the distribution. For sufficiently high values of the Raven's test, the slope becomes non-positive, suggesting positive but concave returns to cognitive skill accumulation.

Figure 1's accumulation path does not distinguish between children with differing psychosocial status. In the case of positive complementarities, we would expect the pattern of cognitive skill accumulation for well-respected children to have higher returns than for their poorly respected counterparts throughout the entire distribution of cognitive skills.

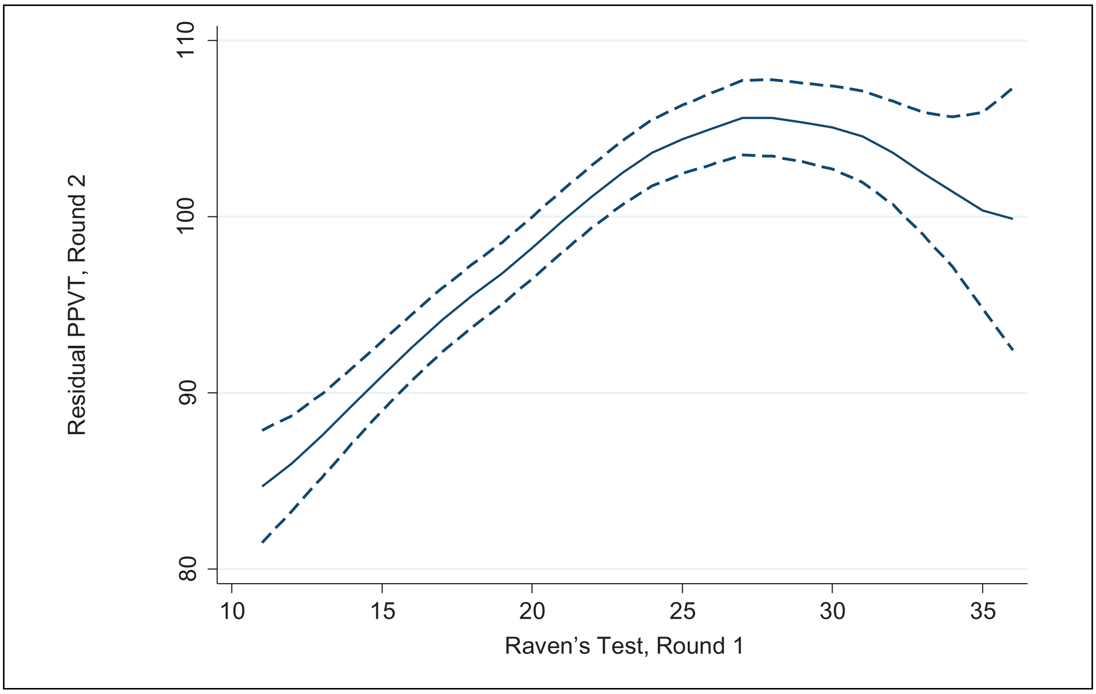
In Figure 3, we investigate this issue by plotting the Raven's test and residual PPVT for well- and poorly respected children separately. First, we note that, consistent with evidence presented in the previous section, poorly respected children have lower PPVT scores on average. Secondly, the patterns presented appear to support the concept of positive complementarities. While the rates of cognitive skill accumulation for well- and poorly respected children are similar where Raven's test scores are low, the paths diverge substantially when previously acquired cognitive skill is high (approximately from score 20 in the Raven's test). For the upper part of the cognitive skill distribution, differences are not only large in magnitude – up to 8 points in the PPVT – but, as Figure 4 shows, also statistically significant. Patterns of accumulation are significantly different at the 10 per cent level of confidence for values of the Raven's test above a score of approximately 25 – which accounts for more than the top tertile of the distribution.

The results presented in Figures 3 and 4 are striking. They show that low levels of perceived respect are correlated with lower rates of return in cognitive skill accumulation and an earlier onset of concavity. In other words, the benefits of early cognitive investments to later cognitive skill accumulation appear to be lower for children who previously received poor psychosocial investments.

To check for the robustness of these findings, we also present results from more conventional methods. Firstly, we estimate equation (6) that augments the baseline specification by allowing for interactions between Raven's test results and a child's perception of respect. To allow for non-linearities in the main and interaction effects, the continuous measure of the Raven's test is replaced by quartile dummies. Secondly, we re-estimate the baseline model – equation (5) – for different quartiles of the Raven's test distribution separately.

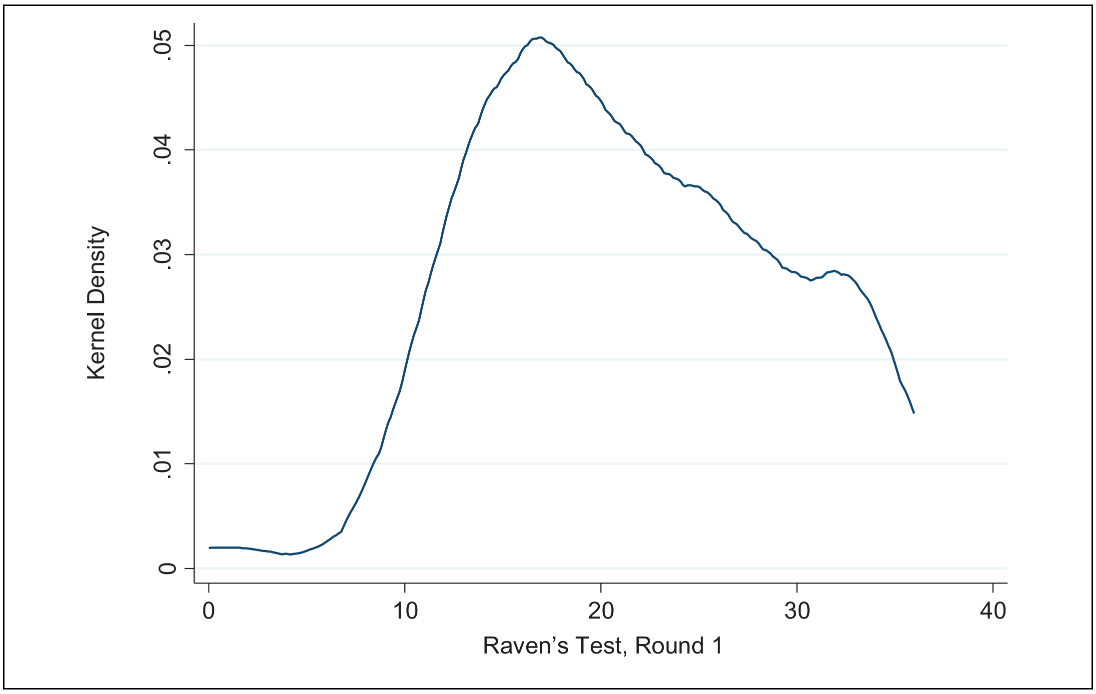
16 Non-parametric methods and non-linear estimates substantially reduce our estimation power. In this section, we therefore rely on the following reduced set of parsimonious controls: height-for-age z-scores, preschool enrolment, child work, gender and age of child, birth order, household size and wealth index, caregiver education, single mother dummy and ethnicity of the mother and cluster dummies.

Figure 1. *Own self-elasticity – residual PPVT and Raven's test*



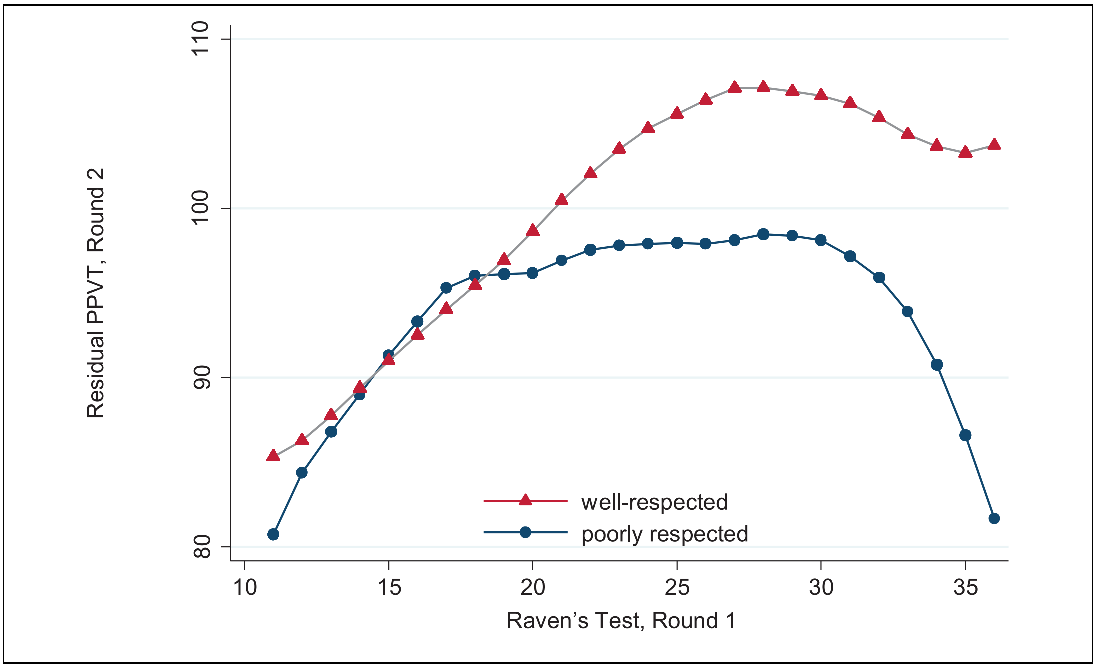
Note: Residual PPVT obtained through eighth-order differencing of 'parsimonious' controls. Lowess Kernel smoothing with 0.4 bandwidth. Ten per cent confidence internals shown in discontinued line. **'Parsimonious controls':** child perception of respect, dummies for Raven's test quartiles and interactions with 'Respect', height-for-age z-score, child's sex, child's age, birth order, household size, caregiver's education, if caregiver has a partner, mother's native language, wealth index, community fixed effects, child attended pre-school, child did paid work in last year. Sample restricted to values of PPVT above 55.

Figure 2. *Raven's test distribution, kernel density*



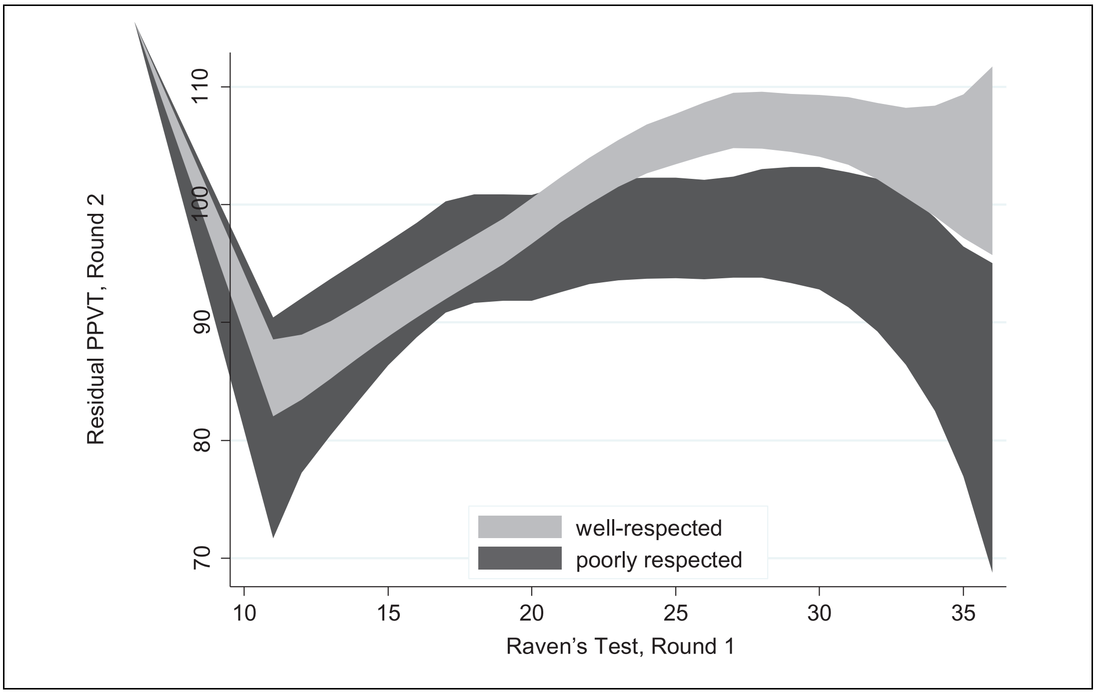
Note: Kernel density function smoothing; optimal smoothing bandwidth applied. Sample restricted to values of PPVT above 55.

Figure 3. *Skill complementarities – cognitive skill accumulation for well- and poorly respected children*



Note: Residual PPVT obtained through eighth-order differencing of 'parsimonious' controls. Lowess Kernel smoothing with 0.4 bandwidth. **'Parsimonious controls':** child perception of respect, dummies for Raven's test quartiles and **interactions with 'Respect',** height-for-age z-score, child's sex, child's age, birth order, household size, caregiver's education, if caregiver has a partner, mother's native language, wealth index, community fixed effects, child attended pre-school, child did paid work in last year. Sample restricted to values of PPVT above 55.

Figure 4. *Skill complementarities – 90 per cent confidence intervals*



Note: Residual PPVT obtained through eighth-order differencing of 'parsimonious' controls. Lowess Kernel smoothing with 0.4 bandwidth. Filled areas correspond to 10% confidence internals. **'Parsimonious controls':** child perception of respect, dummies for Raven's test quartiles and interactions with 'Respect', height-for-age z-score, child's sex, child's age, birth order, household size, caregiver's education, if caregiver has a partner, mother's native language, wealth index, community fixed effects, child attended pre-school, child did paid work in last year. Sample restricted to values of PPVT above 55.

The results are presented in Table 6. Columns (1) to (5) include a parsimonious set of control variables, while the remaining Columns (6) to (10) use the set of core controls from the previous section. The parametric evidence is consistent with the results from the non-parametric analysis. Point estimates from the interaction effects model (see Column (1)) indicate that poorly respected children experience lower cognitive returns than their well-respected counterparts at all levels of the Raven's's test, but these differences are significant only for the top quartile. While well-respected children in the top Raven's test quartile obtain PPVT scores 10 points higher than their counterparts in the bottom quartile, poorly respected children in the same top quartile appear not to benefit from their previously acquired cognitive skills. Specifically, poorly respected children in the top Raven's test quartile register a PPVT score 8.7 points lower than their well-respected counterparts.

Table 6. *Parametric analysis of skill complementarities*

	Raven's test quartiles – Parsimonious controls					Raven's test quartiles – full controls				
	Full sample	Q1	Q2	Q3	Q4	Full sample	Q1	Q2	Q3	Q4
Poorly respected, Round 1	-0.251	-0.340	-1.535	-4.701	-6.466**	-0.727	-1.005	-0.495	-4.228	-5.562*
	(0.949)	(0.908)	(0.482)	(0.193)	(0.024)	(0.855)	(0.708)	(0.822)	(0.221)	(0.063)
Q2 x Poorly respected	-2.997					-1.494				
	(0.514)					(0.737)				
Q3 x Poorly respected	-5.717					-5.273				
	(0.169)					(0.145)				
Q4 x Poorly respected	-8.669**					-7.545*				
	(0.033)					(0.080)				
Dummy Q2 - Raven's Test (vs Q1)	5.188**					4.923**				
	(0.024)					(0.018)				
Dummy Q3 - Raven's Test (vs Q1)	7.621***					7.840***				
	(0.005)					(0.001)				
Dummy Q4 - Raven's Test (vs Q1)	9.977***					9.982***				
Core controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Parsimonious controls	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Number of observations	602	133	155	159	155	579	130	150	153	146
Adjusted R2	0.368	0.205	0.175	0.387	0.449	0.381	0.227	0.152	0.333	0.455

Note: OLS regressions with clustered standard errors robust to heteroskedasticity. P-values reported in brackets; *, ** and *** denote rejection of null hypothesis at 10%, 5% and 1% level of significance, respectively. **'Parsimonious controls':** child perception of respect, dummies for Raven's test quartiles and interactions with 'Respect', height-for-age z-score, child's sex, child's age, birth order, household size, caregiver's education, if caregiver has a partner, mother's native language, wealth index, community fixed effects, child attended pre-school, child did paid work in last year. **'Core controls':** child perception of respect, dummies for Raven test quartiles and interactions with perception of respect, height-for-age z-score, child's sex, birth order, birth year, child's health, child was breastfed, caregiver's education, if the child's caregiver is the biological mother, household size, biological mother's age, father's age, if caregiver has a partner, child's native language, PPVT language, mother's native language, household consumption per capita, housing quality index, consumer durables index, service index, rural residency, quality of water supply in the area, community fixed effects, child attended pre-school, child did paid work in last year. Sample restricted to values of PPVT above 55.

Quartile regressions reported in Columns (2) to (5) suggest a similar pattern. Poorly respected children have lower PPVT scores in all quartiles, but these differences are only significant for the top quartile of Raven's test scores. When the set of core controls is used, significance is marginally lost. This is unsurprising as in both types of models, parameter identification is derived from a small number of individual cell observations.[17] However, we draw some comfort from the fact that point estimates remain robust to the expansion of the set of controls.

17 Specifically, for the top quartile of the Raven's test distribution, only 25 children out of 144 report being poorly respected in their local area.

6. Relevance of perceptions of respect

At this point, it becomes helpful to reflect on the significance of our findings. In particular, it would be instructive to understand the relative importance of 'Respect' in the accumulation of cognitive skills in relation to other cognitive determinants. To this purpose, Table 7 reproduces Columns A and F from Table 4, where, for ease of comparison across variables, we report coefficients in standardised form.[18] Column A therefore reports results for the model specification with our core controls, whereas Column B includes the model with the full set of controls. The standardised coefficients should be interpreted as the percentage of the PPVT standard deviation that is affected by a one standard deviation change in the independent variable. The table shows results for selected variables chosen for their importance in determining cognitive achievement.

Column A shows that an increase by one standard deviation of a child being poorly respected would reduce the PPVT score by 7 per cent of the PPVT standard deviation. Comparison with the marginal effects of the Raven's test and maternal education, which represent approximately 14 per cent and 9 per cent of the PPVT's standard deviation respectively, confirms that 'Respect' has a substantial impact on standard cognitive determinants. Moreover, the relative importance of perceptions of respect does not seem to be a by-product of omitted variable bias, as the standardised coefficient of 'Respect' remains largely unchanged when we take full advantage our sample in Column B. Although not entirely unexpected, it is interesting to note that the importance of the Raven's test is reduced – to 10 per cent of the PPVT standard deviation – when we use our full set of controls, which include a large number of other cognitive measures.

As mentioned in our theoretical section, when estimating a conditional demand function the parameters of lagged skills – 'Respect' and the Raven's test – can be interpreted as 'policy parameters'. In other words, an exogenous change in lagged skills at the age of 8 would result in increased PPVT scores at the age of 12, due to both biological and behavioural factors that would amount to 10 per cent and 7 per cent of the PPVT standard deviation for cognitive and psychosocial skills respectively.

Table 7. *Determinants of cognitive achievement with standardised variables*

	A			B		
	coef	**p-value**	**standardised coefficient**	**coef**	**p-value**	**standardised coefficient**
Poorly respected, Round 1	-3.722**	1.746	-0.069	-3.912**	1.816	-0.072
Raven's test, Round 1	0.392***	0.151	0.143	0.286**	0.137	0.104
Height-for-age z-score, Round 1	1.861**	0.749	0.087	1.610**	0.784	0.076
Birth order: child has two or more older siblings	-8.490***	2.005	-0.200	-7.571***	1.723	-0.179
Household size, Round 1	-0.981**	0.391	-0.089	-0.804**	0.401	-0.073
Biological mother's age, Round 1	0.318***	0.104	0.101	0.322***	0.107	0.102
Caregiver's highest grade of schooling, Round 1	0.452*	0.259	0.089	0.542*	0.298	0.106

18 To standardise the coefficients, we re-weight the estimated parameters using the ratio of standard errors for the dependent and independent variables. See, for example, Wooldridge (2006) on the standardisation of coefficients.

	A			B		
	coef	p-value	standardised coefficient	coef	p-value	standardised coefficient
Parents attend group meetings school, Round 2				5.413***	1.749	0.099
Partner in the house gets drunk, Round 1				-3.815***	1.388	-0.091
The child has someone to help him if there is a problem, Round 2				4.145**	1.798	0.067
Caregiver's agency sub-index, Round 2				2.529*	1.320	0.061
Core controls		**Yes**			**Yes**	
Schooling controls		**No**			**Yes**	
Parental school investment controls		**No**			**Yes**	
History of violence controls		**No**			**Yes**	
Other child psychosocial controls		**No**			**Yes**	
Household psychosocial controls		**No**			**Yes**	
Number of observations		551			551	
Adjusted R2		0.357			0.390	

Note: OLS regressions with clustered standard errors robust to heteroskedasticity. P-values reported in brackets; *, ** and *** denote rejection of null hypothesis at 10%, 5% and 1% level of significance, respectively. Column A and B report results with core and full set of controls, respectively. Only selected controls are reported. In Column A, the full list of controls is as follows**:** child perception of respect, Raven's Test, height-for-age z-score, child's sex, birth order, birth year, child's health, child was breastfed, if the child's caregiver is the biological mother, household size, caregiver's education, biological mother's age, father's age, if caregiver has a partner, child's native language, PPVT language, mother's native language, housing quality index, consumer durables index, service index, rural residency, quality of water supply in the area, community fixed effects, child attended pre-school, child did paid work in last year. In Column B, the full list of controls includes those previously mentioned plus the following: **'Schooling controls':** child's writing level, child's reading level, child's grade, age of school enrolment, age of pre-school enrolment, parental evaluation of child school performance; **'Parent school investment controls':** hours of child home study, parents work for school, parents attend PA meetings, parents attend group meetings, parents attend Individual meetings with teacher, parents involved in fund raising for school, who helps child with homework; **'History of violence controls':** partner gets drunk, partner beats child, mother was beaten as a child, violence in the mother's household; '**Household psychosocial controls':** caregiver's self-esteem index, caregiver's respect index. Sample restricted to values of PPVT above 55.

The results in Column B can be used to assess the relative importance of a range of other determinants of cognitive achievement at the age of 12. As expected, variables traditionally considered to play an important role in the human capital accumulation process, such as the age of the mother, household size or height-for-age – which we interpret as a proxy for socioeconomic status – are also strong determinants in our estimates. Perhaps more unexpected is the importance of birth order. Being the 'third or later' sibling in a household compared to the first child substantially reduces PPVT scores – accounting for up to 18 per cent of the PPVT standard deviation – which suggests strong intra-household patterns in the allocation of cognitive inputs.

Additional controls included in Column B are also important in determining the PPVT. Parental investments – in the form of parents attending school meetings – and low parental preferences for child welfare – proxied by the father's habits in terms of alcohol consumption and violence – both affect PPVT scores, each with the expected sign, by approximately 9 per cent of the PPVT standard deviation. Similarly, maternal psychosocial status – as measured by the 'agency index' – and whether the child receives emotional support – as indicated by the fact that she has someone to turn to when needed – both play an important role in the child's cognitive achievement at the age of 12.

Conclusions

Using data from a cohort of Peruvian children in their transition from mid- to late-childhood, we find compelling evidence suggesting that psychosocial skills play an important role in the accumulation of cognitive skills during the childhood period. Our findings indicate that children who perceive themselves as poorly respected at 8 years old are likely to accumulate fewer cognitive skills by the age of 12 than their well-respected counterparts. This result holds after controlling for a wide array of child and household characteristics, some of which are typically unobserved in standard surveys. Not only does feeling poorly respected play a role in the determination of cognitive achievement, but its contribution to other cognitive inputs is also relatively substantial, explaining about 7 per cent of the standard deviation in cognitive scores at 12 years old.

Our analysis also shows the existence of positive complementarities between cognitive and non-cognitive skills. Poor self-respect is associated with lower rates of return in cognitive skill accumulation and an earlier onset of concavity. In other words, benefits bought by early cognitive investments to later cognitive skill accumulation seem to be lower for children who previously received poor psychosocial investments.

Our results resemble the findings of Cunha and Heckman (2008), who found a similar linkage in a sample of children growing up in the United States. We are unaware of studies that provide similar evidence in the context of a developing country. Helmers and Patnam (2009) followed an approach similar to that of Cunha and Heckman to study skills acquisition using Young Lives data from India; however, they did not find any linkage between non-cognitive and cognitive skills.

These findings enhance our understanding of the skill formation process in a developing country context. A key aspect of our research that can be extended relates to the determination of psychosocial skills. We found that perception of respect at 8 years old is uncorrelated to cognitive-related variables at the same age, which we argue provides some evidence that, at least for this period of the life cycle, it is psychosocial skills that affect cognitive skills and not vice-versa. While this seems to be a plausible result, we still lack a general understanding of how psychosocial competencies are formed in the first place, particularly at early stages of life. For instance, what aspects of poverty and material deprivation are particularly important in determining these competencies? Answering this type of question is essential from a policy perspective because it would highlight the optimal time in a child’s life to direct interventions.

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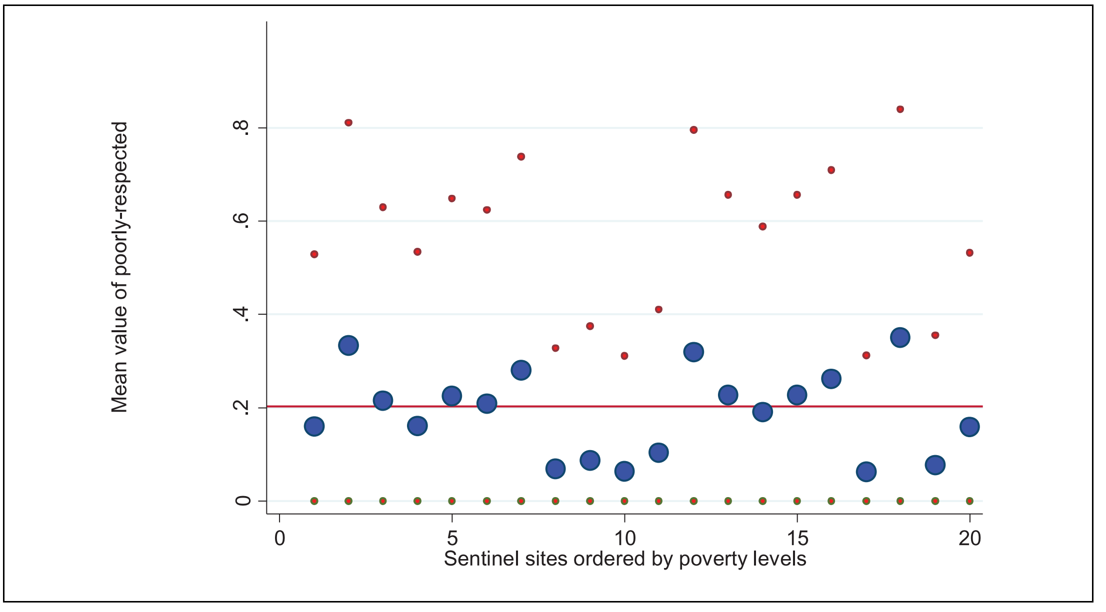
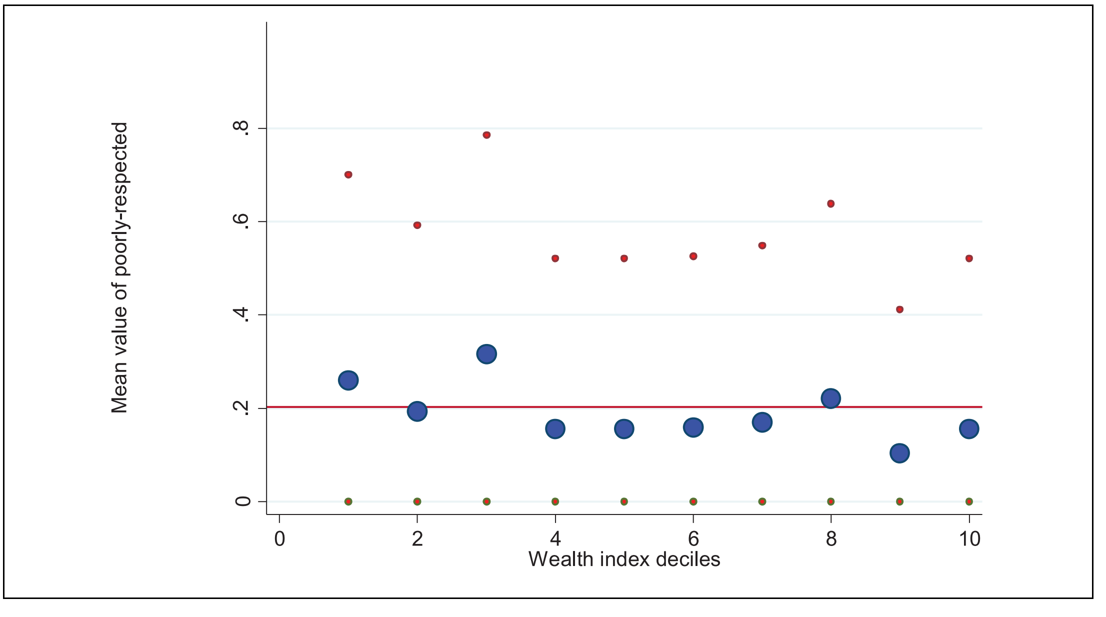
Appendix A: Figures

Figure A1. *Mean value of perception of being poorly respected by sentinel site*



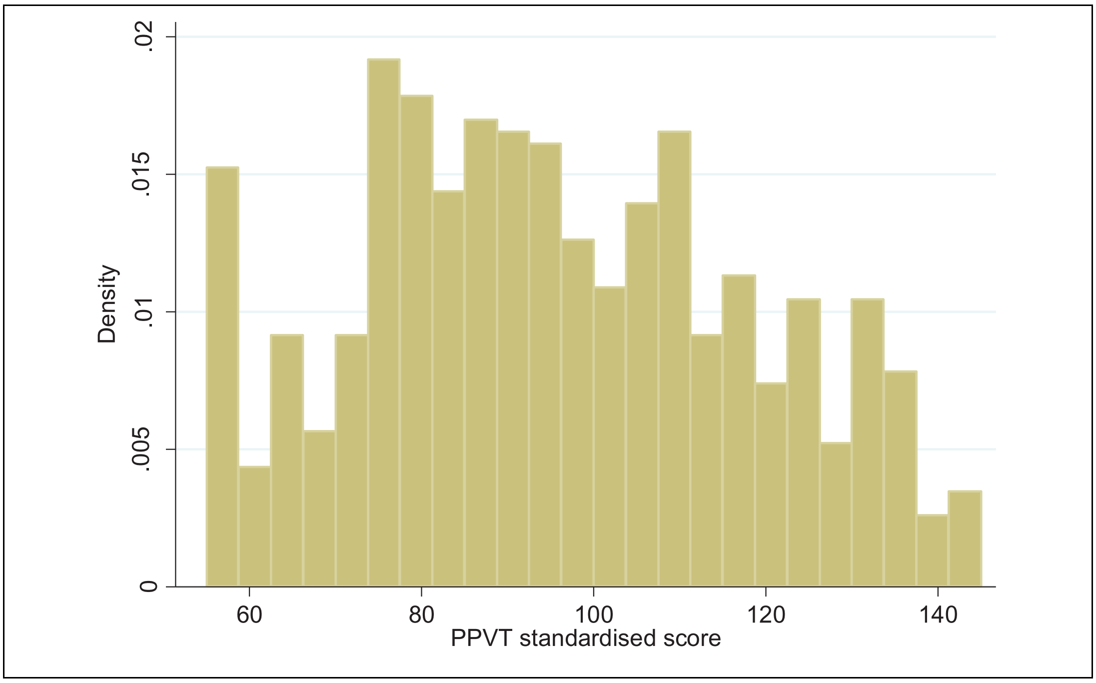
Note: The vertical axis reports the mean value of perception of respect by sentinel site. The horizontal axis orders the 20 Young Lives sentinel sites according to their relative position in the Peru Poverty Map (site number one is the poorest and site number 20 is the richest). The horizontal line represents the mean value of perception of respect for the whole sample. Perception of respect is a binary variable that takes the value of 0 if the child perceives herself as well-respected and 1 otherwise. Thus, the mean value of this variable expresses the percentage of children feeling poorly respected by sentinel site. Mean values of perception of respect were calculated on the basis of the sample used in the regressions (restricted according to data availability in the control variables and excluding those children with a score of 55 in the PPVT).

Figure A2. *Mean value of perception of being poorly respected by wealth index decile*



Note: The vertical axis reports the mean value of perception of respect by wealth decile. The horizontal axis orders sample by wealth decile, with decile 10 being the richest (wealth deciles were estimated using the wealth index, which is defined in Annex 4). The horizontal line represents the mean value of perception of respect for the whole sample. Perception of respect is a binary variable that takes the value of 0 if the child perceives herself as well-respected and 1 otherwise. Thus, the mean value of this variable expresses the percentage of children feeling poorly respected by wealth decile. Mean values of perception of respect were calculated on the basis of the sample used in the regressions (restricted according to data availability in the control variables and excluding those children with a score of 55 in the PPVT).

Figure A3. *Bottom censoring of PPVT variable, histogram*



Note: Histogram of PPVT standardised scores in Round 2. Sample restricted to available information for set of control variables. Sample includes total of 612 children.

Appendix B: Determinants of perception of respect, Round 1

	A	B	C	D	E	F
Raven's test, Round 1	-0.005	-0.004	-0.008	-0.009	-0.011	-0.013
	(0.566)	(0.673)	(0.426)	(0.397)	(0.252)	(0.223)
Height-for-age z-score, Round 1	-0.000	-0.003	0.021	0.021	0.004	0.019
	(0.998)	(0.966)	(0.774)	(0.775)	(0.956)	(0.799)
Child attended pre-school	-0.441***	-0.427**	-0.622	-0.615	-0.549	-0.649
	(0.165)	(0.183)	(0.646)	(0.628)	(0.621)	(0.651)
Child worked in last year, Round 1	0.262	0.286	0.341	0.361*	0.322	0.322
	(0.207)	(0.155)	(0.108)	(0.094)	(0.149)	(0.161)
Child's sex (0 if male, 1 if female)	0.073	0.090	0.091	0.105	0.082	0.093
	(0.693)	(0.643)	(0.635)	(0.569)	(0.668)	(0.636)
Birth order: child has one older sibling	-0.271*	-0.307**	-0.369**	-0.374**	-0.437**	-0.483***
	(0.061)	(0.031)	(0.024)	(0.025)	(0.010)	(0.008)
Birth order: child has two or more older siblings	-0.424**	-0.461**	-0.610***	-0.580**	-0.631***	-0.691***
	(0.043)	(0.024)	(0.007)	(0.010)	(0.010)	(0.009)
Household size, Round 1	0.140***	0.138***	0.153***	0.160***	0.166***	0.169***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Biological mother's age, Round 1	0.016	0.016	0.010	0.008	0.013	0.012
	(0.476)	(0.495)	(0.669)	(0.729)	(0.592)	(0.633)
Caregiver's highest grade of schooling, Round 1	0.046	0.046	0.038	0.036	0.041	0.046
	(0.182)	(0.184)	(0.311)	(0.339)	(0.279)	(0.195)
Child's language (0 if Spanish, 1 otherwise)	0.754*	0.750	0.745	0.720	0.713	0.763
	(0.089)	(0.109)	(0.120)	(0.136)	(0.148)	(0.137)
Mother's language (0 if Spanish, 1 otherwise)	0.370	0.402	0.386	0.382	0.416	0.370
	(0.200)	(0.167)	(0.180)	(0.206)	(0.168)	(0.213)
Log hh. consumption per capita, Round 2	-0.174*	-0.157	-0.143	-0.135	-0.141	-0.124
	(0.092)	(0.126)	(0.190)	(0.223)	(0.216)	(0.295)
Housing quality index (0-1), Round 1	-0.105	-0.029	0.094	0.098	-0.027	-0.123
	(0.747)	(0.933)	(0.748)	(0.738)	(0.931)	(0.721)
Consumer durables index (0-1), Round 1	-0.565	-0.593	-0.452	-0.697	-0.602	-0.493
	(0.200)	(0.196)	(0.371)	(0.137)	(0.212)	(0.347)
Services index (0-1), Round 1	-0.021	0.015	-0.116	-0.092	-0.056	-0.013
	(0.965)	(0.977)	(0.809)	(0.853)	(0.911)	(0.979)
Core controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Schooling controls	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Parental school investment controls	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
History of violence controls	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**
Other child psychosocial controls	**No**	**No**	**No**	**No**	**Yes**	**Yes**
Household psychosocial controls	**No**	**No**	**No**	**No**	**No**	**Yes**
Number of observations	550	550	550	550	550	550
Adjusted R2	0.171	0.176	0.210	0.220	0.239	0.249

Note: OLS regressions with clustered standard errors robust to heteroskedasticity. P-values reported in brackets; *, ** and *** denote rejection of null hypothesis at 10%, 5% and 1% level of significance, respectively. **'Core Controls':** child perception of respect, Raven's Test, height-for-age z-score, child's sex, birth order, birth year, child's health, child was breastfed, if the child's caregiver is the biological mother, household size, caregiver's education, biological mother's age, father's age, if caregiver has a partner, child's native language, PPVT language, mother's native language, housing quality index, household consumption per capita, consumer durables index, service index, rural residency, quality of water supply in the area, community fixed effects, child attended pre-school, child did paid work in last year; **'Schooling controls':** child's writing level, child's reading level, child's grade, age of school enrolment, age of pre-school enrolment, parental evaluation of child school performance; **'Parent school investment controls':** hours of child home study, parents work for school, parents attend PA meetings, parents attend group meetings, parents attend Individual meetings with teacher, parents involved in fundraising for school, who helps child with homework; **'History of violence controls':** partner gets drunk, partner beats child, mother was beaten as a child, violence in the mother's household; **'Other child perceptions controls':** how often child plays, illness that prevents child from attending school/work, illness that prevents child from playing with friends; '**Household psychosocial controls':** caregiver's self-esteem index, Caregiver's Respect Index, Caregiver's Self-Efficacy Index. Sample restricted in all columns to data availability in the full control version (Column F). Sample restricted to values of PPVT above 55.

Young Lives is an innovative long-term international research project investigating the changing nature of childhood poverty.

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- improve understanding of the causes and consequences of childhood poverty and to examine how policies affect children's well-being
- inform the development and implementation of future policies and practices that will reduce childhood poverty.

Young Lives is tracking the development of 12,000 children in Ethiopia, India (Andhra Pradesh), Peru and Vietnam through quantitative and qualitative research over a 15-year period.

Young Lives Partners

Young Lives is coordinated by a small team based at the University of Oxford, led by Jo Boyden.

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Grupo de Análisis para el Desarollo (Group for the Analysis of Development), Peru

Instituto de Investigación Nutricional (Institute for Nutritional Research), Peru

Centre for Analysis and Forecast, Vietnamese Academy of Social Sciences, Vietnam

General Statistics Office, Vietnam

Save the Children, Vietnam

The Institute of Education, University of London, UK

Child and Youth Studies Group (CREET), The Open University, UK

Department of International Development, University of Oxford, UK

Save the Children UK (staff in the Policy Department in London and programme staff in Ethiopia).

Young Lives
An International Study of Childhood Poverty

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