Psycho-social Status and Cognitive Achievement in Peru[1]

Abstract

This paper assesses 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. 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, Psycho-social Status, Cognitive Skills, Non-cognitive Skills

JEL classification: J13, O15

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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; Classens et al. 2009; 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. The evidence on the existence of such relationship is still scarce, especially in the context of developing countries (Helmers and Patnam, 2011). 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. 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.

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

Our interest lies in understanding the effect that psychosocial skills might have on the acquisition of later cognitive skills. Accordingly, we follow Cunha et al. (2006) and Cunha and Heckman (2008) and formalise the production of skills in the following way:

$$s_t^k = f_t^k(s_{t-1}^c, s_{t-1}^{ps}, I_t^k) \qquad (1)$$

where s_t^k indicates the stock of skill k in period t. Index k can therefore take one of two values: c for cognitive skills, and ps for psychosocial skills. Similarly, I_t^k denotes skill-specific inputs in period t, s_{t-1}^c and 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^k. Thus the stock of any type of skills at any point in time is a function of innate skills and the history of external inputs. Equation (1) is built on the assumption that both cognitive and psychosocial skills are self-reinforcing over time (see Cunha et al. 2006).

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 2007; 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 (see, for instance, Glewwe and King 2001).

Even though our data fails in this account, following Glewwe and Miguel (2008) 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,

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

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. 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. It is the latter that is more relevant for policy makers, hence the term 'policy effect' coined by Todd and Wolpin (2007) in reference to equation (1').

2.3 Econometric specifications

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

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

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 skills, 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}). To address potential sources of endogeneity, we follow two strategies. First, we exploit the longitudinal aspect of the Young Lives dataset, which 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. Second, 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 significantly reduce the risk of our estimates being biased due to remaining and potentially correlated unobserved variables. In Section 4.2, we provide extensive evidence that endogeneity issues are likely to be neglectable in our analysis.

Moreover, 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).[2]

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. 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:

[2] 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.

$$s_{it}^{c} = \sum_{j-1}^{3} Q_j \, s_{it-1}^{c} + \sum_{j-1}^{3} \lambda Q_j \, s_{it-1}^{c} * s_{it-1}^{ps} + \delta X_{t-1} + u_{it} \quad (2)$$

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 older 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, though only 685 were traced and re-interviewed in the second round[4] [5]. The attrition level observed (3.9%) is very low by international standards (Dercon and Outes-Leon, 2008).

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

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. Options to answer are "well" and "badly". Our 'Respect' variable is thus a binary variable that takes the value of one if the child feels poorly respected in her local area and zero otherwise. We interpret the answer as a subjective assessment of the child's sense of inclusion and the appreciation 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.

[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. However, we replicate our baseline results with data from the Younger Cohort in Section C of the Web Appendix. Our conclusions remain the same.
[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.

About 18.8% of the children in the sample perceive themselves as poorly-respected in their area.

The literature is cautious about the use of subjective variables as independent variables due to the possibility that measurement errors in self-reported indicators might be correlated with unobservable characteristics of the individual (Bertrand and Mullainathan, 2001). While it is unusual to use a psychosocial indicator based on one subjective 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.

Firstly, we observe that perceptions of respect do not appear to be strongly correlated with community or individual socioeconomic status (see Figures A1 and A2 in Appendix A)[6], suggesting that this variable is not purely determined by geographic location, neighbourhood quality or household wealth. In fact, the share of poorly respected children remains below 40% for all communities and household-specific wealth index deciles, and even children from the richest communities and highest household wealth deciles perceive themselves as poorly respected. This supports the idea that our psychosocial indicator measures a child-specific attribute.

Secondly, when we correlate against psychosocial indexes measured in Round 2, we find that 'Respect' captures a psychosocial attribute that is consistent over time. Table A1 (Web Appendix) shows that perceptions of respect at the age of 8, significantly correlate with self-esteem and sense of inclusion four years later. This provides strong support for the stability of the measured child attribute. 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 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.

[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.

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 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. Even though most 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 a sign of cultural bias or a consequence of the poverty experienced by minorities and its subsequent effect on cognitive skill accumulation[9]. Since 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, the native tongue of the mother, and the language in which the PPVT was administered; secondly, we carry out robustness checks by re-estimating our baseline empirical model for the sub-sample of children whose mothers are native Spanish speakers.

3.3 Data characteristics

Table 1 reports summary statistics for a number of key variables. From here onwards, we focus on the balanced sample of children for which we observe all the relevant explanatory variables. Overall, the sample is a relatively poor one: households are

[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). For our analysis we use the PPVT raw score, standardized by age in years. Specifically, the Young Lives survey administered the Hispanic version of the PPVT-R.

[8] Although many languages are spoken in Peru, Spanish is the official language for Basic Education (bilingual schools represent a small percentage of the total). Therefore, non-Spanish native speakers might face a disadvantage in any test administered in Spanish, considering that 'word knowledge is defined by cultural experience' (Champion et al., 2003). 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.

[9] Native tongue is strongly correlated with poverty in Peru, which implies that even if children take the Peabody test in their native tongue, those that are non-Spanish native speakers are likely to perform poorly in this vocabulary test.

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 of mothers are non-native Spanish speakers.

Table 1: Descriptive Statistics, Well vs Badly Respected Children

	All	Well Respected	Badly Respected
Dummy Badly Respected	0.203		
PPVT Score, Round 2	95.517	97.585	87.38***
Height-for-Age z-score	-1.393	-1.357	-1.54*
Ravens Test	20.824	21.095	19.76*
Pre-School Enrolment	0.882	0.899	0.82***
Child Work	0.167	0.157	0.21
Sex - Male	0.465	0.454	0.51
Age (Months)	12.317	12.322	12.3
HH Size	5.680	5.503	6.38***
Caregiver Education (Grade)	7.309	7.571	6.28***
Mother has No Partner	0.833	0.832	0.84
Mother Language (1 if not Spanish)	0.293	0.263	0.41***
Wealth Index	0.474	0.487	0.42***
Nr Observations	671	535	136

Note: *, ** and *** in the third column imply that differences in mean between well and badly respected children are significant at 10%, 5% and 1%, respectively. All variables reports, except PPVT score (Round 2), are measured in Round 1.

Table 1 also shows that roughly one in five 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 household-specific 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 preschool. However, as mentioned before, these differences are not as large as one would have expected.

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 1). However, differences in PPVT measured at the age of 12 appear to be substantial. Poorly respected children obtain a significantly lower score - on average, ten 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

4.1 Baseline Results

To test the role of psychosocial competencies in later acquisition of cognitive skills, we regress cognitive skills (s_{ijt}^{c}) of child i from community j in period t – as measured by the PPVT at the age of 12 – controlling for skills accumulated in the previous period and for a range of household and child characteristics measured at the age of 8 (period $t-1$),

$$s_{ijt}^{c} = \beta_1 s_{ijt-1}^{c} + \beta_2 s_{ijt-1}^{ps} + X_{ijt-1}\delta + \sigma_j \quad + \mu_{ijt} \qquad (3)$$

where s_{ijt}^{c} 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_{ijt}^{ps} stands for a child's self-reported perception of respect at the age of 8, our selected psychosocial indicator; vector X_{ijt-1} stands for child and household characteristics that can act simultaneously as either inputs or determinants of the rate of investment in child cognitive development; σ_j are community fixed effects; and μ_{ijt} is assumed to be random error. Particularly, the inclusion of community fixed effects ensures that children from similar contexts are compared (for instance, children from the same communities are likely to attend the same schools).

The coefficient of interest is β_2. As we already discussed in Section 2.3, model estimates based on equation (3) address some of the main aspects of potential endogeneity bias. Finally, we include an extensive set of control variables in X_{ijt-1} aimed at reducing the possibility of any remaining unobservables (μ_{ijt}) being correlated with our measures of past skills. All of these variables were measured in Round 1 – when child aged 8 years of age – and include indicators of child educational history and health status, main characteristics of the caregiver and the family, language[10] and household socioeconomic status.

Table 2 reports our baseline estimates of equation (3). Column A controls for the core set of child and household characteristics previously mentioned, and for child´s Raven's test score. Results show that both the stock of cognitive and non-cognitive skills have a significant effect on PPVT test scores four years later. Our estimates suggest that poorly respected children score on average 0.239 standard deviations less in the PPVT than their well-respected counterparts.

A potential concern is that the Raven's test, though an important indicator of cognitive attainment, may not be a perfect measure of cognitive skills. Thus, other components of cognitive skills not captured by the Raven's test might still be correlated with our psychosocial variable – i.e., a deficient early cognitive performance might reduce child perception of respect. Therefore, Column B expands the set of cognitive skill controls to include further variables on educational attainment and school performance at the age of 8 as a robustness check. Results remain largely unchanged.

Additionally, in Columns C and D, we further address the issue of potential remaining language and cultural biases in PPVT scores by replicating the models in Columns A and B for children whose mothers are native Spanish speakers only. Results show that the effect of Respect on cognitive skills four years later is robust to this change (though estimated coefficients become slightly larger). Showing that our main results are not driven by cognitive or psychosocial differences associated with native tongue is a very useful robustness check that increases the validity of our conclusions.[11]

[10] The importance of accounting for language spoken is discussed extensively in Section 3.2.

[11] Another potential 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 some clustering of children reporting a score of 55 (see Figure A3 in Appendix A). As a robustness check, in Table B1 (Web Appendix) we report censoring-corrected regression results (Tobit model) using data from the whole sample. Conclusions remain the same.

Table 2: Determinants of Cognitive Achievement, Round 2

	OLS full sample		OLS - only Spanish speaker mothers	
	A	B	C	D
Poorly respected, Round 1	-0.239***	-0.226***	-0.343***	-0.329***
	(0.078)	(0.075)	(0.075)	(0.071)
Raven's test standardized score, Round 1	0.164***	0.121**	0.211***	0.127**
	(0.050)	(0.048)	(0.066)	(0.060)
Height-for-Age Z-score, Round 1	0.067*	0.040	0.079*	0.042
	(0.038)	(0.039)	(0.041)	(0.036)
Child's sex (0 if male, 1 if female)	-0.070	-0.099	-0.021	-0.073
	(0.067)	(0.064)	(0.087)	(0.083)
Child Attended Preschool	0.077	0.011	0.285**	0.185
	(0.096)	(0.091)	(0.121)	(0.116)
Child's work in last year, Round 1	0.006	-0.044	-0.099**	-0.162***
	(0.070)	(0.073)	(0.040)	(0.046)
Birth Order; 1 if there is one older sibling, 0 otherwise	-0.232*	-0.215*	-0.254*	-0.250*
	(0.124)	(0.122)	(0.142)	(0.135)
Birth Order; 1 if there is more than one older sibling, 0 otherwise	-0.537***	-0.472***	-0.640***	-0.535***
	(0.109)	(0.089)	(0.115)	(0.098)
Household Size, Round 1	-0.035**	-0.025	-0.026	-0.012
	(0.016)	(0.017)	(0.019)	(0.020)
Biological Mother's Age, Round 1	0.010	0.009	0.019***	0.017***
	(0.007)	(0.006)	(0.007)	(0.007)
Caregiver's highest grade of schooling, Round 1	0.020*	0.017	0.015	0.013
	(0.011)	(0.011)	(0.013)	(0.013)
Child's language (0 if Spanish, 1 otherwise)	-0.489***	-0.335**		
	(0.104)	(0.159)		
PPVT language (0 if Spanish, 1 if Quechua)	-0.055	-0.133	-0.868***	-0.820***
	(0.167)	(0.174)	(0.150)	(0.135)
Mother's language (0 if Spanish, 1 otherwise)	0.239**	0.239***		
	(0.095)	(0.092)		
Log household consumption per capita, Round 2	0.047	0.047	0.018	0.021
	(0.069)	(0.067)	(0.050)	(0.049)
Housing quality index (0-1), Round 1	0.069	-0.029	0.224	0.112
	(0.271)	(0.282)	(0.292)	(0.310)
Consumer durables index (0-1), Round 1	0.149	0.160	0.191	0.166
	(0.168)	(0.153)	(0.205)	(0.195)
Services index (0-1), Round 1	0.414**	0.372**	0.205	0.128
	(0.182)	(0.168)	(0.215)	(0.206)
Reading Level of Child, Round 1		0.281**		0.362**
		(0.139)		(0.159)
Writting Level of Child, Round 1		0.177**		0.243***
		(0.077)		(0.054)

Child's grade at school, Round 1		0.248***		0.329***
		(0.077)		(0.105)
Age child started school		0.077		0.042
		(0.058)		(0.086)
Community fixed effects	**Yes**	**Yes**	**Yes**	**Yes**
Core controls	**Yes**	**Yes**	**Yes**	**Yes**
Other cognitive controls	**No**	**Yes**	**No**	**Yes**
Number of observations	578	578	414	414
Adjusted R2	0.401	0.428	0.376	0.429

Note: OLS regressions with community-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. Additional **'Core controls'** not reported for parsimony include self -perception of child's health, if child was breastfeed, child's year and quarter of birth, if caregiver is the biological mother, if caregiver has a partner, father's age, rural residency and water quality.

4.2 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 both 'Respect' and cognitive outcomes can be correlated with unobserved factors such as 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 such as health problems might also play a role.

Our approach is to further explore the extent of the remaining potential bias[12]. 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

[12] At first sight, these concerns could be addressed by taking advantage of the longitudinal nature of the YL data to include individual fixed effects. However, this is not possible due to the dynamic nature of our model (e.g., estimates for lagged cognitive skills). Moreover, attitudes and perceptions are highly sensitive to current status, which limits the potential for individual fixed effects to account for unobserved heterogeneity among individuals in the sample.

variables and tackle directly the problem of unobserved heterogeneity in the cognitive skills equation.

Table 3 reports the results of this exercise. For comparison purposes, Columns A and B reproduce the initial specifications from Table 2, using the 'core' set of controls and the expanded set of cognitive skill and schooling measures, respectively. In turn, Column C reports results that control for parental attitudes towards education as well as proxies of the educational culture that might prevail in a household[13]. Parents that are particularly concerned with their children's education might also care more for their psychological well-being. However, the 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 a link between household violence and drinking habits and poor psychosocial well-being among children[14]. 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. When accounting for these factors[15], we find that point estimates of perceptions of respect become smaller in magnitude, although the reduction is only modest (see Column D).

Columns E and F include two further sets of controls: a set of variables on children's self-reported perceptions and social attitudes[16], and a set of variables on the psychosocial status of the child's mother or caregiver[17]. Regarding the first specification, the inclusion of these variables aims to eliminate the possibility that the

[13] 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).

[14] 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).

[15] 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.

[16] Specifically, we include indicators of how often the child plays, self-reported Illnesses that prevent the child from going to school or working, and self-reported Illnesses that prevent the child from playing or making friends.

[17] The specification in Column F includes psychosocial indexes of a mother's agency, perception of respect and self-esteem.

effect of perceived respect is due to any other psychosocial factor that might also affect the child's cognitive performance. As for column F, this specification aims to test whether the baseline results are driven by the psychosocial status of other household members other than the child. Particularly, caregivers and mothers with poor psychosocial status might not only pass on their psychosocial status to their children but could also provide fewer cognitive investments. Similar to the earlier sets of additional controls, both of these modifications have little impact on the estimated coefficients.

Finally, column G includes a set of variables to control for the relative position of the child within the community. Specifically, we add two variables that measure the position of the child in the ranking of height-for-age within her community and the position of the household in the ranking of household consumption per-capita. The inclusion of these variables aims to account for the possibility that the effect of perceived respect might be driven by a comparison with others, rather than a child-specific trait. However, previous results remain largely unchanged.

Table 3: Determinants of Cognitive Achievement, Round 2 - Robustness Check

	A	B	C	D	E	F	G
Poorly respected, Round 1	-0.239***	-0.219***	-0.226***	-0.237***	-0.239***	-0.243***	-0.251***
	(0.078)	(0.076)	(0.072)	(0.077)	(0.076)	(0.080)	(0.081)
Raven's test standardized, Round 1	0.164***	0.108**	0.103**	0.108**	0.113***	0.113***	0.113***
	(0.050)	(0.045)	(0.046)	(0.044)	(0.042)	(0.042)	(0.042)
Height-for-Age Z-score, Round 1	0.067*	0.040	0.039	0.039	0.039	0.039	0.052
	(0.038)	(0.039)	(0.037)	(0.037)	(0.037)	(0.037)	(0.068)
Child Attended Preschool	0.077	0.005	0.203	0.191	0.171	0.148	0.156
	(0.096)	(0.093)	(0.144)	(0.148)	(0.145)	(0.141)	(0.143)
Child's work in last year, Round 1	0.006	-0.048	-0.077	-0.076	-0.088	-0.084	-0.081
	(0.070)	(0.071)	(0.072)	(0.074)	(0.074)	(0.076)	(0.078)
Child's sex (0 if male, 1 if female)	-0.070	-0.105	-0.112*	-0.111*	-0.101	-0.091	-0.090
	(0.067)	(0.064)	(0.062)	(0.064)	(0.063)	(0.062)	(0.063)
Birth Order; 1 if there is one older sibling, 0 otherwise	-0.232*	-0.198*	-0.210*	-0.211*	-0.196	-0.203	-0.203
	(0.124)	(0.119)	(0.117)	(0.118)	(0.120)	(0.125)	(0.125)
Birth Order; 1 if there is more than one older sibling, 0 otherwise	-0.537***	-0.462***	-0.445***	-0.443***	-0.451***	-0.462***	-0.466***
	(0.109)	(0.083)	(0.080)	(0.078)	(0.077)	(0.081)	(0.081)
Household Size, Round 1	-0.035**	-0.025	-0.029*	-0.027	-0.025	-0.025	-0.031
	(0.016)	(0.017)	(0.016)	(0.017)	(0.017)	(0.018)	(0.019)
Biological Mother's Age, Round 1	0.010	0.009	0.009	0.009	0.010	0.010*	0.010*
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Caregiver's highest grade of schooling, Round 1	0.020*	0.017	0.020	0.018	0.021*	0.020	0.020
	(0.011)	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)

Child's language (0 if Spanish, 1 otherwise)	-0.489***	-0.356**	-0.346**	-0.357*	-0.353*	-0.345*	-0.340*
	(0.104)	(0.170)	(0.169)	(0.187)	(0.190)	(0.204)	(0.206)
PPVT language (0 if Spanish, 1 if Quechua)	-0.055	-0.117	-0.143	-0.097	-0.096	-0.104	-0.114
	(0.167)	(0.174)	(0.160)	(0.157)	(0.162)	(0.157)	(0.157)
PPVT language (0 if Spanish, 1 if Quechua)	0.239**	0.232***	0.213***	0.202***	0.221***	0.232***	0.233***
	(0.095)	(0.087)	(0.080)	(0.077)	(0.071)	(0.065)	(0.063)
Log household consumption per capita, Round 2	0.047	0.037	0.030	0.031	0.038	0.051	0.100
	(0.069)	(0.067)	(0.064)	(0.060)	(0.058)	(0.057)	(0.069)
Housing quality index (0-1), Round 1	0.069	-0.069	-0.048	-0.045	-0.089	-0.113	-0.100
	(0.271)	(0.282)	(0.271)	(0.284)	(0.286)	(0.282)	(0.281)
Consumer durables index (0-1), Round 1	0.149	0.190	0.152	0.134	0.157	0.179	0.203
	(0.168)	(0.152)	(0.156)	(0.180)	(0.196)	(0.184)	(0.181)
Services index (0-1), Round 1	0.414**	0.363**	0.318*	0.301*	0.323*	0.326**	0.320**
	(0.182)	(0.171)	(0.176)	(0.170)	(0.167)	(0.161)	(0.161)
Community fixed effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Core controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Other cognitive controls	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Parental school investment controls	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
History of violence controls	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Other child psychosocial controls	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**
Household psychosocial controls	**No**	**No**	**No**	**No**	**No**	**Yes**	**Yes**
Relative position in the community	**No**	**No**	**No**	**No**	**No**	**No**	**Yes**
Number of observations	578	578	578	578	578	578	578
Adjusted R2	0.401	0.434	0.434	0.436	0.435	0.437	0.436

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. Additional **‘Core controls’** not reported for parsimony include self -perception of child’s health, if child was breastfeed, child’s year and quarter of birth, if caregiver is the biological mother, if caregiver has a partner, father’s age, rural residency and water quality. **‘Schooling controls’:** child’s writing level, child’s reading level, child’s grade, age of school enrolment;

‘Parent school investment controls’: Age enrolment in preschool, Parent evaluate child school performance, Hours of child home study, Parents work for school, Parents assist PA meetings, Parents assist group meetings, Parents assist Individual meetings with teacher, Parents fund raising for school, Who helps kid 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 from school/work, Illness that prevents from play/friends; ‘**Household psychosocial controls’:** Caregiver’s Self Esteem Index, Caregiver’s Respect Index, Caregiver’s Self-Efficacy Index. ‘**Relative position in the community’**: Height-for-age z-score ranking by cluster, Real expenditure per capita ranking by cluster.

In summary, Table 3 provides extensive evidence of the robustness of the cognitive effect of perceptions of respect. The process of overparametrising the model specification reported in Table 3 can be described as an attempt to reduce the size of the unobserved term in our model specification. The results show that the magnitude of the estimated coefficient of ‘Respect’ remains remarkably stable, despite the inclusion of multiple sets of controls designed to address potential sources of estimation bias in our baseline specification. This suggests that the remaining unobserved heterogeneity was relatively modest.

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 3. Results show that perceptions of respect are most strongly correlated with variables that are relatively cognitive skill neutral[18], while variables primarily linked to parental and cognitive investments appear to have no significant effect on perceptions of respect[19].

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.

[18] For example, household size, birth order, non-native Spanish speaking and pre-school enrolment.
[19] Specifically, 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.

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. So far, we have assumed that the influence of early cognitive skills over later outcomes is independent of the child's initial psychosocial status. In this section, we extend our analysis to allow for the possibility that differences in non-cognitive skills can lead to diverging cognitive accumulation paths. We are motivated by the possibility that psychosocial skills might not only affect cognitive outcomes directly, but also through a mediated influence over the degree of self-productivity between cognitive skills at different stages of development. Obtaining evidence of such a relationship would make our case about the importance of investing in non-cognitive skills during this particular stage of development even stronger.

Empirically, we investigate the interplay between our two measures of skills, 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)[20] in estimating the alternative equation

$$y = f(z) + X\delta + u \qquad (4)$$

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 (4), we include a parsimonious set of control variables[21].

[20] 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.

[21] 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,

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, even after accounting for other explanatory variables that might be correlated with psychosocial status. Second, 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 tercile 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.

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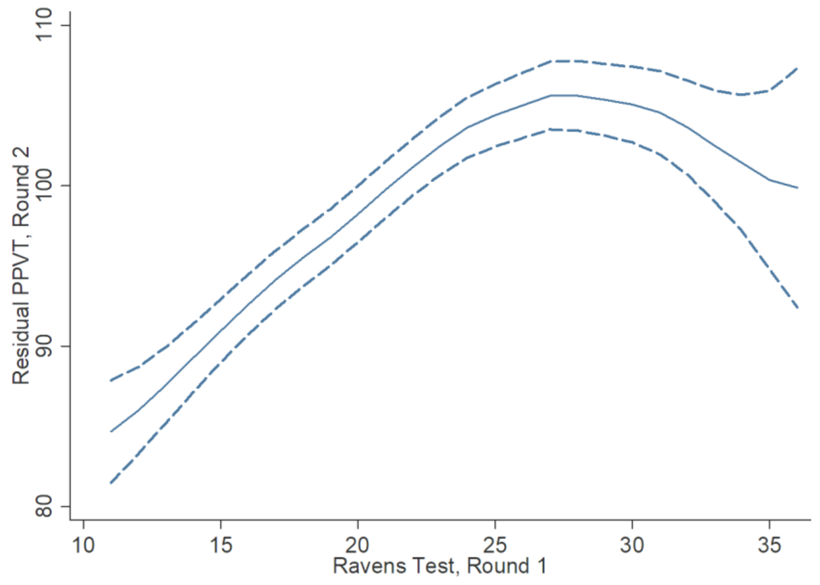
preschool enrolment, child work, gender and age of child, birth order, household size and wealth index, caregiver education, single mother dummy and ethnicity of the mother and cluster dummies.

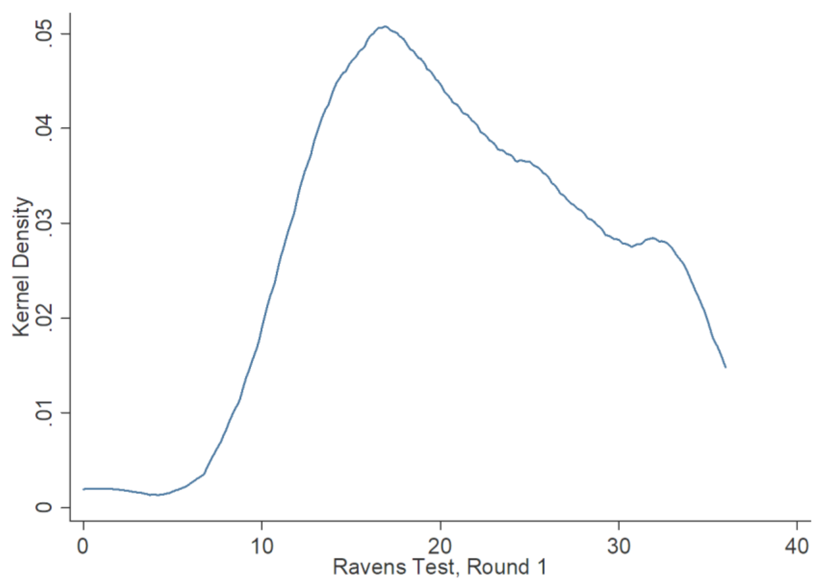
To check for the robustness of these findings, we also present results from a more conventional parametric method. Firstly, we augment the baseline specification (3) by allowing for interactions between Raven's test results and a child's perception of respect. To allow for non-linearities in the main and interaction effects, the continuous measure of the Raven's test is replaced by quartile dummies. Secondly, we reestimate the model for different quartiles of the Raven's test distribution separately.

Figure 1: Own Self-Productivity - Residual PPVT and Raven's Test



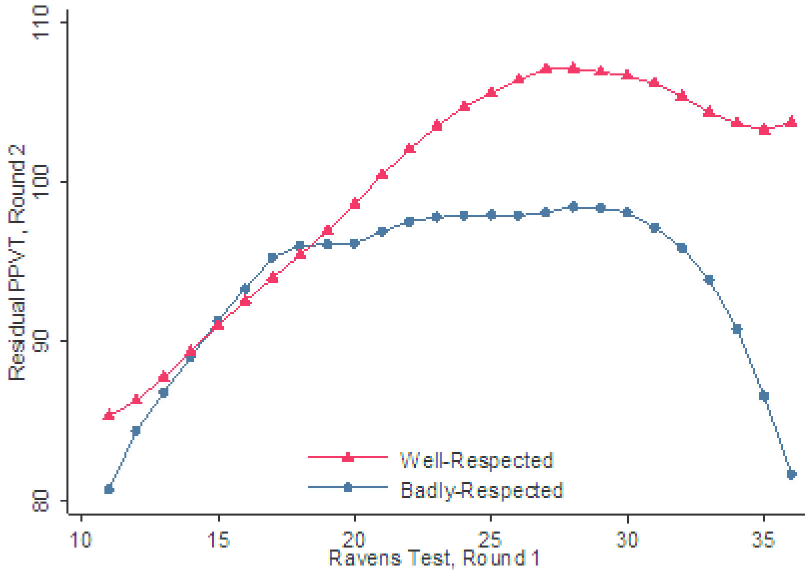
Note: Residual PPVT obtained through 8th-order differencing of 'parsimonious' controls. Lowess Kernel smoothing with 0.4 bandwidth. 10% confidence internals shown in discontinued line. **'Parsimonious Controls':** child self-perception of respect, dummies for Raven test quartiles and interactions with 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 preschool, child did a paid work in last year. Sample restricted to values of PPVT above 55.

Figure 2: Raven's Test Distribution, Kernel Density



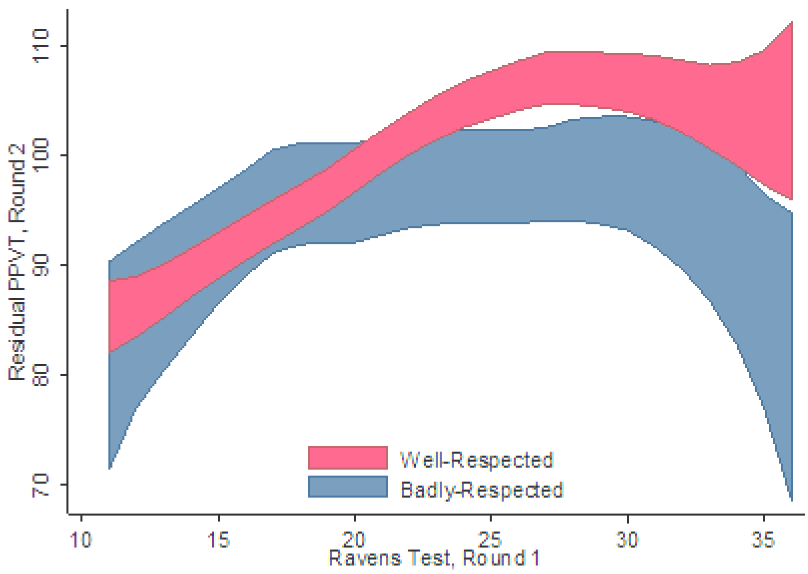
Note: Kernel density function smoothing; optimal smoothing bandwidth applied. Sample restricted to values of PPVT above 55.

Figure 3: Skill Complementarities – Cognitive Skill Accumulation for Well and Badly Respected Children



Note: Residual PPVT obtained through 8th-order differencing of 'parsimonious' controls. Lowess Kernel smoothing with 0.4 bandwidth. **'Parsimonious Controls':** child self-perception of respect, dummies for Raven 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 preschool, child did a paid work in last year. Sample restricted to values of PPVT above 55.

Figure 4: Skill Complementarities - 90% Confidence Intervals



Note: Residual PPVT obtained through 8th-order differencing of 'parsimonious' controls. Lowess Kernel smoothing with 0.4 bandwidth. Filled area correspond to 10% confidence internals. **'Parsimonious Controls':** child self-perception of respect, dummies for Raven 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 preschool, child did a paid work in last year. Sample restricted to values of PPVT above 55.

The results are presented in Table 4. 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 nonparametric analysis. Point estimates from the interaction effects model (see Columns (1) and (6)) indicate that poorly respected children experience lower cognitive returns than their well-respected counterparts at the top two quartiles of the Raven's test distribution, although these differences are not significant at conventional levels. Specifically, well-respected children in the top two Raven's test quartiles obtain PPVT scores 0.298 and 0.469 standard deviations higher than their counterparts in the bottom quartile, but the direction of the interaction coefficients suggests that this advantage is offset by poor perceptions of Respect. In general, poorly respected children appear not to benefit from their previously acquired cognitive skills.

Quartile regressions reported in Columns (2) to (5) and (7) to (10) suggest a similar pattern. Poorly respected children have lower PPVT scores in all quartiles, and in this case the estimates are significant for the top two quartiles of the Raven's test distribution regardless of the selection of control variables. This provides support to our conclusions from the interaction effects-model.

Overall, our results in this Section provide interesting insights on the complementarity between cognitive and psychosocial skills. Classical models typically assume that this relationship implies the existence of cross-productivity between both types of skills in different stages of development. However, our findings suggest that the stock of psychosocial skills may also influence the returns to cognitive skills during the same period. Particularly, a poor perception of respect at age 8 appears to affect children in the top quartiles of the cognitive distribution disproportionately, compensating their initial advantage almost entirely by age 12. These findings suggest that age 8 might be a critical period to invest in proper psychosocial development for children with high cognitive skills. As for the children in the bottom parts of the cognitive distribution, cognitive inputs appear to be more beneficial at this stage.

Table 4: Parametric Analysis of Skill Complementarities

	Raven Test Quartiles - Parsimonious Controls					Raven test Quartiles - Core Controls				
	Full Sample	Q1	Q2	Q3	Q4	Full Sample	Q1	Q2	Q3	Q4
Poorly respected, Round 1	-0.139	-0.225	-0.086	-0.348*	-0.354***	-0.123	-0.181	0.025	-0.481***	-0.347***
	(0.170)	(0.148)	(0.172)	(0.189)	(0.086)	(0.150)	(0.135)	(0.204)	(0.169)	(0.104)
Q2 - Raven Test x Poorly Respected	0.045					0.061				
	(0.235)					(0.210)				
Q3 - Raven Test x Poorly Respected	-0.240					-0.274				
	(0.208)					(0.177)				
Q4 - Raven Test x Poorly Respected	-0.350					-0.321				
	(0.227)					(0.201)				
Q2 - Raven Test (vs Q1)	0.207**					0.200*				
	(0.104)					(0.108)				
Q3 - Raven Test (vs Q1)	0.298**					0.334***				
	(0.124)					(0.122)				
Q4 - Raven Test (vs Q1)	0.469***					0.462***				
	(0.142)					(0.139)				
Number of observations	550	141	149	145	143	550	141	149	145	143
Adjusted R2	0.378	0.263	0.160	0.430	0.479	0.396	0.291	0.219	0.428	0.440

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 self-perception of respect, dummies for Raven 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 preschool, child did a paid work in last year. **'Core Controls'** include child self-perception of respect, dummies for Raven test quartiles and interactions with respect, height for age Z-score, child's sex, birth order, birth year, child's health, child's 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 preschool, child did a paid work in last year.

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 also found that non-cognitive skills promote the formation of cognitive skills in a sample of children growing up in the United States. However, other studies such as Coneus et al. (2012) have not found evidence of cross productivity from non-cognitive skills to cognitive skills in developed countries (e.g., Germany). Interestingly, we are unaware of studies that provide similar evidence to our results in the context of a developing country. Helmers and Patnam (2011) 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 skills in mid-childhood and cognitive skills at later stages of development.

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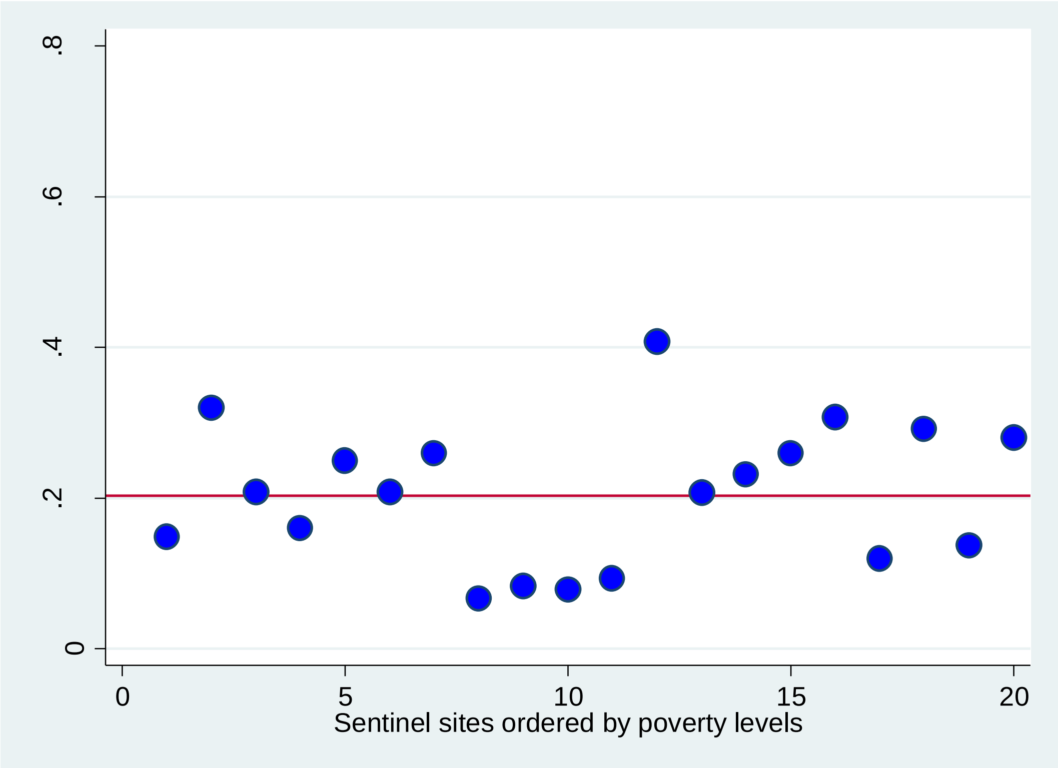
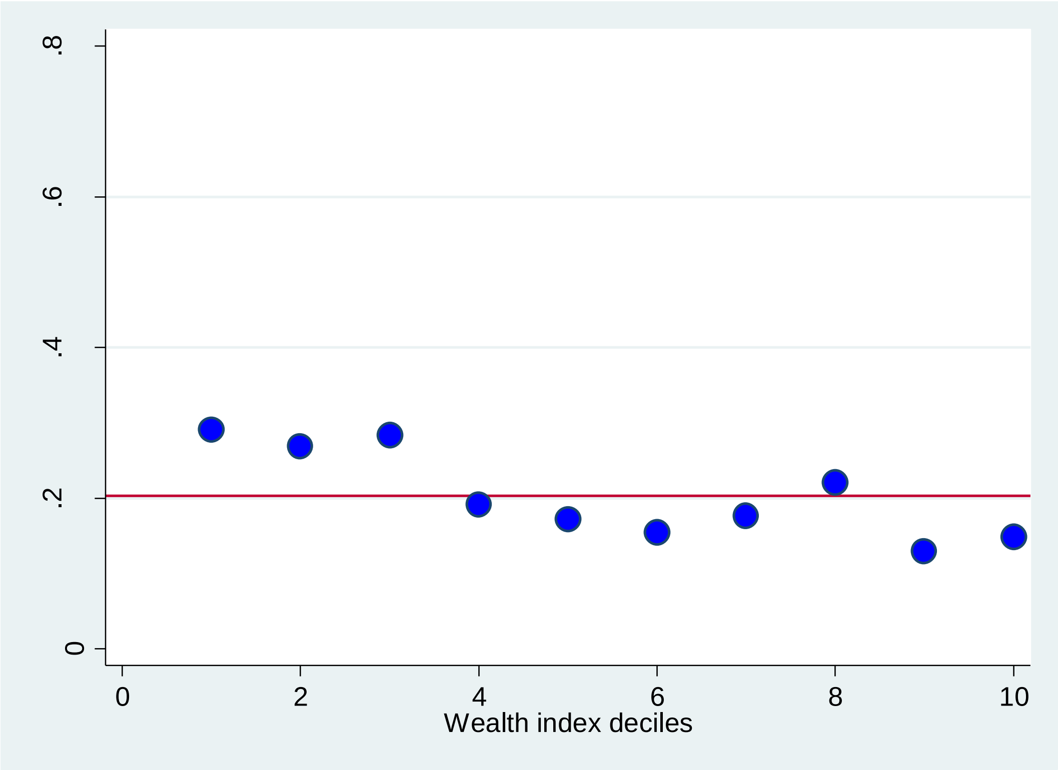
Appendix A: Figures

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



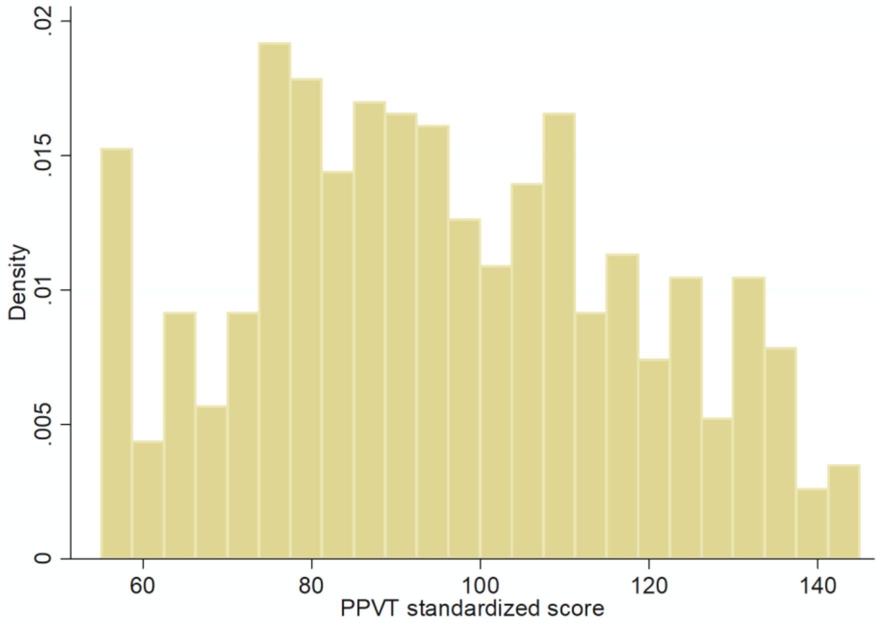
Note: The vertical axis reports the mean value of Respect by sentinel site. The horizontal axis orders the 20 Young Lives sentinel sites according to their relative position in the Peru Poverty Map (site number 1 is the poorest and site number 20 is the richest). The horizontal line represents the mean value of respect in the whole sample. 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 badly-respected by sentinel site.

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



Note: The vertical axis reports the mean value of Respect by wealth deciles. The horizontal axis orders sample by wealth deciles, with the 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 respect in the whole sample. 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 badly-respected by wealth deciles.

Figure A3. Bottom censoring of PPVT variable, histogram



Note: Histogram of PPVT standardized 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	G
Raven's test standardized, Round 1	-0.021*	-0.020	-0.021	-0.021	-0.022	-0.023	-0.022
	(0.012)	(0.015)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)
Height-for-Age Z-score, Round 1	-0.006	-0.003	0.004	0.006	0.005	0.007	-0.017
	(0.015)	(0.014)	(0.013)	(0.013)	(0.012)	(0.012)	(0.036)
Child Attended Preschool	-0.117**	-0.109**	-0.116	-0.124	-0.122	-0.141	-0.147
	(0.051)	(0.055)	(0.127)	(0.122)	(0.118)	(0.122)	(0.120)
Child's work in last year, Round 1	0.016	0.023	0.025	0.026	0.019	0.019	0.018
	(0.040)	(0.038)	(0.040)	(0.039)	(0.042)	(0.043)	(0.044)
Child's sex (0 if male, 1 if female)	0.028	0.028	0.031	0.030	0.028	0.030	0.030
	(0.041)	(0.042)	(0.039)	(0.038)	(0.037)	(0.037)	(0.037)
Birth Order; 1 if there is one older sibling, 0 otherwise	-0.079**	-0.082**	-0.089**	-0.089**	-0.094**	-0.103***	-0.102***
	(0.035)	(0.036)	(0.039)	(0.038)	(0.038)	(0.039)	(0.037)
Birth Order; 1 if there is more than one older sibling, 0 otherwise	-0.140***	-0.149***	-0.163***	-0.160***	-0.166***	-0.174***	-0.173***
	(0.054)	(0.056)	(0.059)	(0.059)	(0.061)	(0.061)	(0.060)
Household Size, Round 1	0.031***	0.029***	0.030***	0.031***	0.030***	0.030***	0.031**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)	(0.012)
Biological Mother's Age, Round 1	0.004	0.004	0.005	0.005	0.005	0.005	0.005
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Caregiver's highest grade of schooling, Round 1	0.002	0.002	0.003	0.002	0.003	0.004	0.004
Child's language (0 if Spanish, 1 otherwise)	0.231*	0.226*	0.247*	0.248*	0.249*	0.274*	0.277**
	(0.129)	(0.133)	(0.135)	(0.136)	(0.134)	(0.141)	(0.139)
0 if child answered PPVT in spanish, 1 oth	-0.085	-0.083	-0.096	-0.082	-0.087	-0.093	-0.098

	(0.088)	(0.085)	(0.074)	(0.071)	(0.077)	(0.077)	(0.075)
Mother's language; 0 if native tongue is spanish, 1 oth	0.057	0.064	0.057	0.054	0.055	0.039	0.041
	(0.064)	(0.068)	(0.063)	(0.063)	(0.061)	(0.060)	(0.061)
Log household consumption per capita, Round 2	-0.009	-0.006	-0.010	-0.010	-0.009	-0.003	-0.006
	(0.022)	(0.022)	(0.023)	(0.024)	(0.024)	(0.024)	(0.039)
Housing quality index (0-1), Round 1	-0.005	0.019	0.020	0.029	0.003	-0.013	-0.015
	(0.064)	(0.060)	(0.049)	(0.049)	(0.051)	(0.054)	(0.057)
Consumer durables index (0-1), Round 1	-0.123	-0.137	-0.116	-0.137	-0.121	-0.098	-0.099
	(0.112)	(0.114)	(0.117)	(0.111)	(0.107)	(0.111)	(0.120)
Services index (0-1), Round 1	-0.014	0.004	-0.006	-0.012	-0.010	0.007	0.009
	(0.092)	(0.093)	(0.089)	(0.090)	(0.091)	(0.096)	(0.098)
Community fixed effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Core controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Other cognitive controls	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Parental school investment controls	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
History of violence controls	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Other child psychosocial controls	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**
Holsehold psychosocial controls	**No**	**No**	**No**	**No**	**No**	**Yes**	**Yes**
Relative position in the community	**No**	**No**	**No**	**No**	**No**	**No**	**Yes**
Number of observations	**578**	**578**	**578**	**578**	**578**	**578**	**578**
Adjusted R2	0.077	0.075	0.081	0.079	0.079	0.089	0.086

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. Additional **'Core controls'** not reported for parsimony include self -perception of child's health, if child was breastfeed, child's year and quarter of birth, if caregiver is the biological mother, if caregiver has a partner, father's age, rural residency and water quality. **'Schooling controls':** child's writing level, child's reading level, child's grade, age of school enrolment; **'Parent school investment controls':** Age enrolment in preschool, Parent evaluate child school performance, Hours of child home study, Parents work for school, Parents assist PA meetings, Parents assist group meetings, Parents assist Individual meetings with teacher, Parents fund raising for school, Who helps kid 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 from school/work, Illness that prevents from play/friends; '**Household psychosocial controls':** Caregiver's Self Esteem Index, Caregiver's Respect Index, Caregiver's Self-Efficacy Index. '**Relative position in the community'**: Height-for-age z-score ranking by cluster, Real expenditure per capita ranking by cluster.