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Información para el desarrollo

Pre-school Education and Schooling Outcomes in Peru

Juan José Díaz

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Abstract

In this paper I examine the relationship between child schooling and achievement outcomes and attendance at pre-school education, monitoring socio-economic status (SES), parenting practices, and parent education. Using data from an 8 year-old cohort from the Peruvian Young Lives Study, I find evidence that pre-school education has a significant positive and statistical relationship with school attendance, the correct grade-forage and writing and maths achievement, even after monitoring for additional co-variants in a multi-variant analysis. I have also found that children who attend a CEI have better results than those who attend a PRONOEI, and that pre-school benefits materialize with the length of exposure to the stimuli provided at the CEI.

1 Introduction

Specialists in education, including academics, policy makers and other stake holders, agree that the educational system is in desperate need of reform. However, there is no strong consensus regarding the specific initiatives which must be taken. Primary education is almost universal, while secondary enrolment is increasing. A number of recommendations and proposals have been made for improving the quality of schools. Some specialists indicate that the problem is partly that children enter primary schools with serious learning problems and that more attention must be given to pre-schools.

Peruvian schools are generally of poor quality. The problem is particularly acute in state schools. Results for fourth-grade students in the language test in the 2001 National Evaluation of School Achievement (ENRE-2001) are discouraging. In the reading comprehension test, only 31 per cent of students in urban areas obtained good enough marks, whereas 54 per cent of students had marks below the basic or minimum level. In rural areas, only 11 per cent of fourth grade students obtained good-enough

[1] Associate Researcher at GRADE. E-mail: jjdiaz@grade.org.pe. This paper is part of the Young Lives Project, an innovative longitudinal study of childhood poverty in Ethiopia, India (Andhra Pradesh State), Peru and Vietnam. The research was funded by DfID.

marks, whereas 81 per cent fell below the minimum level. Grammar results were even more discouraging: almost no students had good-enough marks, either in urban or rural areas. In urban areas, 62 per cent of the students obtained below-minimum marks and only 38 per cent attained the minimum level; in rural areas these figures were 86 and 14 per cent. (See Figure 1)

ENRE 2001 results for eleventh grade students, at the end of secondary, were also disappointing. In the language test, 63 per cent of the students had below-minimum marks. In maths, the results were even worse. A total of 83 per cent of all eleventh graders obtained below minimum level marks. There were dramatic differences between students from state and private schools. A total of 31 per cent of private students had below minimum performance levels in the language test, while the figure for state school students was 69 per cent. In maths, 88 per cent of state school students and 55 per cent of private school students' marks fell below the minimum level. Since it is almost entirely children from poor families who attend state primary and secondary schools, the most vulnerable groups receive education of very poor quality, which poses serious challenges for the skills with which they enter the labour market.

In addition to the learning deficiencies that these tests reveal, other indicators show the serious problems facing Peru's education system. Although the system has improved its infrastructure coverage in the last decade and enrolment at primary level has improved in most of Peru's 24 departments (states), enrolment at secondary level is still low, especially in rural areas. Serious drop-out problems persist at secondary, and extra-age at primary and secondary level. Although the extra-age problem was reduced in the Nineties, the country still has a long way to go. In 1999, the percentage of primary school students in the right grade for their age was just 67 per cent, while in secondary schools it was only 36 per cent. These figures however represent an improvement of approximately 10 per cent compared with the situation in 1993.

In this paper, I use data from the Young Lives Study (Peru) to explore the relationship between family investment in children, with emphasis on the impact of pre-schools on schooling and achievement outcomes. One advantage over previous studies is that the Young Lives Study (Peru) data was gathered from several departments around the country, and from both urban and rural communities.

Families play a central role in shaping children's cognitive and socio-emotional abilities in the early stages of human development. They provide the genetic endowments and pre-and post-natal environments (care, love, influence, etc.) from which these abilities will develop. An interesting hypothesis to test is

whether families that invest more and better on the formation of these skills "produce" high ability children who will later succeed at school and at the labour market. One of such investments is pre-school education, where children are exposed to stimuli that help them develop cognitive and socio-emotional abilities.

There are multiple cognitive and socio-emotional abilities or skills, and there is evidence suggesting that these different dimensions of "ability" do vary over time and are affected by family "investments" (time, care, influence). IQ is one of the most popular measures of cognitive ability, which is positively correlated to test scores and school achievement. Traits such as motivation, patience and persistence are unobserved socio-emotional abilities likely correlated to school achievement and are undoubtedly rewarded in the labour market. Persistence and patience may improve the acquisition of knowledge during school age, while motivation may help people to do well with difficult tasks. Economics studies which support the positive relationship between socio-emotional abilities, school performance and labour market outcomes include Klein, Spady and Weiss (1991), Heckman and Rubinstein (2001), and Duncan, Claessens and Engel (2004).

It is crucial to understand how the different dimensions of "ability" or "skill" are formed at early stages if policy-making is to be geared to the development of human capital. When families fail to provide the environment appropriate for developing these abilities, public policy may play a crucial role as a remedy before as well as during school age. The Balsakhi Programme in India is an interesting remedial education program in a developing country. The program identified third-grade children falling behind their peers and provided them with a teacher to work with them on the competencies they should have acquired in previous grades, such as minimum numeric and literacy skills. A randomized evaluation (Banerjee et al. 2004) suggests the program has been successful, increasing the average test scores of all children in treatment schools by 0.14 standard deviations in the first year, and 0.28 standard deviations in the second year compared to children from control schools.

In this study I analyze the relationship between children's schooling and achievement outcomes, pre-school education and family structure using the first wave of the Young Lives Study in Peru (YLS Peru). I use data on Peruvian children in the 8 year-old cohort from the YLS Peru. The outcomes studied are school attendance in the correct grade for age and verbal and numerical achievement as recorded in the YLS Peru survey. The investments studied are the use of pre-school or child care, such as an Infants School (CEI) which is a mainstream infants school or the Independent Infants Education Programme (PRONOEI), the

time spent at pre-school and parenting practices related to school life (helping children with homework). In the analysis, I monitored potential confounding variables, such as parents' characteristics (age, marital status, education), family SES, residence, number of siblings and child gender (as parents may invest differently in education and skills acquisition for boys and girls).

2 Pre-school education in Peru, an overview

2.1 The pre-school system in Peru

In Peru, pre-school education for children of 3-5 years old provides two kinds of service: school services provided by public and private schools and independent services provided by public programs.

Schools which provide services to three to five year-olds are known as Infants Schools (CEI). They are managed and funded by the Ministry of Education. In some cases, state primary schools have a pre-school but in general, state pre-schools are separate schools with their own principal and teaching staff. The CEI are run in facilities provided by the Ministry of Education and offer formal pre-school education with the Ministry's curriculum. Private CEI are generally privately-owned pre-schools with private management and are usually funded by tuition and fees paid by parents or by charitable contributions from civil society or the Church. The private CEI also provide formal pre-school education services, but do not necessarily follow the Ministry of Education curriculum. In both types of CEI, pre-school teachers are professionals with teaching degrees in pre-school education.

Independent services are provided through several public programs recognized by the Ministry of Education. These provide services for fostering parenting practices among parents and guardians or directly to children. Among the latter are the Independent Infants Education Programs (PRONOEI). The PRONOEI are run in communities where there is no formal pre-school education, usually rural areas or shanty towns, and provide care–giving services and cognitive and socio-emotional development. A PRONOEI is usually organized on the initiative of local communities, which provide the installations for the service. The PRONOEIs do not have professional teachers, as do the CEIs, but rather a volunteer care-giver called a facilitator. The facilitator is usually a woman volunteer from the community, chosen and appointed by the community organization. The Ministry of Education provides minimum training in child care and development for the PRONOEIs' facilitators. The facilitator does not receive a salary but rather a stipend or pocket money. Both the PRONOEI and the facilitators are monitored by a coordinator appointed by the Ministry of Education's Local Education Authority.

PRONOEIs have their roots in the *Waw*a *Was*i or *Waw*a *Ut*a ("Children's House" in the Quechua and Aymara languages), an initiative in the state of Puno around 1968 started by a group of volunteer women to provide day-care for their children while they made a living making knitwear. They organized in their local communities to provide day-care with supplementary food provided by CARITAS. They had the support of Father Ramon Leon, a priest working with CARITAS, who helped them to get a government-backed literacy program. Several similar community initiatives grew out of the Puno experience. In the early Seventies, the Puno program and others were brought under the jurisdiction of the Ministry of Education.

A recent survey to evaluate parent satisfaction with several social programs including PRONOEI (Cuanto, 2003) applied to 1,128 mothers nationwide, reveals that 52 per cent of mothers whose children attend a PRONOEI are satisfied with the services and education their children receive. About 40 per cent of mothers think that their PRONOEI's infrastructure is inadequate, while 22 per cent think they are completely inadequate. However, 79 per cent said they believe the volunteer facilitator helps their children and that she is well trained (only 4 per cent believe she is not good with their children and not well qualified).

The number of CEIs (state and private) and PRONOEIs has increased in recent decades. In 1993, pre-school education was declared compulsory for five year-olds and several efforts have been made to expand coverage for children over three. Ministry of Education figures (School Census and Minimum Statistics) shown in Table 1, reveals that from 1993 to 2004 the supply of CEIs and PRONOEIs grew by 25 per cent. By 2004, the number of CEIs and PRONOEIs was around 33 thousand nationwide. In the same period, the total number of CEIs increased by 44 per cent, with more private CEIs (around 88 per cent compared with the state CEIs' 25 per cent. The number of PRONOEIs increased by 10 per cent in the same period. Most of the expansion occurred during the 1990s, as panel (B) from Table 1 shows. However, insufficient attention was given to the aspects of the quality and equity of pre-school education.

Enrolment rates for children of 3-5 years old in infants schools, either CEIs or PRONOEIs, have also increased during the past decades although they are still far from achieving universal coverage. In the early 1970s, the enrolment rate in infant education was close to 5 per cent for 3-5 year olds, according to Ministry of Education estimates. By 1985, the enrolment rate at pre-schools increased to 21 per cent, and by 2003 reached 53 per cent (see Table 2 for details).

Although there are no gender differences in pre-school enrolment rates, nationwide household survey data reveals inequalities regarding residence and poverty status. In 2003, the enrolment rate among urban children was about 62 per cent, while among rural children it was only 43 per cent. In the same year, the enrolment rate for children from non-poor households was 67 per cent, while for children from poor and extremely poor households the rates were 55 and 36 per cent.

These differences in enrolment rates corresponding to socioeconomic status and place of residence are also related to a potential problem of quality differences. State education in shanty towns and in rural areas is of lower quality, in places where poverty is more severe. As a result, poor households are probably restricted to CEI and PRONOEI of lower quality. Because coverage is not universal, there is room to increase both the supply and coverage to start providing quality of education in the country.

Figures in Table 2 also suggest that pre-school enrolment rates seem to follow the business cycle. Even when the supply of CEIs and PRONOEIs increased during the 1990s, enrolment fell sharply in 1998, when the Asian and Russian financial crises hit the Peruvian economy and produced a recession.

2.2 What do we know about the effects of pre-school education in Peru?

Two previous studies explore the relationship between pre-school education, early childhood development and achievement in school-age children in Peru. Myers (1992) explores the relationship between pre-school and child development in Puno, one of Peru's 25 political regions. Myers (1992) studied third-grade children from the region of Puno, comparing those who attended a PRONOEI with those without pre-school education. Child development indicators used in the study are measures of intellectual, motor and social development from standardized tests aimed at measuring cognitive and socio-emotional child development. Myers found that children who attended a PRONOEI performed better in this test than those who did not, showing that the PRONOEI had positive effects on early childhood development indicators. However, in primary school achievements, the study found no difference in the rates of moving up from first to second grade and from second to third grade between children who attended a PRONOEI and those who did not.

Cueto and Diaz (1999) studied the relationship between pre-school education and primary school performance, specifically during the first year of primary education. The authors collected data for 300 second-grade children from nine state schools in Lima in districts where state schools had poor drop-out

and repetition rates. The authors designed a questionnaire to obtain information about the children's household socioeconomic status and discover whether the child had attended a CEI, a PRONOEI, or had no pre-school education. The outcomes of interest were the children's maths and language marks in the first grade. The data came from the school's administrative records. Their multivariate analysis suggests that children who went to a CEI performed better during the first year of primary education, having higher marks in both maths and language compared with children who did not attend pre-school, while those who went to a PRONOEI showed no statistically significant difference from those without pre-school education.

3 Methods

3.1 Data

The Young Lives Study is an international study of childhood poverty which is being conducted in Peru, Ethiopia, Vietnam and India. The study has been designed to provide longitudinal data (quantitative and qualitative) to study the causes and consequences of childhood poverty and to provide better research evidence for policy-making. The study will follow children and their families over a fifteen-year period. Two cohorts of children were sampled and surveyed for the first time in 2002. The first cohort is composed of children of 6 to 18 months at the time of the survey (the one-year-old cohort), the second by 7.5 to 8.8 year-olds (the 8-year-old cohort).

In Peru, 2,044 children from the one-year-old cohort and 709 children from the 8-year-old cohort were selected and enrolled in the study using a stratified sample of 20 localities (sentinel sites). The sample covers both urban and rural communities nationwide. Data were gathered on these children, their families, and their communities. In this paper I use data from the 8-year-old cohort. For further information on the Peruvian component, including details of the data collected, see Escobal et al (2003a).

3.2 Variables

3.2.1 Dependent (outcome) variables

1 **Age.** This outcome indicates whether children are progressing as expected in attendance in the correct grade for their age. The "Age" variable has a value of one if the child is either in the correct grade for its age or when the child is in a grade at an age below the regular age (early entrants), and nought when the child is over-age for the grade it is attending.

2 **Writing.** This variable is to measure writing achievement. In the interview, children were asked to

write down the sentence "Bread is tasty". The "Writing" variable has a value of one if the child writes the sentence without mistakes.

3 **Maths.** This variable is for measuring maths calculation or numeracy achievement. In the interview, children were asked to do the maths calculation "2 X 2". The "Maths" variable had a value of one when the child gave the correct answer.

3.2.2 Control variables

1. **Pre-school education.**

   (a) Pre-school attendance.

   (b) Type of pre-school. Here, I divided the pre-school variable by the type of institution: CEI vs. PRONOEI. The CEI variable has a value of one when the child attended a pre-school and a value of nought otherwise. The PRONOEI variable has a value of one when the child attended an Independent Pre-school Education Program school and nought otherwise.

   (c) Length of pre-school attendance. In this case I calculate the number of years the child attended a CEI or a PRONOEI (1, 2 or 3 years).

2. Child gender. This has a value of one if the child is a boy, nought otherwise.
3. Mother's native language. This has a value of one if the mother's native language is Spanish, nought otherwise. I anticipate a positive relationship with schooling and achievement outcomes.
4. Place of residence. This has a value of one if the child lives in urban areas, nought otherwise.
5. Parents help with school homework. This has a value of one if the biological parents help the child with school homework, nought otherwise. I anticipate a positive relationship with the outcomes of interest.
6. Per capita income log. This is the natural logarithm of the family income divided by the number of household members. This variable, as well as those related to parent education and family size, is aimed to check for the family SES. A positive relationship is expected.
7. Mother's age. Measured in years.
8. Parents' schooling. For the mother, this has a value of one when the biological mother has secondary or higher education, of nought otherwise. For the father, it has a value of one when the biological father has secondary or post-secondary schooling, nought otherwise.
9. Child health indicators. Height for age z-score and weight for age z-score.
10. Family size. Number of family members. This variable also checks for SES in the sense that all else being equal, bigger families have fewer resources for each individual member. A negative

relationship is expected.

11. Younger siblings. Number of 0-4 year-old siblings. In addition to the effect of family size, the presence of younger siblings might also affect the schooling and achievement outcomes for the children studied. As long as younger siblings demand more time and care from their parents and other caregivers, 8 year-old children in the sample might receive fewer resources in terms of parental care.

3.3 Working Sample

The original YLS-Peru data consisted of 707 observations for 7.5 to 8.5 year-old children. I restricted this data for the analysis to get a working sample with all the relevant information for the purposes of the paper.

Observations were ignored when:

1 The biological mother was not present (34 observations dropped);
2 There was no report on family income (6 observations dropped);
3 There was no report on height/age (5 observations dropped).

The final sample size was 602 children drawn from the YLS-Peru, 356 boys (54 per cent) and 306 girls (46 per cent).

Additionally, when working with the outcome variables of interest, some additional observations are lost because it was not possible to construct the outcomes for the full sample. For the "Writing" outcome, it was impossible to construct the variable for 10 children whose information was missing. For the "Maths" outcome, there was incomplete information in the case of 16 children. Finally, in the regression analysis, 2 extra observations are lost because the mother's age was missing.

3.4 Statistical framework

To perform the multivariate analysis I used Probit regression models because the outcome variables of interest (school attendance re age and writing and maths achievement) are binary outcomes. The Probit model can be derived from an underlying latent variable model, where the unobserved latent variable $y*$ is a linear function of observable control variables plus an error term (which is assumed to have a normal distribution) and the observed outcome variable y takes a value of 1 when $y^* > 0$ and nought when $y^* \leq 0$.

Denoting the linear function by I (Z) (where Z represent the covariates), and the error term by ε, then the latent variable model can be expressed as:

$$y^* = I(Z) + \varepsilon,$$
$$y = 1[y^* > 0],$$

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where 1[.] is the indicator function and has the value of one when the term in brackets is true, and nought otherwise. This is equivalent to writing $\Pr(y = 1 \mid Z) = F(I(Z))$, where F (.) represents the normal cumulative distribution function. The model is estimated by maximum likelihood. Finally, to interpret appropriately the effect of a particular control variable z on the likelihood $\Pr(y = 1 \mid Z)$, it is necessary to measure the marginal changes given by:

$$\frac{\partial \Pr(y = 1 \mid Z)}{\partial z} = \frac{\partial I(Z)}{\partial z} \times f(I(Z)),$$

where f (.) represents the normal density distribution function.

I estimate the following Probit models particularly:

$$\Pr(y_{ij} = 1) = F(\alpha 0 + \alpha 1 \text{PRE-SCHOOL}_{ij} + X_{ij}\Gamma), \quad (1)$$

where i denotes the child and j the locality, $\Pr(y_{k,ij} = 1)$ denotes the probability that the outcome of interest takes the value of one; that is, that the child attends school at the right age, writes correctly and gives the correct answer to the maths question. The variable PRE-SCHOOL$_{ij}$ indicates whether the child attended a pre-school, and X_{ij} includes all the other control variables: SES, parenting, parents' education, mother's native language, place of residence, number of younger siblings, child gender and health status.

I also tested for differential effects on education and achievement outcomes by the type of pre-school the child attended. For this, I estimated the Probit regression:

$$\Pr(y_{ij} = 1) = F(\lambda 0 + \lambda 1 \text{CEI}_{ij} + \lambda 2 \text{PRONOEI}_{ij} + X_{ij}\Gamma), \quad (2)$$

where the variables CEI*ij* and PRONOEI*ij* indicate whether the child attended a CEI or a PRONOEI. Finally, I have tested for differential effects during attendance at a CEI or PRONOEI. Here, I replaced the CEI and PRONOEI dummies by three dummies which reflect whether the child attended a CEI or PRONOEI for one, two, or three or more years.

4 Evidence from the Young Lives Study

The first column of Table 3 reports the percentage of children attending school on-age or below age. About 80 per cent of children in the sample attend school in the correct grade for their age or below the regulation age; about 66 per cent of children in the sample attend on-age, and 14 per cent attend below-age. This latter occurs because schools sometimes allow children to enrol in the first grade although they are below the regulation age of 6 by June 30. Girls perform better than boys in this case. A total of 83 per cent of girls in school are at the right grade for their age and 78 per cent of boys. The first column of Table 3 additionally reports the percentage of children attending on-age or below the age dividing the sample by place of residence. As expected, children from urban areas perform better than children from rural areas: 84 per cent versus 70 per cent respectively. Again, in each area girls perform better than boys: in rural communities 73 per cent of girls attend school on age versus 67 per cent of boys; in urban areas these figures are 87 per cent and 82 per cent respectively.

Since the sample I use in this paper is not the original sample from the YLS-Peru data, in Table 4 I present a comparison of the percentage of children attending school on-age measured by using my working sample and those percentages measured using the original sample as reported by Cueto et al (2004). Figures in panels A and B are from Cueto et al (2004) and those in panel C are from my working sample. Panel A reports the distribution of the original sample by the grade the children are attending. Most of the children in the sample are attending second grade (55 per cent) and third grade (35 per cent). In general, children from rural areas attend lower grades than those from urban areas.

Panel B reports child status by grade-for-age using the original YLS-Peru data. Overall, using the regulation age by June 30 set by the Ministry of Education, 20 per cent of children in the data are over-age for the grade they are attending, 66 per cent attend the correct grade for their age and 14 per cent attend school at an age below the regulation age for the grade (most likely because of early entrance). Dividing the original sample by area, over-age children represent 17 per cent in urban areas and 28 per cent in rural

areas.

Panel C reports child status by grade-for-age using my working sample, which excludes 45 observations from the original sample. As the panel shows, there are no differences in the general patterns and only slight differences in the magnitudes. Thus, at least in terms of the "on age" variable, there are no major differences between my working sample and the entire sample from the original data.

It is worth mentioning that these figures are relatively high compared with government figures from the Ministry of Education. Using data from the 2002 Education Census, the official over-age figure at the national level for children attending primary schools was 39 per cent. This means that those attending at the correct grade-for-age or below the regulation age represented about 61 per cent of all primary school children (62 per cent for girls and 61 for boys). However, it has to be acknowledged that the data for the 8-years-old cohort from YLS-Peru is not intended to provide national-level representative figures.

The second column of Table 3 reports the results for the "Writing" outcome. It shows the percentage of children who wrote the sentence "Bread is tasty" without mistakes. Overall, only 54 per cent of children in the sample wrote the sentence without mistakes, with girls performing better than boys, 57 per cent versus 52 per cent respectively. In urban areas, 62 per cent of children wrote the sentence without mistakes, while in rural areas only 33 per cent completed the task correctly. The pattern of better performance of girls over boys also appears when the sample is divided by area.

Column 3 of Table 3 reports the results for the "Maths" outcome. The column shows the percentage of children who gave the correct answer to the multiplication "2 x 2". As the table reveals, a disappointingly low 57 per cent gave the correct answer. Again, children from urban areas perform better than those from rural areas (63 per cent versus 40 per cent). However, in contrast to the results for the other outcomes, boys perform better in maths than girls, both in the overall sample and by place of residence. In the aggregate, 60 per cent of boys perform the multiplication without errors, as compared to 54 per cent of girls.

Results in columns 2 and 3 from Table 3 are in line with the poor achievement results in the 2001 National Evaluation. In general, children are not performing well in school, neither in language nor in mathematics. It has to be emphasized that the tasks in "Writing" and "Maths" outcomes are very simple, but despite this about half of the children in the sample are not performing as they should.

Table 5 reports summary statistics for the outcomes as well as for the control variables. Regarding pre-school attendance, 88 per cent of children attended a pre-school in my sample from the YLS-Peru, 85 per cent in rural areas and 89 per cent in urban areas. About 70 per cent of children attended a CEI. In rural areas 59 per cent of children went to a CEI, while in urban areas 74 per cent did so. A total of 18 per cent of children attended a PRONOEI, 21 per cent in rural areas and 11 per cent in urban areas. In general, more boys were sent to a CEI than girls (74 per cent versus 65 per cent), both in urban areas (77 per cent versus 70 per cent) and rural areas (66 per cent versus 50 per cent). In contrast, girls were sent to a PRONOEI more often than boys (23 per cent versus 14 per cent), both in urban areas (19 per cent versus 12 per cent) and rural areas (32 per cent versus 21 per cent).

Moving on to parenting environment, about 70 per cent of parents help their child with their homework, 59 per cent in rural areas and 72 per cent in urban areas. In 88 per cent of cases, the mother's native language is Spanish, 65 per cent among children from rural communities and 97 per cent among children from urban communities. About xx per cent of children in the sample have at least one 0-4 years old sibling, xx per cent in rural areas and xx per cent in urban areas. On the other hand, for about 80 per cent of the children in the sample the biological father is at home (remember that the sample is restricted to children whose biological mother lives with them).

An average of 47 per cent of the children in the sample have mothers with no or only primary education, 41 per cent with secondary education and 12 per cent with post-secondary education. For those whose biological father lives at home, 29 per cent have fathers with no education or just primary education, 36 per cent have fathers with secondary education and 14 per cent have fathers with post-secondary education. The average family size is about 5.6 members per household. As expected, this figure is higher among children from rural households (about 6 members) than among children from urban households (about 5 members).

4.1 Basic regression results

The basic regression results (multivariate analysis) using the overall working sample are reported in Table 6. Each column gives the result of a Probit regression of the outcome variables of interest on the control variables. The table shows estimated marginal changes in probability for continuous variables and estimated discrete changes for dummy variables. Standard errors are corrected for observations clustering at the community level.

Column 1 of Table 6 reports estimated the marginal effects of the control variables for the on-age outcomes. The effect of attending a pre-school is positive and statistically significant, the estimated marginal effect suggest that children who attend a pre-school have a 10 per cent better chance of attending the right grade for their age. The fact that parents that help their children with their school homework does not seem to have a statistically significant effect, although the estimated marginal effect is positive as expected. Neither per capita income log, nor the mother's native language, family size nor the number of younger siblings have a statistically significant relationship with being on-age. On the other hand, parents' schooling is positively related to being on-age. Children whose mothers have secondary or post-secondary education are 7 per cent more likely to attend school at the right grade for their age, while for children whose fathers have secondary or post-secondary education the figure is 8 per cent. There is also a positive and statistically significant relationship between being on age at school and the weight-for-age z-score. Other variables show no differences for attending school on age between boys and girls or between rural and urban children.

Column 2 of Table 6 shows the writing results. Children that attended a pre-school are 13 per cent more likely to write the sentence "Bread is tasty" without mistakes. Children whose mother's native language is Spanish are 15 per cent more likely to complete the writing test satisfactorily. Those whose parents help them with their homework are 10 per cent more likely to write the sentence correctly. Parents' education does not affect the writing result, and the mother's or father's education does not have a statistically significant relationship with the writing result. Children from households with a better SES also have a better chance of performing well: the relationship between writing without mistakes and per capita income is positive and statistically significant, while the relationship with family size is negative and statistically significant. Nor is there a statistically significant relationship between writing correctly and the number of younger siblings in the household, despite the fact that the estimated marginal effect is negative. Although the estimated marginal effects are positive for health status as expected, they are not statistically significant. Regarding child gender, even after controlling for the additional covariates considered in the regression model, girls still perform better than boys in writing.

Column 3 of Table 6 reports the results of the Probit regression for the maths outcome (multiplying "2 x 2"). Again, there is a positive and statistically significant relationship between performing well and having

pre-school education. Children who attended a pre-school were 16 per cent more likely to answer the maths question correctly. Parents' education is positively related to performing well in the maths test. A child whose mother has secondary or post-secondary schooling is 17 per cent more likely to answer correctly, and if the father has these levels of schooling the advantage is 8 per cent. Higher SES, reflected by a higher per capita income or a smaller family size, is also related to maths achievement. The estimated marginal effects of these variables are statistically significant in the regression, and suggest that a child from a home with a higher per capita income is 5 per cent more likely to answer the question correctly, while a bigger family size reduces the likelihood by 3.4 per cent. In terms of health status, children with higher height for age z-scores perform better in maths than other children, the estimated marginal effect suggest that the chances of giving the correct answer increases by 8 per cent with height for age. Boys perform better than girls in maths. Even after control for additional covariates, boys are 8 per cent more likely to give the correct answer than girls.

In summary, the results of the multivariate analysis suggest that: (a) pre-school education is statistically significant and positively related to school attendance at the right grade for their age and to writing and maths achievement; (b) children whose mother's native language is Spanish write better than children whose mother's native language is Quechua or another language; (c) SES, measured by per capita income and family size, is positively related to writing and maths achievement but not to on-age school attendance; (d) parents' schooling is positively related to on-age school attendance and to maths performance; (e) girls perform better than boys in writing and worse in maths, even after controls for other variables in regressions; (f) health status is positively related to attending school on age (weight for age z-score) and giving the correct answer in maths (height for age z-score).

4.2 The differential effects by type of pre-school institutions

I will go on to explore the hypothesis of differentiated effects of pre-school education by pre-school type. In a CEI, professional school teachers are in charge of the children, while in a PRONOEI mothers from the community are responsible. Trained school teachers (who study from four to five years at college) should produce better results for the children in their care than briefly trained facilitators, and we may expect that a CEI will affect children more than a PRONOEI. Cueto and Diaz (1999) find that among first-graders from nine public schools in Lima, those who attended a pre-school performed better than those who did not and that the positive effect of pre-school is higher for those who went to a CEI than those who went to a PRONOEI.

In Table 7 I report the results of Probit regressions similar to those reported previously but replacing the dummy variable for pre-school attendance by two dummy variables each indicating whether the child attended a CEI or a PRONOEI. All other control variables are the same as before. The results presented in the Table suggest that CEI attendance has a statistically significant and positive association with on-age school attendance and achievement in writing and maths. Children who attended a CEI are about 12 per cent more likely to attend school in the correct grade for their age, 15 per cent more likely to write the sentence "Bread is tasty" correctly, and 19 per cent more likely to give the correct answer to the maths calculation "2 x 2" than children who did not. However, even when the estimated marginal effects associated with attendance at a PRONOEI are positive, estimates are not statistically significant.

4.3 Effects of pre-school by time

I used this data to test for an additional hypothesis regarding pre-school education: the positive effects of pre-school education materialize because of the time the child spent at pre-school. Children who spend more time affected by the stimuli provided by pre-schools gain more from the experience.

I re-estimated the regressions using as control variables dummies for the number of years the child spent at a CEI or a PRONOEI. In general children may attend a pre-school from the age of three, but in some cases (especially at PRONOEIs) they may attend earlier. Thus, for each type of pre-school I constructed three dummies to reflect whether the child attended for one year (enrolled from the age of five), two years (enrolled from the age of four), or three or more years (enrolled from the age of three).[2]

Table 8 reports the estimated marginal changes in the probability of being on age and writing and maths achievement associated to the time spent at pre-school. The results suggest that the advantages materialized for those children who attended pre-school longer. Children who attended a CEI for three years increased their chances of attending school on age by 11 per cent, their chances of performing well in writing by 20 per cent, and their chances of performing well in maths by 24 per cent. Being exposed to only one or two years at pre-school in a CEI does not seem to have a statistically significant effect on these outcomes. On the other hand, children who attended a CEI for just one year perform worse in all outcomes as the estimated marginal effects are negative. However, only the coefficient in the maths regression is

2 Only 5.5 per cent of the children who attended a pre-school in the working sample began going to pre-school (either a CEI or a PRONOEI) before the age of three.

statistically significant and negative. Regarding the relationship between time spent at a PRONOEI and outcomes, there are no statistically significant effects except for the writing outcome. Children who attended a PRONOEI for three years increased their chances of performing well in the writing task by 12 per cent.

4.4 Heterogeneity by gender and place of residence

In this section I explore the heterogeneity of results by gender and place of residence. Table 9 reports estimated marginal changes from separate Probit regressions for boys and girls. The results suggest that attending a CEI has a positive and statistically significant relationship with the three outcomes of interest only for girls; attending a PRONOEI has no effect on either girls or boys. Parents' help for their child with school homework increases the probability that the child will attend school on age and that boys will perform well in maths and girls will perform well in writing. The mother's native language has a positive and statistically significant relationship with writing, both among boys and among girls. Parents' education has a positive and statistically significant effect on writing and maths among boys, and on attending school on age and maths among girls. Regarding SES, the effect of per capita income is positive for writing and maths among boys, but is not statistically significant among girls.

Table 10 reports the estimated marginal changes by place of residence. In urban areas, children who attended a CEI were more likely to perform well in writing, but there is no statistically significant relationship with on-age school attendance or maths performance, whereas in rural areas attendance at a CEI increased the changes of attending school on age and performing well in maths. PRONOEIs have no effect in urban areas, but in rural areas there is a positive and statistically significant relationship between att4endance at a PRONOEI and maths performance. Parents' help with homework only affects the maths outcome in urban areas. The positive relationship between writing and the mother's native language is only statistically significant in urban areas. Children with better-educated parents are more likely to attend school on age and perform well in maths in urban areas, whereas in rural areas the effect of parents' education only affects maths performance. Family size reduces the chances of performing well in maths, both in urban and rural areas.

4.5 A note of caution

A potential problem that I do not address in the current version of the paper is the selection bias that might

arise because of the parents' choice of sending their child to a pre-school and the pre-school type. For instance, it is possible that parents more committed to their children's development choose to send them to a pre-school institution or a pre-school which they think is of better quality or may yield better results for their children. More committed parents may also provide a better environment for the early skills (cognitive and socio-emotional) development of their children. Thus, despite the fact that I control for parents' education and SES, it is possible that the better results for the children who attended a CEI can be explained by their parents' choice, which reflects the better family environment of those children. If indeed parents choose the type of pre-school education they send their children acting upon variables I can not observe in the data, then the estimated effects of pre-school education on achievement cannot be interpreted as a causal relationship between attending a pre-school and child achievement.

One way to explore this possibility is to estimate the regressions using an instrumental variable for the pre-school type. An instrumental variable affects the outcome of interest (child achievement) only through its effect on the causal variable (type of pre-school). A drawback in implementing this type of estimate is that, in general, instruments are hard to find. However, it is currently possible to consider institutional aspects of education provision such as the supply of public pre-schools at local level. This task is pending.

5 Discussion

In this paper I have explored how pre-school education and family environment affect schooling and achievement in writing and maths outcomes. In general, girls perform better in writing and worse in maths in comparison with boys, even after controlling for other control variables in a multivariate analysis. However, once these variables are taken into account in the multivariate analysis, the raw differences by gender in on-age attendance disappear. SES, measured by per capita income and family size, is positively related to writing and maths achievement but not to attending school on age. Another dimension of SES, parents' education, which may also be associated to parenting capacity, is positively related to attending school on age and to maths performance. When parents help children with their homework, the children perform better writing and maths than children who did not receive this support. Child health status is positively related to attending school on age (weight for age z-score) and performing well in maths (height for age z-score). Additionally, children whose mother's native language is Spanish perform better in writing than children whose mother's native language is Quechua or another native language.

I also find evidence suggesting that pre-school education has a positive and statistically significant

relationship to attending school at the correct grade-for-age and to writing and maths achievement, even after controlling for additional covariates in the multivariate analysis. Furthermore, I find that CEI has a stronger effect than a PRONOEI and that the benefits of pre-school appear with the time the child is subject to the stimuli provided at the CEI. The better-trained teachers at CEIs or differences in infrastructure between CEIs and PRONOEIs may help explain these results.

Pre-school education is important because it may help to promote both cognitive and socio-emotional development. It may complement good parenting environments and it may help compensate parenting deficiencies. This is important because boosting skills development early in life promotes later development, thus facilitating learning, which in turn will translate into school success and better labour market profiles. International evidence suggests that measures of cognitive skills in adolescent and later years are highly correlated to those taken when the subjects were about 10 years old, when cognitive development is well set. This implies that investment geared to fostering cognitive skills development must be made during the critical period before the 10 year-old threshold. Socio-emotional skills also begin to develop early in life. Traits such as motivation, socialization, optimism, persistence and self-esteem, which are harder to measure than cognitive skills, play an important role during life. In the United States the evidence suggest that socio-emotional skills are also associated with remaining at school and higher achievement in tests (Cunha et al. 2005), and higher earnings in the labour market (Bowles, Gintis, and Osborne, 2001; Duncan, Claessens, and Engel 2004).

Investing early in child skills development is a profitable venture. Returns on investments in human capital made at early stages of human development are higher than those made at later stages for two reasons. First, early investment has more time to mature and is harvested over a longer period (Becker 1962). Second, human capital investments exhibit "dynamic complementarity" in the sense that early investments increase the productivity or lower the cost of later investments (Carneiro and Heckman 2003, Cunha et al. 2005, Heckman 1999). This is because the skills (both cognitive and socio-emotional) acquired early in life facilitate the development of later stages of development, in this sense "learning begets learning". Even though the Peruvian educational system has been declared in crisis, and many changes are needed to improve the primary and secondary levels, policy-makers must not forget the crucial years before a child reach school age. The evidence reported in this paper regarding the positive relationship between pre-school education and schooling and achievement outcomes for 8 year-old children from the YLS-Peru suggests that public policy may play a very important role in childhood skills development through interventions for improving the quantity and quality of pre-schools (teachers' qualifications,

school infrastructure, school management, scope of intervention by actively working with the parents) to complement the role of the family, but may also promote subsequent learning by boosting cognitive and socio-emotional development. Additionally, even when it is hard to improve cognitive skills beyond the critical period of the first decade of life, the evidence suggests that it is possible to improve socio-emotional skills during the adolescent years. Thus, specific policy intervention in primary and secondary levels could also be designed to include improvement in socio-emotional skills development. At the same time, the current evaluation system in Peru which measures school achievement may be enriched if complemented with measures of socio-emotional traits, which also have a market value.

For future research into this area, the YLS provides a unique opportunity to gather quantitative and qualitative data on skills investments early in a child's life. Given the evidence suggesting that cognitive skills are well developed by ages 9-10, instruments to measure them, such as the Peabody Picture Vocabulary Test, the Peabody Individual Achievement Test, or the Raven's Progressive Matrices might be considered in the one-year-old cohort and eight-year-old cohorts from the YLS-Peru. YLS-Peru offers the chance to explore the cognitive development of these cohorts early in their lives and its relationship to socio-economic status, children health, parenting and social capital. It is important to emphasize the relevance of measuring cognitive development for the one-year-old cohort, because this makes it possible to study the relationship between community and family environments, SES, parenting practices and cognitive skills development in Peru. This is also relevant for the 8-year-old cohort, since these children will be about 10-11 years old when the second wave of the study is carried out. For these children, the Raven's Coloured Progressive Matrices (CPM) was applied during the first wave. It will be interesting to have longitudinal data on the cognitive development for this cohort (not yet possible using the one-year-old cohort), because it will be possible to research, in the very short term, the production of skills among Peruvian families.

It is also important to explore instruments to measure socio-emotional skills development among Peruvian children. There is no systematic (quantitative or qualitative) research on socio-emotional traits in Peru, and the YLS-Peru provides the opportunity to investigate how these traits are formed and how to design policies to encourage their development.

It would also be interesting to design and implement qualitative studies for exploring parenting practices which affect child skills development and which practices in particular are more common among Peruvian families. It is important to research into whether there are common practices that might harm or

depress early cognitive and socio-emotional skills development and whether these practices maybe quantified for future quantitative measurement. This research might enable policy-makers to design policies which encourage good practices and work towards reducing and eliminating harmful practices. Again, pre-schools may play a crucial role if they also help "educating" parents in the sense of spreading information about better parenting practices, and actively involving parents in their children's development.

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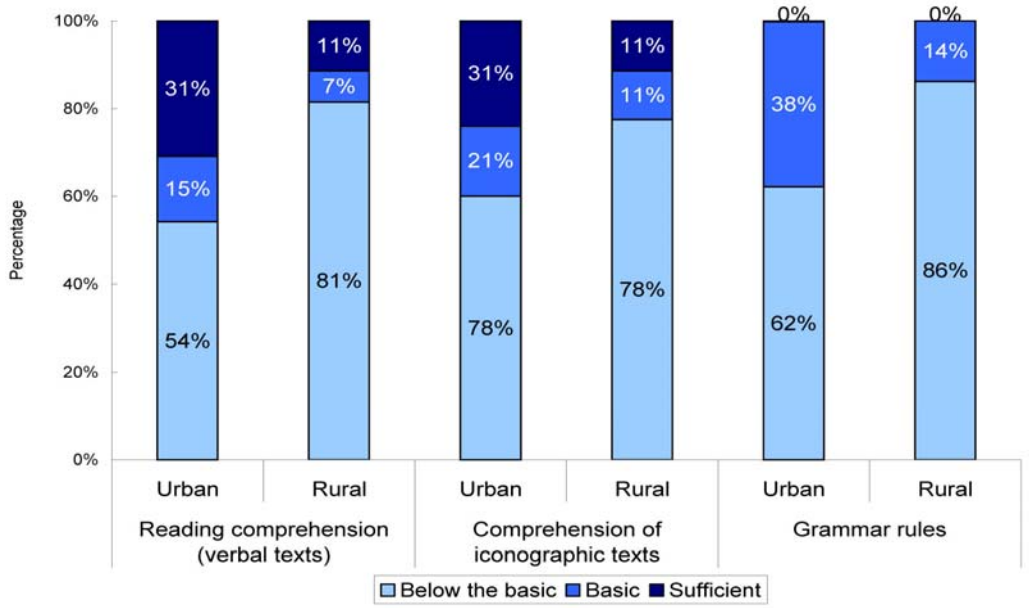
Figure 1: Results in language test for fourth-graders in the National Evaluation 2001



Source: Ministry of Education (Unidad de Medición de la Calidad Educativa). National Evaluation 2001.

Table 1: Peru: number of preschool centers[a]

	CEI			PRONOEI	Total
	All	Public	Private		
A. Number of preschools					
1993	11,838	8,312	3,526	14,738	26,576
1998	14,812	9,582	5,230	16,328	31,140
1999	14,863	9,747	5,116	15,053	29,916
2000	15,574	9,930	5,644	15,782	31,356
2001	15,727	9,989	5,738	16,973	32,700
2002	15,860	10,086	5,774	18,303	34,163
2003	16,211	10,155	6,056	17,906	34,117
2004	17,006	10,354	6,652	16,247	33,253
B. Growth rates					
1993-2000	31.6%	19.5%	60.1%	7.1%	18.0%
2000-2004	9.2%	4.3%	17.9%	2.9%	6.0%
1993-2004	43.7%	24.6%	88.7%	10.2%	25.1%

[a] Source: Ministry of Education – Censo Escolar 1993, Estadistica Basica 1998-2004.

Table 2: Peru: preschool enrollment rates for children 3-5 years old[a]

	1985	1994	1998	2003
A. Total	**21.1**	**57.1**	**45.5**	**53.2**
B. Gender				
Girls	20.3	56.8	46.1	53.0
Boys	21.9	57.3	44.9	53.5
C. Place of residence				
Urban	28.7	59.1	51.0	61.6
Rural	12.6	44.7	39.9	42.5
D. Poverty status				
Extreme-poor	10.3	45.1	32.5	35.7
Poor	18.2	55.2	44.7	54.8
Non-poor	28.0	68.2	53.8	66.5

[a] Sources:
(a) National Bureau of Statistics (Instituto Nacional de Estadisticas) – Encuesta Nacional sobre Medicion de Niveles de Vida 1985; Encuesta Nacional de Hogares IV-1998, and 2003.
(b) Instituto Cuanto – Encuesta Nacional sobre Medicion de Niveles de Vida 1994.
Taken from: Ministry of Education (Unidad de Estadistica Educativa), Indicadores de la Educacion –Peru 2004.
The numbers reported in the table are the percentage of 3-5 years old children who were attending a preschool (CEI or PRONOEI) at the time of the survey (as a percentage of the total population of 3-5 years old children).

Table 3: Children schooling and achievement outcomes in the YLS data[a]

	On age[b] (% on-age or below-age)	Writing[c] (% wrote without errors)	Math[d] (% gave correct answer)
A. Overall sample			
Girls	83%	57%	54%
Boys	78%	52%	60%
Total	80%	54%	57%
B. Rural			
Girls	73%	37%	36%
Boys	67%	28%	44%
Total	70%	33%	40%
C. Urban			
Girls	87%	65%	60%
Boys	82%	60%	65%
Total	84%	62%	63%

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave.
The original sample size was 707 children. Observations were discarded when: (a) the biological mother was not present (34 observations dropped); (b) there was no report on family income (6 observations dropped); (c) there was no report on height age (5 observations dropped)

[b] The column reports the percentage of children in the correct grade for their age or below the age for their grade using the normative age by June 30.

[c] The column reports the percentage of children who wrote the sentence "The bread is tasty" without errors.

[d] The column reports the percentage of children who gave the correct answer to the math calculation "2×2".

Table 4: School enrollment and child status by grade-for-age in the YLS data[a]

	Rural		Urban		Total	
	Cases	(%)	Cases	(%)	Cases	(%)
A. School enrollment by grade						
First grade	25	13%	28	5%	53	7%
Second grade	130	66%	262	51%	392	55%
Third grade	39	20%	210	41%	249	35%
Fourth grade	2	1%	10	2%	12	2%
Total	196	100%	511	100%	707	100%
B. Child status by grade-for-age						
Over-age	54	28%	88	17%	142	20%
On-age	121	62%	345	68%	466	66%
Below-age	19	10%	77	15%	96	14%
Total[b]	194	100%	510	100%	704	100%
C. Child status by grade-for-age						
Over-age	53	30%	78	16%	131	20%
On-age	108	61%	338	70%	446	67%
Below-age	15	9%	70	14%	85	13%
Total[c]	176	100%	486	100%	662	100%

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave.
Figures in panels (A) and (B) are from Cueto, Guerrero, Leon, Huttly, Penny, Lanatta, and Villar (2004). Figures in panel (C) based on the sample used in this paper.

[b] The totals do not coincide with those from panel (A) because in some cases it was not possible to compute the age of the child by June 30.

[c] The totals correspond to the sample used in this paper. Observations were discarded when: (a) the biological mother was not present (34 observations dropped); (b) there was no report on family income (6 observations dropped); (c) there was no report on height age (5 observations dropped).

Table 5: Summary statistics[a]

	Overall sample		Rural		Urban	
	Mean (std.dev.)	N	Mean (std.dev.)	N	Mean (std.dev.)	N
'On age' for grade	0.802 (0.399)	662	0.699 (0.460)	176	0.840 (0.367)	486
'Writing' (wrote sentence without errors)	0.544 (0.498)	652	0.326 (0.470)	172	0.623 (0.485)	480
'Math' Calculation (gave correct answer)	0.570 (0.496)	646	0.404 (0.492)	166	0.627 (0.484)	480
Child attended Preschool	0.878 (0.328)	662	0.847 (0.361)	176	0.889 (0.315)	486
Child attended a CEI	0.696 (0.460)	662	0.585 (0.494)	176	0.737 (0.441)	486
Child attended a PRONOEI	0.181 (0.386)	662	0.261 (0.441)	176	0.152 (0.360)	486
Child gender (boy=1)	0.538 (0.499)	662	0.523 (0.501)	176	0.543 (0.499)	486
Log per capita income	6.842 (1.160)	662	5.972 (1.186)	176	7.157 (0.975)	486
Mother's age	34.014 (6.754)	661	34.703 (6.877)	175	33.765 (6.699)	486
Mother's schooling primary	0.467 (0.499)	662	0.795 (0.405)	176	0.348 (0.477)	486
Mother's schooling secondary	0.409 (0.492)	662	0.193 (0.396)	176	0.488 (0.500)	486
Mother's schooling post-secondary	0.121 (0.326)	662	0.006 (0.075)	176	0.163 (0.369)	486
Mother mother's tongue Spanish	0.882 (0.323)	661	0.653 (0.477)	176	0.965 (0.184)	485
Father lives at home	0.804 (0.398)	662	0.881 (0.325)	176	0.776 (0.418)	486
Father's schooling primary	0.292 (0.455)	662	0.580 (0.495)	176	0.187 (0.391)	486
Father's schooling secondary	0.364 (0.482)	662	0.261 (0.441)	176	0.401 (0.491)	486
Father's schooling post-secondary	0.142 (0.349)	662	0.023 (0.149)	176	0.185 (0.389)	486
Height for Age	-1.355 (1.025)	662	-1.869 (0.857)	176	-1.169 (1.018)	486
Weight for Age	-0.478 (0.916)	662	-0.965 (0.698)	176	-0.302 (0.922)	486
Family size	5.610 (1.864)	662	6.023 (1.805)	176	5.461 (1.865)	486
# siblings 0-4 year-olds	0.429 (0.620)	662	0.580 (0.736)	176	0.374 (0.563)	486
Place of residence (urban=1)	0.734 (0.442)	662				
Parents help with school homework	0.689 (0.463)	662	0.591 (0.493)	176	0.724 (0.447)	486

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave.
The original sample size was 707 children. Observations were discarded when: (a) the biological mother was not present (34 observations dropped); (b) there was no report on family income (6 observations dropped); (c) there was no report on height age (5 observations dropped).

Table 6: Basic regression results for children outcomes[a]

	On age	Writing	Math
Preschool education	0.098**	0.126**	0.163**
	(0.050)	(0.058)	(0.069)
Child gender (boy=1)	-0.043	-0.063*	0.079*
	(0.030)	(0.038)	(0.044)
Mother mother's tongue	0.078	0.151***	0.014
	(0.058)	(0.046)	(0.067)
Place of residence (urban=1)	-0.013	0.101	-0.008
	(0.046)	(0.070)	(0.094)
Parents help with school homework	0.016	0.103*	0.068
	(0.025)	(0.056)	(0.047)
Log per capita income	0.012	0.048**	0.049*
	(0.012)	(0.020)	(0.027)
Mother's age	-0.002	0.001	0.010***
	(0.002)	(0.003)	(0.003)
Mother's schooling secondary or higher	0.068*	0.048	0.173***
	(0.038)	(0.045)	(0.066)
Father's schooling secondary or higher	0.077**	0.018	0.084***
	(0.035)	(0.046)	(0.032)
Height for Age	0.016	0.034	0.074**
	(0.012)	(0.021)	(0.029)
Weight for Age	0.045*	0.054	0.018
	(0.026)	(0.036)	(0.028)
Family size	-0.007	-0.017*	-0.034***
	(0.010)	(0.009)	(0.011)
# siblings 0-4 year-olds	-0.024	-0.035	-0.047
	(0.022)	(0.030)	(0.031)
Observations	660	650	645
LL	-292.3	-393.8	-374.9
Pseudo R2	0.11	0.12	0.15

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave.
Each column gives the result of a Probit regression. Reported in the table are estimated marginal changes in probability for continuous variables and estimated discrete changes for dummy variables.
Standard errors reported in parentheses are corrected for clustering of the observations at the locality level.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Type of preschool education and children outcomes[a]

	On age	Writing	Math
CEI	0.116**	0.148**	0.191***
	(0.046)	(0.059)	(0.073)
PRONOEI	0.021	0.04	0.048
	(0.050)	(0.067)	(0.072)
Child gender (boy=1)	-0.052*	-0.073*	0.068
	(0.028)	(0.038)	(0.044)
Mother mother's tongue	0.077	0.146***	0.005
	(0.063)	(0.045)	(0.072)
Place of residence (urban=1)	-0.023	0.091	-0.021
	(0.046)	(0.071)	(0.097)
Parents help with school homework	0.021	0.109*	0.077*
	(0.024)	(0.057)	(0.046)
Log per capita income	0.012	0.047**	0.048*
	(0.012)	(0.020)	(0.026)
Mother's age	-0.002	0.001	0.010***
	(0.002)	(0.003)	(0.003)
Mother's schooling secondary or higher	0.071*	0.053	0.178***
	(0.039)	(0.045)	(0.065)
Father's schooling secondary or higher	0.075**	0.017	0.083**
	(0.035)	(0.046)	(0.033)
Height for Age	0.017	0.034	0.075***
	(0.012)	(0.021)	(0.029)
Weight for Age	0.044*	0.054	0.019
	(0.025)	(0.038)	(0.026)
Family size	-0.005	-0.016*	-0.033***
	(0.010)	(0.009)	(0.011)
# siblings 0-4 year-olds	-0.021	-0.032	-0.042
	(0.022)	(0.029)	(0.032)
Observations	660	650	645
LL	-289.8	-392.0	-371.7
Pseudo R2	0.12	0.13	0.16

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave.
Each column gives the result of a Probit regression. Reported in the table are estimated marginal changes in probability for continuous variables and estimated discrete changes for dummy variables.
Standard errors reported in parentheses are corrected for clustering of the observations at the locality level.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Time of exposure to preschool education and children outcomes[a]

	On age	Writing	Math
CEI for 3 or more years	0.106*	0.204***	0.241***
	(0.063)	(0.068)	(0.090)
CEI for 2 years	0.029	-0.074	-0.019
	(0.047)	(0.045)	(0.072)
CEI for 1 year	-0.072	-0.041	-0.184***
	(0.048)	(0.054)	(0.063)
PRONOEI for 3 or more years	0.033	0.116*	0.074
	(0.070)	(0.067)	(0.109)
PRONOEI for 2 years	-0.059	-0.15	-0.062
	(0.089)	(0.108)	(0.145)
PRONOEI for 1 year	0.029	0.034	0.008
	(0.062)	(0.146)	(0.125)
Observations	660	650	645
LL	-288.7	-389.7	-366.2
Pseudo R2	0.12	0.13	0.17

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave. Each column gives the result of a Probit regression. Reported in the table are estimated marginal changes in probability for continuous variables and estimated discrete changes for dummy variables.
Not reported in this Table are the estimated coeficientes associated to those additional covariates included in the regressions from Tables 6 and 7.
Standard errors reported in parentheses are corrected for clustering of the observations at the locality level.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Type of preschool education and children outcomes by gender[a]

	Boys			Girls		
	On age	Writing	Math	On age	Writing	Math
CEI	0.094	0.121	0.166	0.132**	0.180*	0.201**
	(0.068)	(0.082)	(0.112)	(0.052)	(0.106)	(0.099)
PRONOEI	0.057	-0.018	-0.007	-0.002	0.097	0.092
	(0.070)	(0.121)	(0.149)	(0.054)	(0.092)	(0.102)
Mother mother's tongue	0.106	0.129*	0.002	0.047	0.187***	0.013
	(0.084)	(0.067)	(0.114)	(0.062)	(0.061)	(0.067)
Place of residence (urban=1)	-0.056	0.098	-0.077	0.003	0.092	0.038
	(0.046)	(0.065)	(0.103)	(0.059)	(0.100)	(0.132)
Parents help with school homework	0.091**	0.027	0.098*	-0.054	0.174**	0.038
	(0.045)	(0.079)	(0.056)	(0.046)	(0.068)	(0.080)
Log per capita income	0.015	0.062***	0.072**	0.009	0.033	0.019
	(0.024)	(0.024)	(0.037)	(0.015)	(0.037)	(0.031)
Mother's age	-0.005	-0.001	0.007	0	0.002	0.012**
	(0.003)	(0.005)	(0.005)	(0.003)	(0.004)	(0.006)
Mother's schooling secondary or higher	0.064	0.170***	0.168**	0.068	-0.085	0.178**
	(0.053)	(0.065)	(0.075)	(0.045)	(0.080)	(0.090)
Father's schooling secondary or higher	0.056	-0.035	0.091*	0.095***	0.062	0.081
	(0.056)	(0.075)	(0.048)	(0.032)	(0.048)	(0.065)
Height for Age	0.01	0.013	0.042	0.037	0.078*	0.141***
	(0.015)	(0.032)	(0.031)	(0.030)	(0.046)	(0.051)
Weight for Age	0.077***	0.067	0.058*	0.002	0.029	-0.043
	(0.029)	(0.053)	(0.033)	(0.032)	(0.065)	(0.048)
Family size	-0.005	-0.007	-0.028*	-0.004	-0.031*	-0.037**
	(0.014)	(0.012)	(0.016)	(0.009)	(0.017)	(0.016)
# siblings 0-4 year-olds	-0.042	-0.028	-0.041	-0.01	-0.02	-0.054
	(0.032)	(0.047)	(0.038)	(0.031)	(0.039)	(0.057)
Observations	356	352	350	304	298	295
LL	-159.1	-211.1	-196.3	-124.3	-174.9	-172.5
Pseudo R2	0.15	0.13	0.17	0.12	0.14	0.15

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave.
Each column gives the result of a Probit regression. Reported in the table are estimated marginal changes in probability for continuous variables and estimated discrete changes for dummy variables.
Standard errors reported in parentheses are corrected for clustering of the observations at the locality level.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: Type of preschool education and children outcomes by area[a]

	Urban			Rural		
	On age	Writing	Math	On age	Writing	Math
CEI	0.085	0.210***	0.134	0.168**	-0.036	0.300**
	(0.052)	(0.080)	(0.089)	(0.071)	(0.134)	(0.117)
PRONOEI	0.008	0.102	-0.015	0.019	-0.123	0.229**
	(0.069)	(0.080)	(0.097)	(0.070)	(0.081)	(0.112)
Child gender (boy=1)	-0.054**	-0.051	0.058	-0.047	-0.095*	0.046
	(0.025)	(0.043)	(0.052)	(0.065)	(0.052)	(0.082)
Mother mother's tongue	0.101	0.256**	0.115	0.100	0.044	-0.003
	(0.126)	(0.126)	(0.144)	(0.089)	(0.066)	(0.086)
Parents help with school homework	0.004	0.088	0.126***	0.059	0.103	-0.076
	(0.032)	(0.072)	(0.048)	(0.078)	(0.110)	(0.061)
Log per capita income	0.011	0.054**	0.051	0.008	0.016	0.033
	(0.017)	(0.025)	(0.033)	(0.018)	(0.027)	(0.047)
Mother's age	-0.001	0.001	0.009**	-0.005	0.002	0.013
	(0.003)	(0.004)	(0.004)	(0.005)	(0.003)	(0.011)
Mother's schooling secondary or higher	0.092**	0.06	0.156**	-0.059	-0.042	0.163*
	(0.044)	(0.053)	(0.073)	(0.110)	(0.115)	(0.094)
Father's schooling secondary or higher	0.078**	-0.019	0.057	0.087	0.147	0.224***
	(0.039)	(0.049)	(0.036)	(0.102)	(0.102)	(0.053)
Height for Age	0.011	0.024	0.106***	0.056**	0.06	-0.055
	(0.013)	(0.016)	(0.030)	(0.027)	(0.065)	(0.045)
Weight for Age	0.038	0.05	0.012	0.043	0.073	0.02
	(0.025)	(0.036)	(0.026)	(0.077)	(0.090)	(0.067)
Family size	-0.004	-0.011	-0.027**	-0.015	-0.046	-0.063*
	(0.008)	(0.009)	(0.012)	(0.030)	(0.037)	(0.032)
# siblings 0-4 year-olds	-0.031	-0.032	-0.05	0.007	0.03	-0.003
	(0.024)	(0.043)	(0.042)	(0.050)	(0.052)	(0.059)
Observations	485	479	479	175	171	166
LL	-189.5	-291.8	-267.2	-97.9	-95.2	-96.7
Pseudo R2	0.11	0.08	0.16	0.09	0.12	0.14

[a] Source: Peru's Young Lives Study, 8-years-old cohort, first wave.
Each column gives the result of a Probit regression. Reported in the table are estimated marginal changes in probability for continuous variables and estimated discrete changes for dummy variables.
Standard errors reported in parentheses are corrected for clustering of the observations at the locality level.
* significant at 10%; ** significant at 5%; *** significant at 1%.