Preschool Attendance and School-Age Profiles: a Revision

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Preschool Attendance and School-Age Profiles: a Revision

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Data collected from the Uruguayan household survey (ENHA) of year 2006 is used to provide more evidence and revision on the longer-term impact of pre-primary education on subsequent school attendance and accumulated years of education. In order to control for unobserved individual or household characteristics that may affect both the participation in a preschool program and the later educational attainment, we instrumented preschool attendance with average attendance rates by age in each locality. Previous research found a positive effect both on school attendance and accumulated years of education, and this effect magnify as children grow up. But, till 2006 survey, there's no accurate data available to calculate properly the accumulated years of education a child should have and so the causality between preschool and the outcome accumulated years of education was only approximated. Thus, a major contribution of this paper is that for the first time, ENHA makes possible to work with real data on school grade repetitions (estimate accurately the possible lag in children education) and we find results which are different to previous findings. In sum, though preschool impacts positively on subsequent school attendance, preschool seems not to have an increasing impact on years of education as children grow up if we take into account new data on grade repetition. Also this paper broaden the scope of previous research adding data on rural areas and taking into account also children who do not live with both biological parents. Spreading out preschool education seems to be a successful policy option in a country with large drop-out rates but to cope with school grade repetition new options should be studied.

JEL: I2, J1
Keywords: Preschool, pre-primary education, school performance

1. Introduction

In this research, we attempt to shed some light in the debate about the long run educational effects of preschool expansion in developing countries. A large body of empirical evidence makes the case for the investment in early childhood education. But it is arguable if a policy that solely fosters preschool is the panacea to cope with the bad results on the education in developing countries.

In order to sum up the large body of literature, Barnett (2011) provides the stylized facts that have emerged from previous studies. Longitudinal random trials with some hundred children found positive effects on achievement tests and behavior both in the short and long run. However, Barnett finds that is more difficult to produce results like

those above through large-scale public programs, and studies of such public programs have more mixed results. For instance, a recent randomized trial (n = 4667 initially) evaluated 1 year of Head Start (HS), the U.S. federal preschool program for children in poverty that provides education. After 1 year of HS at age 3 or 4, 13 of 22 measures of language, literacy, and math effects were significant. At the end of kindergarten and grade one, no significant cognitive or grade repetition effects were found. Also, no positive effects were found on any teacher-reported measure of socioemotional development or behavior. A randomized trial (n = 3001 initially) of Early Head Start (EHS), the federal early intervention program for infants and toddlers in poverty, produced results similar to those for HS. Thus, Barnett suggests that expanded coverage should be guided by new research.

As we observed in Barnett (2011), most previous research on the long-run effects of large-scale preschool programs is focused in rich countries. Hence, our paper estimates the effect of early exposure to pre-primary education on school stay-on rates, grade retention and levels of completed years of education among individuals aged 7–15 in a developing country. We restrict our analysis to this age range precisely to compare our results with previous literature (Berlinski et al. (2008). Can large-scale public programs in a developing country replicate the positive results of small-scale research programs in rich countries? Some recent studies answer "Yes" but we want to argue against too much optimism. If we are right, increasing time in safe, supervised settings is not enough. Moreover, the relative gains by means of the spreading out of preschool may prevent more study by the policy makers to reach real positive results on academic achievement in the long run.

We use cross-sectional data of the year 2006 from Extended National Household Survey (Encuesta Nacional de Hogares Ampliada – ENHA) which includes retrospective information of preschool attendance. Our methodological strategy is an instrumental variables (IV) approach employing "Two Stages Least Squares" (TSLS). We instrumented preschool attendance with the mean of preschool attendance by child age in each locality.

Our findings suggest that preschool seems not to have a positive impact on years of education as children grow up. Thus, employing similar methods and more recent data we uncover different results that may guide the necessity of more research on the long run effects of preschool expansion in a developing country.

Since the 1990's, Uruguay experienced a considerable increase in pre primary coverage. From a policy point of view it is relevant to analyze the impact of such raise. Previous research in Uruguay about the impact of pre-primary school attendance on the subsequent educational attainment concentrates in children living in a two parent family and employs the following indicators of subsequent achievements: school attendance rates and number of accumulated years of formal education. However, this last indicator is far from a perfect indicator due to the limitations of the data available in Uruguay: the survey does not include a question about child's birthday. Thus, since no child could start primary school till he/she is 6 years old at least on April 30th, there's no means to know exactly if each child is in the correct grade school or if the kid is suffering from educational gap and how many years his education is lagging.

Berlinski et al. (2008) studies the effect of pre-primary education on children's subsequent school outcome: number of accumulated years of formal education and

probability of school attendance. They focus on individuals whose ages are in the range 7 to 15 years old. They use data from the Uruguayan household survey (ECH) –from 2001 to 2005- that collects retrospective information on preschool attendance. The authors employ the within household estimator and the instrumental variables estimator to control for unobserved determinants of school progression. They use the average attendance rates by locality of residence and birth cohort as instrumental variable. They find small gains from preschool attendance at early ages that magnify as children grow up: by age 15, treated children have accumulated 0.8 extra years of education and are 27 percentage points more likely to be in school compared to their untreated siblings. Thus, they employ two indicators of academic performance (the dependent variables to be explained): years of schooling and school attendance.

Though the authors have good data on school attendance, the available data from 2001 to 2005 has a serious problem regarding years of schooling. The problem is that the survey does not include birth date information. Thus, since no child could start primary school till he/she is 6 years old at least on April 30th, there's no means to know exactly if each child is in the correct grade school or if the kid is suffering from educational gap and how many years his education is lagging. As Cascio (2005) states, this lack of accurate data could produce considerable biases. Think, for example, about two children who are 10 years old in 2001 survey: one of them completed 4 years of education and the other completed 3 years of education. You could be misinformed by this data and think that the second child has an educational gap but it is not true: both of them have the correct accumulated years of education. The first one was born on April 29th 1991 and so started primary school (Primary School starts the first week of March) in 1997 and the second one was born on 29th May 1991 and thus was commanded to start primary school in 1998. Berlinski et al. (2008) also attempts to overcome this difficulty by concentrating on the months of January to April of the survey. The authors assume that children aged 7 during the interview months of January to April should have completed 1 year of education. However, it is misleading: suppose that on March 5th one child is interviewed and states that he is 7 years old and has completed one year of Primary School. But the interviewer is not able to know that this child birth date is March 6th so this child tomorrow would be 8 years old and so he should have completed 2 years of Primary Education. In sum, this child has an educational gap.

Our paper uses the 2006 Extended National Household Survey (Encuesta Nacional de Hogares Ampliada – ENHA) that includes also rural regions and cities with less than 5,000 inhabitants which were not covered in surveys for past years, and, for the first time, a specific question that shows if the individual has experienced at least one year of grade repetition: in this way, this new survey provides a non error indicator of school achievements. Cascio (2005) states that due to the usual unavailability of data on grade retention, a number of recent economic literature employs a binary variable "below grade" as a proxy of grade retention. Using data from a special battery of questions administered in the 1990s as part of the October Current Population Survey School Enrollment Supplement, she compares reported grade repetition experiences against grade-for-age in the population of school-aged students and finds that no systematic evidence exists on the quality of "below grade" as a proxy for retention. Also, she finds that the extent of misclassification in the proxy and the resulting biases are considerable. Additionally, Cascio (2005) finds that instrumental variables estimates remove endogeneity bias, but not the bias associated with misclassification. Thus, her findings show the importance of employing accurate data on grade retention as we employ in the present paper.

Also, we extend previous research by taking into account not only those children who live in a two parent family but also those who live with only one parent or no parent at all. Heckman (2008) states that family environment -that has changed significantly in the last 40 years- could play a powerful role in shaping children outcomes. It seems to be interesting to take into account family structure for the estimations: in 2006 the children, between 8 and 14 years old, who live with both biological parents are far from 100 percent: they are 57 percent. In addition, we pay particular attention to those subpopulations which could be especially vulnerable (households living in poverty; children whom mother has few years of formal education; rural populations). One subpopulation that requires a special attention in Uruguay is the one formed by those who are able to finish junior high school (individuals who are fourteen or fifteen years old): Kaztman (2006) shows that more than 35 percent of the individuals between 12 and 17 years old attend school with a gap. And this figure grows to near 60 percent in the case of children living in poverty.

2. Background

Katzman (2006) provides us with a description of the educational situation in Uruguay in 2006. Since early 1990's, pre-primary education has been promoted from the government and has showed an important increase. In the years 2005-2006, 95 percent of the children aged 5 attended preschool, 79 percent of aged 4 attended this program, and 54 percent of overall children who are less than six years old attended preschool (and one third of them attended private preschool).

[Insert Figure 1]

Figure 1 shows that preschool attendance for kids aged 4-5 growth from 58% in 1991 to 85% in 2006. The increase was more pronounced in the public preschools where attendance augmented from 32% in 1991 to 66% in 2006.

[Insert Figure 2]

The raise in preschool presence was particularly relevant for families in the bottom of the income distribution (see Figure 2). Preschool attendance for kids aged 4-5 living in families in the lowest two quintiles of the income distribution augmented from 50% in 1991 to 82% in 2006.

Especially during 1995, in a environment of important educational reforms and public debate, the government of Uruguay -by its agency in charge of education- started a policy to expand access to pre-primary education by means of investment on teaching infrastructure. In the period 1995-2002, besides the increase of the number and quality of preschool teachers, nearly one thousand classrooms were built or made available. In this context, in 1998, the parliament approved a law that makes mandatory for the children of 5 years old to attend pre-primary schools. Finally, in 2009, the parliament approved a new law that extends the obligation of pre-primary education to children of 4 years old. To sum up, though pre-primary education is mandatory since 1998, the preschool attendance has not been 100 percent yet: since the beginning of this policy, the government has decided to encourage parents by the supply side, that is, improving the preschool facilities, the availability of this service in every neighbourhood, etc. In terms of children incorporated into

pre-primary school, the policy has been very successful. For instance, between 1995 and 2004, enrolment in public preschools rises by nearly 80%.

A large body of literature in psychology and economics of education makes the case for early childhood intervention. Most of this literature has the focus in rich countries. Magnuson et al. (2007), using rich data from Early Childhood Longitudinal Study, estimates the effects of prekindergarten on children's school readiness in the US. They find that prekindergarten is associated with higher reading and mathematics skills at school entry, but also higher levels of behavior problems. Currie (2002) provides evidence on the longer-term effects of Head Start, a public program for poor preschool-age children. They use panel data from Panel Survey of Income Dynamics (PSID) and focus on four adult outcomes: completion of high school, attendance at some college, earnings if the household member worked, and whether the household member ever reported being booked or charged with a crime. The authors find that whites who attended Head Start are, relative to their siblings who did not, significantly more likely to complete high school and attend college, and African-Americans who participated in the program are less likely to have been booked or charged with a crime. Black et al. (2008) studies the long-term effects of the preschool starting age and uses data from Norway. They find evidence for a small positive effect of starting school younger on IQ scores measured at age 18. In contrast, they find evidence of much larger positive effects of age at test, and these results are very robust. They also find that starting school younger has a significant positive effect on the probability of teenage pregnancy, but has little effect on educational attainment of boys or girls.

In terms of recent scientific literature in poorer countries, besides Berlinsk et al. (2008), Berlinski et al. (2009) contribute to the empirical case by investigating the effect of a large expansion of universal pre-primary education on subsequent primary school performance in Argentina. They estimate that one year of pre-primary school increases average third grade test scores by 8% of a mean or by 23% of the standard deviation of the distribution of test scores. They also find that pre-primary school attendance positively affects student's self-control in the third grade as measured by behaviors such as attention, effort, class participation, and discipline.

3. Data

We use cross-sectional data of the year 2006 from Extended National Household Survey (Encuesta Nacional de Hogares Ampliada – ENHA) which includes socio-economic information of households and individuals (such as retrospective information of preschool attendance which is our variable of interest).

The ENHA is Uruguay's main household survey. It is administered by the National Institute of Statistics (Instituto Nacional de Estadística – INE) on an annual basis and contains questions both at the individual and household level concerning housing, income, wage, labour market and schooling status. The survey is representative of the entire nation. Specifically for the year 2006, it has a rather uncommon feature because it collects not only urban data but also rural data and information from towns with less than 5,000 inhabitants. In six months of the year there is a special education section of the survey that included precise information regarding school grade repetition. Approximately 43,000 households and 130,000 individuals are surveyed, representing 4.1% of total households in the nation.

The extensiveness of the ENHA survey allows us a large number of controls. Given the large number of observation that we can count on in the ENHA, we can improve the precision of the estimations.

We dropped the observations of children with disabilities and take into account only those with ages in the interval [7,15] (19,732 individuals in the first and third quarter of 2006): the usual age entry at school is 6 years old and it is compulsory to be at least in school till the individual finishes the Junior High School (approximately 15 years old). In the interval [7,15], 83% of the children attended preschool when they were 5 or less years old (there's no difference in the boys and girls attendance). This figure talks about the significant extension of the preschool program in Uruguay.

[Insert Table 1]

Table 1 provides simple descriptive statistics at the person-level data. Average age for the population sampled is 11.04 years and 49% of the sample is female. The average educational attainment is 4.41 years and the majority of the sample (68%) lives outside of the capital city, Montevideo.

[Insert Table 2]

Given that our focus is on preschool we also provide household level descriptive statistics. Table 2 shows the difference in individual and household characteristics between children who attended pre-primary school and those who not. The former have, in average, greater school attendance and lower grade retention rates; and a greater proportion of these children study now at private schools. Also their average family structure includes fewer children, fewer people who receive periodically a personal income and parents with more years of formal education.

4. Results

An experiment in which children were randomly assigned to preschool or to a control group and then tracked for ten years might be the ideal way to evaluate the effects of preschool on subsequent years. However, such experimental evaluation of preschool is illegal in Uruguay because preschool is mandatory after 4 years old. With the data actually available, our strategy is different. In order to control for unobserved individual or household characteristics that may affect both the participation in a preschool program and the later educational attainment – better-off or more able children are both more likely to attend preschool and to perform better in school –, we instrumented preschool attendance with average attendance rates by age in each locality, following Berlinski et al. (2008) who states that such source of variation is arguably uncorrelated with children's unobserved characteristics within each household, hence leading to consistent estimates of the treatment effects. These average attendance rates are significantly correlated with preschool attendance as is shown in table A.1 (see Annex).

[Insert Table 3]

Table 3 shows the second stage of the instrumental variable approach and the results confirm that the pre-primary education would imply better subsequent educational attainments: the children who attended preschool present greater school attendance[1]. This result is robust along models with different controls and samples. However there's an important finding: when age is introduced as a control, the positive effect is dramatically reduced. For example, regarding the complete sample, treated children are 41 percent points more likely to be in school compared to their untreated siblings. But this likelihood is reduced to 14 percent points when age is introduced as an explicative variable. This phenomenon occurs also when sample is restricted to children who live with both biological parents. In addition, we find a similar result if sample is restricted to older children. A possible explanation is that when we include age as a control, this variable collects the effect of a greater probability of school drop-out as the child become older because, for example, he/she perceives more job opportunities.

[Insert Table 4]

In Table 4, we show the results of the second stage of the instrumental variable approach applied on school grade repetition. In the first model, children who attended preschool are 53 percent points less likely to experiment grade repletion. And this figure is 41 percent in model 3. But if we introduce age as an explicative variable the effect is reduced to 12 percent in the case of the entire sample. However, if we restrict the sample to children who live with both biological parents, the effect is null. And there's no effect also if we confine the sample only to older children. Thus, age seems to collect the entire effect of preschool: older children have greater likelihood of having experienced grade repetition just because they are older.

In order to analyse short term and medium term impacts of preschool attendance, Table 5 reports the results of the instrumental variable estimator allowing preschool to interacting with age dummies, both for the sample of children who live with biological parents and for the entire population. Like Berlinski's et al. (2008) results, preschool attendance impacts positively on subsequent school attendance and this effect is also present for older children: by age 13, treated children are 19 percentage points more likely to be in school compared to their untreated siblings. And a remarkable different finding from Berlinski's is that those who attended preschool has lower probability of suffering grade repetition but this effect fades up as children grow. Berlinski et al (2008) find that preschool impacts positively on accumulated years of schooling and states that this could be the compound effect of drop-out and repetition (Berlinski et al (2008) have no data to test the relative incidence of these possible channels). Our findings contributes to the literature showing that the main channel behind the impact of preschool on accumulated years of schooling seems to be the stay-on rate, not grade repetition. Thus, in terms of policy implications, spreading out preschool education seems to be a successful policy option in a country with large drop-out rates but to cope with school grade repetition new options should be studied.

[Insert Table 5]

[1] **In all our tables we include similar control variables as the ones used by Berlinski et al. in order to compare our findings with these authors. As a kind of robustness check, we include also the variables of Table 2 –individuals are unbalanced in those variables and may bias outcomes-, and we also employ Probit models with instrumental variables. Our findings remain similar to tables observed in our paper. Results are not shown but are available upon request.**

Tables 6 and 7 show the effect of preschool attendance on educational attainments by subpopulations. Results suggest that all subpopulations –except the urban regions excluding Montevideo and the rural one- receive benefits –in terms of greater stay-on rates- from preschool attendance. However, preschool attendance seems to have no impact on school grade repetition in any subpopulation.

[Insert Tables 6 and 7]

Table 8 shows that the effect of preschool on school attendance endures on time for boys and girls. This positive effect is greater for kids in Montevideo and with less educated mothers.

Looking for more detail about different ages along subpopulations, we could observe in Table 9 that in most cases pre-primary education has no impact on grade repetition. Thus, Table 9 contrasts with Table 8 where we really find significant effects suggesting that preschool impacts positively on subsequent school attendance.

[Insert Tables 8 and 9]

If we employ the error measure of completed years of schooling used by Berlinski et al. (2008) our results change completely. In that case we concluded (as them) that the effect of preschool on years of schooling is higher as children grow up (see Table 10). But working with non error years of schooling data we concluded that preschool reduces grade repetition (thus incrementing years of schooling accumulated) only for some ages but this effect does not endure when children reach 15 years old (see Table 5).

[Insert Table 10]

In summary, there's empirical evidence that suggests a positive effect of preschool attendance especially on school stay-on rates. Also, those who attended preschool present lower likelihood of grade repetition. However, the positive effect fades up as children grow. Berlinski et al. (2008) looks for possible explanations that could underpin the positive effects. From an economic perspective, they found that the explanation could be that the returns to human capital investments decline during the life cycle and the opportunity costs of attending school at short ages is low. The authors also sum literature from neuroscience and psychology and state that cognitive stimulation in early life is critical for long term skill development. Thus, pre-primary education facilitates the process of cognitive stimulation by providing systematic activities for the children, and also preschool helps non-cognitive skills such as children's socialization (and parent's) and self-control needed in formal education.

Heckman (2008) points out the importance of non-cognitive skills and criticizes public policies that concentrate attention solely on achievement test scores and do not evaluate important non-cognitive factors that promote success in school and life. Nevertheless, the serious problem of grade repetition is not tackled completely by preschool program: Kaztman and Rodríguez (2006) shows that more than 35 percent of the individuals between 12 and 17 years old attend school with a gap -this figure grows to near 60 percent in the case of children living in poverty- but preschool attendance seems to have no influence on adolescents from this range of age. These findings suggest that it is crucial to learn more about what happens inside the "black box" of preschool: perhaps it is necessary to focus on

preschool quality and no merely its quantity. Magnuson (2007) states that without measures of preschool characteristics and observations of classroom processes we cannot assess how children's outcomes were shaped by differing dimensions of program quality. In addition, other dimensions of children's preschool and prekindergarten experiences (like the number of hours in nonparental care, the age they entered care, and the continuity in preschool arrangements) may also be important to understanding children's outcomes.

5. Conclusions

Early educational interventions have been recommended as one means of addressing problems such as poverty, poor nutrition and inadequate education. Thus, provision of early education has been increasing throughout the developing world. But scientific literature about the effects of pre-primary school on educational achievements is not conclusive. In low scale randomized field experiments, academic outcomes are mostly positive. However, in randomized control trials of a great scope, results are mixed. Most of the latter experiments are conducted in rich countries, and recent empirical findings in developing countries may overestimate the impact of preschool to improve education in these regions.

Looking from more empirical evidence about the consequences of pre-primary education on subsequent educational achievements, this paper uses recent cross sectional data from the ENHA 2006 Survey which provide better o new non error measure of school grade repetition –important information for building a child performance indicator. Also, the 2006 survey covers a more representative sample of Uruguay (regions with less than 5,000 inhabitants). From a methodological point of view, the present research employs instrumental variable techniques to handle possible bias caused by children or household unobserved characteristics. Though the identification strategy follows Berlinski et al. (2008) and the instrument is arguably uncorrelated with children's unobserved characteristics within each household, also one could always argue that the locality specific effects depend on the cohort or the age of the kid (some localities get better or worse as time goes by). It is a valid concern and it would be taken into account in further research, but in this paper it is the best instrument available in the data set and it follows recent applied literature.

Previous research found a positive effect both on school attendance and accumulated years of education, and this effect magnify as children grow up. But, till 2006 survey, there's no accurate data available to calculate properly the accumulated years of education a child should have and so the causality between preschool and the outcome accumulated years of education was only approximated. Thus, a major contribution of this paper is that for the first time, ENHA makes possible to work with real data on school grade repetitions (estimate accurately the possible lag in children education) and we find results which are in some way contrary to previous findings. In sum, though preschool impacts positively on subsequent school attendance, preschool seems to have a positive effect on accumulated years of education only for some ages but no effect as children grow up.

One likely explanation for these mixed results is that the effects of preschool programs are heterogeneous. That is, preschool programs do not produce positive impacts simply by changing the environment in which children spend their time. Increasing time in safe, supervised settings is not enough: for instance, parental involvement seems also to be crucial (Cid and Rossi, 2012). Moreover, it may be necessary to explore the type and

quality of pre-primary education available to today's children (Weisman et al, 2003). Another possible reason for the mixed results of preschool's impact is the existence of negative peer associations (Zief, Lauver, and Maynard, 2006) that may provide "deviance training" or may reinforce deviant attitudes and antisocial behavior (Rorie et al., 2010): our findings suggest that preschool impacts positively on stay-on rates, but precisely due to this greater stay-on rate, children may suffer a negative peer effect that would overcome the positive effect of pre-primary education. Our results could help to guide further research and public policy.

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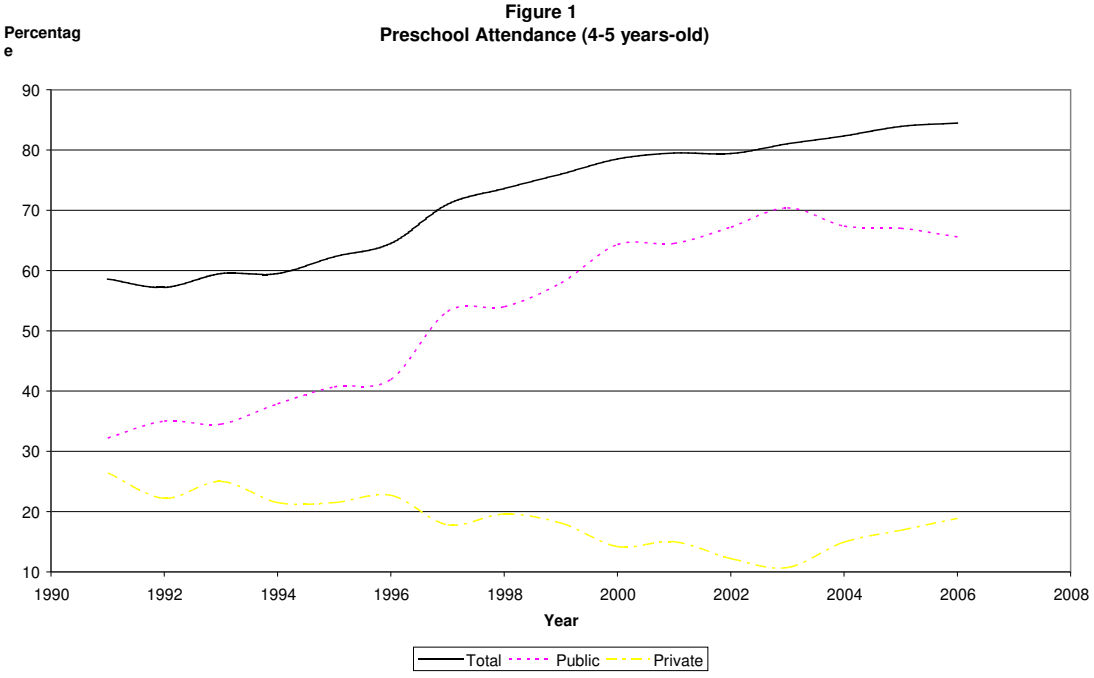
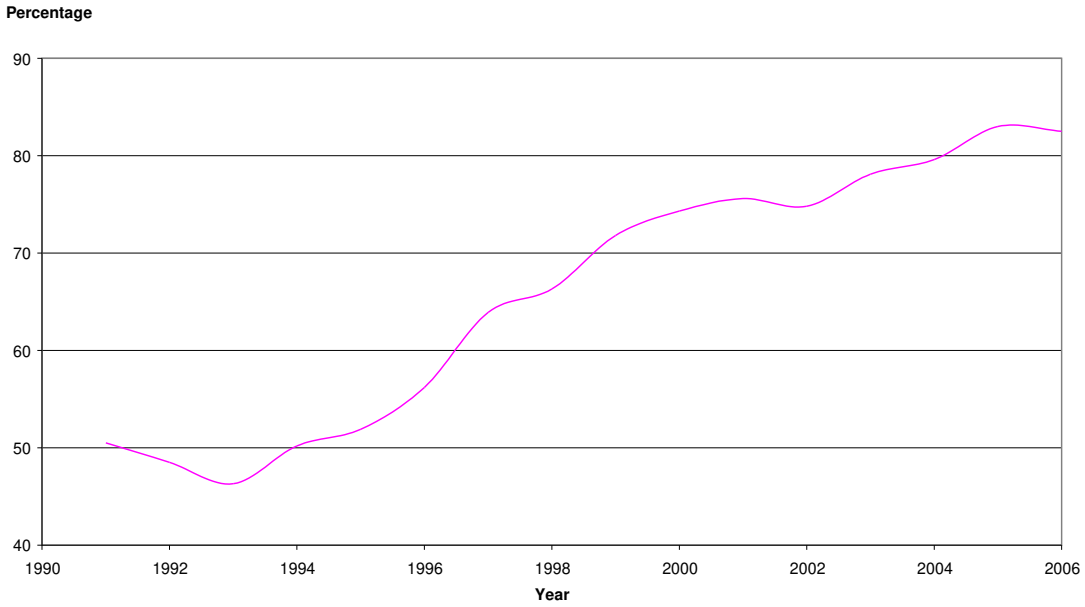
Figure 1
Preschool Attendance (4-5 years-old)



Source: ANEP (Administración Nacional de Enseñanza Primaria)

Figure 2
Preschool Attendance (4-5 years-old) - 1st and 2nd Income Quantile



Source: ANEP (Administración Nacional de Enseñanza Primaria)

Table 1. Definition and Description of Variables – Uruguay – 2006 ENHA Survey

	Mean	Std. Dev	Min	Max
Preschool Attendance	.83	.37	0	1
School Attendance	.95	.21	0	1
Grade Repetition	.30	.46	0	1
Years of Schooling	4.4	2.47	0	10
Age	11.0	2.54	7	15
Female	.49	.50	0	1
Mother's age at birth	27.3	6.68	12	47
Mother's Schooling	7.8	3.9	0	22
Montevideo	.32	0.47	0	1
Observations	19732			

Table 2 – Descriptive Statistics: Means – Children among [7, 15] years old with previous preschool attendance and without previous preschool attendance - Uruguay – 2006 ENHA Survey

	With Preschool	Without Preschool	Difference	p-value
Girls	.49	.47	.02***	0.008
School Attendance at Present	.96	.88	-.08***	0.000
One Grade Repetition at Least	.28	.42	-.14***	0.000
Private School at Present	.10	.05	.05***	0.000
Living with both Biological Parents	.63	.61	.02**	0.027
Mother's Age	38.2	39.0	-.08***	0.000
Father's Age	42.1	43.5	-1.4***	0.000
Number of persons 13 years old or less	2.12	2.28	-.16***	0.000
Number of people receiving personal income	2.64	2.82	-.18***	0.000
Illiterate Mother	.009	.019	-.010***	0.000
Illiterate Father	.018	.036	-.018***	0.000
Mother's Years of Education	8.65	7.38	1.27***	0.000
Father's Years of Education	8.19	6.88	1.31***	0.000

***p<0.01; **p<0.05; *p<0.10 Sample Size= 19732.

Table 3 – School Attendance - Second Stage Instrumental Variables Estimation - Average of Preschool Attendance by Age in each Locality as Instrument of Preschool Attendance - Children among [7, 15] years old - Uruguay – 2006 ENHA Survey

Dependent Variable: School Attendance	(1)	(2)	(3)	(4)	(5)	(6)
	All Children in age rank [7,15]	All Children in age rank [7,15]	Children in age rank [7,15] who live with both biological parents	Children in age rank [7,15] who live with both biological parents	Adolescents in age rank [14,15] who live with both biological parents	Adolescents in age rank [14,15] who live with both biological parents
Preschool	.411 (.040)***	.143 (.028)***	.360 (.043)***	.126 (.035)***	.329 (.107)***	.289 (.102)***
Controls:						
Age	**No**	Yes	**No**	Yes	**No**	Yes
Female	Yes	Yes	Yes	Yes	Yes	Yes
Month x Locality	Yes	Yes	Yes	Yes	Yes	Yes
Mother's age at birth	**No**	**No**	Yes	Yes	Yes	Yes
Mother's Years of Education	**No**	**No**	Yes	Yes	Yes	Yes
Observations	19732	19732	12519	12519	2729	2729

Standard errors clustered by locality in parenthesis
***p<0.01; **p<0.05; *p<0.10

Table 4 – School Grade Repetition - Second Stage Instrumental Variables Estimation - Average of Preschool Attendance by Age in each Locality as Instrument of Preschool Attendance - Children among [7, 15] years old - Uruguay – 2006 ENHA Survey

Dependent Variable: At Least One Grade of School Repetition	(1)	(2)	(3)	(4)	(5)	(6)
	All Children in age rank [7,15]	All Children in age rank [7,15]	Children in age rank [7,15] who live with both biological parents	Children in age rank [7,15] who live with both biological parents	Adolescents in age rank [14,15] who live with both biological parents	Adolescents in age rank [14,15] who live with both biological parents
Preschool	-.533 (.058)***	-.124 (.050)**	-.411 (.068)***	-.029 (.059)	.123 (.134)	.146 (.135)
Controls:						
Age	**No**	Yes	**No**	Yes	**No**	Yes
Female	Yes	Yes	Yes	Yes	Yes	Yes
Month x Locality	Yes	Yes	Yes	Yes	Yes	Yes
Mother's age at birth	**No**	**No**	Yes	Yes	Yes	Yes
Mother's Years of Education	**No**	**No**	Yes	Yes	Yes	Yes
Observations	19732	19732	12519	12519	4369	4369

Standard errors clustered by locality in parenthesis
***p<0.01; **p<0.05; *p<0.10

Table 5 - The Impact of Preschool Attendance on School Attendance and Grade Repetition - Instrumental Variable Estimates – Children among [7, 15] years old – Uruguay – 2006 ENHA Survey

	(1)	(2)	(3) **(Only Children living with both Biological Parents)**	(4) **(Only Children living with both Biological Parents)**
	School Attendance	Grade Repetition	School Attendance	Grade Repetition
Attended Preschool x Age=7	-0.0594	-0.0224	-0.0631	0.170
	(0.0309)	(0.0791)	(0.0430)	(0.113)
Attended Preschool x Age=8	0.000145	0.0141	-0.0517	0.216*
	(0.0399)	(0.0850)	(0.0421)	(0.109)
Attended Preschool x Age=9	-0.0137	-0.0719	-0.0153	-0.0564
	(0.0267)	(0.0988)	(0.0339)	(0.117)
Attended Preschool x Age=10	-0.0236	-0.0784	-0.0174	-0.0598
	(0.0339)	(0.0973)	(0.0426)	(0.132)
Attended Preschool x Age=11	-0.0343	-0.283**	-0.0460	-0.193*
	(0.0271)	(0.0961)	(0.0333)	(0.0918)
Attended Preschool x Age=12	0.0814*	-0.140	0.0873*	-0.0565
	(0.0340)	(0.0951)	(0.0436)	(0.106)
Attended Preschool x Age=13	0.194**	-0.247*	0.148	-0.197
	(0.0705)	(0.1000)	(0.0793)	(0.105)
Attended Preschool x Age=14	0.285***	-0.169	0.265**	-0.0191
	(0.0718)	(0.0882)	(0.0870)	(0.0962)
Attended Preschool x Age=15	0.414***	-0.0438	0.368***	0.0723
	(0.0667)	(0.0583)	(0.0701)	(0.0809)
Controls:				
Age	Yes	Yes	Yes	Yes
Month x Locality	Yes	Yes	Yes	Yes
Female	Yes	Yes	Yes	Yes
Mother's age at birth	**No**	Yes	**No**	Yes
Mother's years of Education	**No**	Yes	**No**	Yes
Observations	19732	19732	12519	12519

Clustered Standard Errors in parenthesis
Source: Own calculations based on Encuesta de Hogares Ampliada 2006
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6 – Impact of Preschool Attendance on School Attendance among Subpopulations - Instrumental Variables Estimation - Average of Preschool Attendance by Age in each Locality as Instrument of Preschool Attendance - Children among [7, 15] years old - Uruguay who live with both biological parents – 2006 ENHA Survey

Dependent Variable: School Attendance							
	Girls	Boys	Children living in poverty	Montevideo	Urban Regions (excluding Montevideo)	Rural Regions	Low Mother's Education
Preschool	.134 (.055)**	.131 (.045)***	.218 (.122)*	.148 (.042)***	.056 (.046)	.049 (.068)	.118 (.061)*
Controls:							
Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Female	**No**	**No**	Yes	Yes	Yes	Yes	Yes
Month x Locality	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother's age at birth	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother's Years of Education	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6197	6322	1998	3639	6155	2725	5317

Standard errors clustered by locality in parenthesis
***p<0.01; **p<0.05; *p<0.10

Table 7 – Impact of Preschool Attendance on School Grade Repetition among Subpopulations - Instrumental Variables Estimation - Average of Preschool Attendance by Age in each Locality as Instrument of Preschool Attendance - Children among [7, 15] years old who live with both biological parents - Uruguay – 2006 ENHA Survey

Dependent Variable: At Least One Grade of School Repetition							
	Girls	Boys	Children living in poverty	Montevideo	Urban cities excluding Montevideo	Rural	Low Mother's Education
Preschool	-.054 (.070)	-.011 (.096)	.232 (.199)	-.227 (.218)	-.089 (.087)	-.064 (.091)	-.016 (.081)
Controls:							
Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Female	**No**	**No**	Yes	Yes	Yes	Yes	Yes
Month x Locality	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother's age at birth	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother's Years of Education	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6197	6322	1998	3639	6155	2725	5317

Standard errors clustered by locality in parenthesis
***p<0.01; **p<0.05; *p<0.10

Table 8 - The Impact of Preschool Attendance on School Attendance - Instrumental Variable Estimates – Children among [7, 15] years old - Uruguay – 2006 ENHA Survey

	(1) Girls	(2) Boys	(3) Poorest	(4) Montevideo	(5) Urban (not Montevideo)	(6) Rural	(7) Less Educated Mothers
Attended Preschool x Age=7	-0.0855	-0.0626	0.0642	-0.0804	0.0672	-0.119	-0.0847
	(0.0727)	(0.0455)	(0.105)	(0.133)	(0.0490)	(0.0597)	(0.0720)
Attended Preschool x Age=8	-0.173*	-0.0215	-0.0294	-0.0693	-0.0114	-0.1000	-0.0695
	(0.0834)	(0.0475)	(0.0771)	(0.0603)	(0.0589)	(0.0772)	(0.0638)
Attended Preschool x Age=9	-0.119	-0.00200	0.0221	-0.0872	0.0708	-0.0246	0.0284
	(0.0661)	(0.0427)	(0.0957)	(0.0496)	(0.0421)	(0.0506)	(0.0600)
Attended Preschool x Age=10	0.0130	-0.0238	0.134	-0.187**	0.0385	-0.0622	0.00813
	(0.0662)	(0.0545)	(0.112)	(0.0620)	(0.0583)	(0.0759)	(0.0647)
Attended Preschool x Age=11	-0.0184	-0.106*	0.0585	-0.0493	-0.0153	-0.0622	-0.0334
	(0.0525)	(0.0426)	(0.105)	(0.0724)	(0.0377)	(0.0614)	(0.0449)
Attended Preschool x Age=12	0.0984	0.125*	0.276	-0.0830	0.0939	0.137	0.161*
	(0.0786)	(0.0620)	(0.202)	(0.0539)	(0.0540)	(0.110)	(0.0772)
Attended Preschool x Age=13	0.107	0.258*	0.125	0.110	-0.0446	0.135	0.164
	(0.113)	(0.112)	(0.183)	(0.0997)	(0.0921)	(0.226)	(0.119)
Attended Preschool x Age=14	0.229*	0.315	0.506	0.169	0.0917	0.280	0.131
	(0.0904)	(0.162)	(0.323)	(0.106)	(0.0779)	(0.283)	(0.191)
Attended Preschool x Age=15	0.401***	0.371***	0.367	0.805**	0.142	0.177	0.302*
	(0.0991)	(0.0954)	(0.208)	(0.205)	(0.109)	(0.161)	(0.116)
Observations	6202	6331	2001	3642	6162	2729	5326

Clustered Standard Errors in parenthesis
Source: Own calculations based on Encuesta de Hogares Ampliada 2006
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9 - The Impact of Preschool Attendance on Grade Repetition - Instrumental Variable Estimates – Children among [7, 15] years old - Uruguay – 2006 ENHA Survey

	(1) Girls	(2) Boys	(3) Poor	(4) Montevideo	(5) Urban (not Montevideo)	(6) Rural	(7) Less Educated Mothers
Attended Preschool x Age=7	0.132	0.197	0.302	-0.0367	0.154	0.300	0.0702
	(0.168)	(0.160)	(0.209)	(0.531)	(0.189)	(0.159)	(0.162)
Attended Preschool x Age=8	0.315	0.256*	0.406	0.400	0.197	0.0844	0.315
	(0.234)	(0.119)	(0.285)	(0.437)	(0.135)	(0.187)	(0.160)
Attended Preschool x Age=9	-0.0117	-0.0326	0.161	0.306	-0.352*	-0.0335	-0.0201
	(0.193)	(0.146)	(0.278)	(0.361)	(0.176)	(0.177)	(0.159)
Attended Preschool x Age=10	0.0419	-0.268	0.166	0.0961	-0.112	-0.196	-0.0751
	(0.137)	(0.217)	(0.363)	(0.282)	(0.165)	(0.239)	(0.219)
Attended Preschool x Age=11	-0.00409	-0.466**	-0.301	-0.271	-0.314**	-0.0767	-0.197
	(0.0884)	(0.177)	(0.425)	(0.343)	(0.116)	(0.170)	(0.131)
Attended Preschool x Age=12	-0.195	0.0427	0.284	-0.383	-0.255	-0.106	-0.0754
	(0.149)	(0.171)	(0.345)	(0.420)	(0.155)	(0.244)	(0.147)
Attended Preschool x Age=13	-0.260	-0.0963	0.367	-0.589*	-0.0271	-0.409*	-0.130
	(0.140)	(0.158)	(0.288)	(0.259)	(0.180)	(0.179)	(0.146)
Attended Preschool x Age=14	-0.0680	0.0450	0.0204	-0.631**	-0.0697	-0.152	0.0330
	(0.127)	(0.171)	(0.267)	(0.214)	(0.154)	(0.140)	(0.157)
Attended Preschool x Age=15	-0.0250	0.162	0.457*	-0.112	0.0303	-0.101	0.0753
	(0.118)	(0.132)	(0.207)	(0.298)	(0.163)	(0.0840)	(0.111)
Observations	6202	6331	2001	3642	6162	2729	5326

Clustered Standard Errors in parenthesis

Source: Own calculations based on Encuesta de Hogares Ampliada 2006

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10. The Impact of Preschool Attendance on Years of Schooling Completed by the Individuals that are 7-15 years old - Instrumental Variable Estimates

	(1) Years of Formal Education Completed by Individuals	(2) Years of Formal Education Completed by Individuals
Attended Preschool x Age=7	0.00349	-0.143
	(0.194)	(0.205)
Attended Preschool x Age=8	0.0779	-0.129
	(0.232)	(0.246)
Attended Preschool x Age=9	0.128	-0.0108
	(0.213)	(0.214)
Attended Preschool x Age=10	0.262	0.0634
	(0.209)	(0.194)
Attended Preschool x Age=11	0.516**	0.278
	(0.175)	(0.174)
Attended Preschool x Age=12	0.467	0.300
	(0.268)	(0.254)
Attended Preschool x Age=13	0.897***	0.695**
	(0.263)	(0.261)
Attended Preschool x Age=14	0.895***	0.653***
	(0.172)	(0.160)
Attended Preschool x Age=15	0.895**	0.812**
	(0.271)	(0.259)
Controls:		
Mother's age at child birth	No	Yes
Mother's education	No	Yes
Month x Locality	Yes	Yes
Age	Yes	Yes
Observations	12533	12533

Clustered Standard Errors in parenthesis
Source: Own calculations based on Encuesta de Hogares Ampliada 2006
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Table A1. Preschool Attendance and Average Preschool Attendance by Age and Locality – First Stage Estimates

Dependent Variable: Preschool Attendance	(1)	(2)	(3)	(4)	(5)	(6)
	All Children in age rank [7,15]	All Children in age rank [7,15]	Children in age rank [7,15] who live with both biological parents	Children in age rank [7,15] who live with both biological parents	Adolescents in age rank [14,15] who live with both biological parents	Adolescents in age rank [14,15] who live with both biological parents
Average preschool attendance by age and locality	.946 (.026)***	.941 (.029)***	.868 (.022)***	.871 (.035)***	.812 (.032)***	.824 (.087)***
Controls:						
Age	**No**	Yes	**No**	Yes	**No**	Yes
Female	Yes	Yes	Yes	Yes	Yes	Yes
Month x Locality	Yes	Yes	Yes	Yes	Yes	Yes
Mother's age at birth	**No**	**No**	Yes	Yes	Yes	Yes
Mother's Years of Education	**No**	**No**	Yes	Yes	Yes	Yes
Observations	19732	19732	12519	12519	2729	2729

Standard errors clustered by locality in parenthesis
***p<0.01; **p<0.05; *p<0.10

Table A2 - Definition and Description of Variables - Children living with both biological parents

	mean	sd	min	max
Preschool Attendance	.8359531	.3703329	0	1
Grade Repetition	.2583579	.4377492	0	1
School Attendance	.9613022	.1928815	0	1
Mother's age at birth	27.90633	6.479411	12	62
Montevideo	.2905928	.4540541	0	1
Years of Schooling	4.462698	2.508012	0	12
Female	.4948536	.4999935	0	1
Schooling of the Father	8.027527	3.472425	0	25
Schooling of the Mother	8.578473	3.487588	0	22
Illiterate Father	.019708	.1390004	0	1
Illiterate Mother	.0093354	.0961714	0	1
Private School	.1116368	.3149321	0	1
Observations	12533			

Table A3 - Definition and Description of Variables - Children living in Montevideo

	mean	sd	min	max
Preschool Attendance	.8585714	.3484908	0	1
Grade Repetition	.3631746	.4809527	0	1
School Attendance	.9653968	.182787	0	1
Mother's age at birth	27.25364	6.822008	5	79
Years of Schooling	4.319206	2.494861	0	10
Female	.4892063	.4999232	0	1
Schooling of the Father	6.263968	5.073644	0	22
Schooling of the Mother	8.423175	4.143325	0	22
Illiterate Father	.0111757	.1051345	0	1
Illiterate Mother	.0135547	.1156428	0	1
Private School	.1751069	.3800897	0	1
Both Parents at Home	.5780952	.4939027	0	1
Observations	6300			

Table A4 - Definition and Description of Variables - Children living in poverty

	mean	sd	min	max
Preschool Attendance	.740005	.4386866	0	1
Grade Repetition	.4981142	.5000593	0	1
School Attendance	.9140055	.2803911	0	1
Mother's age at birth	26.81548	7.254644	7	58
Montevideo	.2554689	.4361793	0	1
Years of Schooling	3.835806	2.269992	0	10
Female	.4681921	.49905	0	1
Schooling of the Father	3.844858	3.343786	0	17
Schooling of the Mother	5.789288	2.689191	0	16
Illiterate Father	.0588901	.2354634	0	1
Illiterate Mother	.0258882	.1588236	0	1
Private School	.0126547	.1117946	0	1
Both Parents at Home	.5031431	.500053	0	1
Observations	3977			

Table A5 - Definition and Description of Variables - Children living in rural regions

	mean	sd	min	max
Preschool Attendance	.7155645	.4512103	0	1
Grade Repetition	.263933	.4408271	0	1
School Attendance	.9214554	.2690655	0	1
Mother's age at birth	27.11155	6.534738	10	54
Years of Schooling	4.373664	2.416872	0	12
Female	.5047647	.5000495	0	1
Schooling of the Father	6.040716	3.44861	0	20
Schooling of the Mother	7.106266	3.267441	0	18
Illiterate Father	.026393	.160327	0	1
Illiterate Mother	.0064005	.0797588	0	1
Private School	.0460671	.2096632	0	1
Both Parents at Home	.788045	.4087521	0	1
Observations	3463			

Table A6 - Definition and Description of Variables - Only individuals 14 and 15 years old

	mean	sd	min	max
Preschool Attendance	.7697414	.4210465	0	1
Grade Repetition	.4161135	.4929693	0	1
School Attendance	.8416114	.3651468	0	1
Mother's age at birth	27.50461	6.731596	7	79
Years of Schooling	7.44976	1.32021	0	12
Female	.5200275	.4996559	0	1
Schooling of the Father	5.986496	4.640812	0	25
Schooling of the Mother	7.71458	4.079764	0	22
Illiterate Father	.0237877	.1524105	0	1
Illiterate Mother	.0142109	.1183743	0	1
Private School	.1014414	.3019534	0	1
Both Parents at Home	.6255436	.4840376	0	1
Observations	4369			

Table A7 - Definition and Description of Variables - Children with low educated mother

	mean	sd	min	max
Preschool Attendance	.7764269	.4166658	0	1
Grade Repetition	.4134886	.4924904	0	1
School Attendance	.927054	.2600645	0	1
Mother's age at birth	27.72677	7.176833	7	79
Years of Schooling	4.270668	2.415937	0	12
Female	.5024315	.5000261	0	1
Schooling of the Father	5.04236	3.362805	0	21
Schooling of the Mother	5.510622	1.154107	0	6
Illiterate Father	.0352147	.1843368	0	1
Illiterate Mother	.0211159	.1437801	0	1
Private School	.0226394	.1487613	0	1
Both Parents at Home	.6815971	.4658865	0	1
Observations	7814			

Table A8 - Definition and Description of Variables - Children in urban cities excluding Montevideo

	mean	sd	min	max
Preschool Attendance	.8546494	.3524716	0	1
Grade Repetition	.2813723	.4496912	0	1
School Attendance	.9595747	.1969645	0	1
Mother's age at birth	27.48251	6.813868	7	62
Years of Schooling	4.488815	2.476717	0	12
Female	.4939312	.4999882	0	1
Schooling of the Father	5.935701	4.510953	0	25
Schooling of the Mother	7.785836	3.923805	0	22
Illiterate Father	.0252518	.1568996	0	1
Illiterate Mother	.0105389	.1021223	0	1
Private School	.0648129	.2462083	0	1
Both Parents at Home	.6181162	.4858727	0	1
Observations	9969			