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Pre-School Education and School Performance. The Case of Public Schools in Montevideo

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Abstract

In this paper we try to explain the academic performance of a sample of children starting their first year at public schools in 1999 in Montevideo, Uruguay. We are mainly interested in the effect of pre-school education on the children's academic results. We found fairly strong empirical evidence to suggest that having pre-school education has a short term positive effect on these children's results in the first year at school, and the long-term effect, after six years, seems to be somewhat weaker but is still positive. We also estimated several other factors connected with schools and with households that might lie behind children's short-term and long-term performance. It is important to note that the results for boys are clearly differentiated from those for girls.

JEL-code: I21

Keywords: pre-school education; school performance; Uruguay

1. Introduction

There is increasing concern about the results of public education policies. In countries with extensive primary school coverage it seems appropriate to focus on an analysis of the impact that educational policies have on academic outcomes. Uruguay is in this situation; it is a small, middle-income country with a long tradition of social inclusion and with education that is mainly provided by the state. Primary schooling has been compulsory since the end of the 19th century, and today the country has a combination of public and private teaching institutions from pre-school right through to university. In the past, pre-school education was mainly provided by private institutions but now public pre-schools are playing an increasing role (Berlinski et al., 2007).

In 1995 an educational reform was launched, which mainly affected the public system from pre-school up to and including secondary education. In this reform, pedagogic programs were modified, the incentives structure and the training system for teachers were changed, and there was considerable investment in education infrastructure and pedagogic materials. One of the main features of this reform was to universalize pre-school education for children of four and five years old, and, according to the education authorities, this was achieved for five-year-olds in 1999 (Magnuson et al., 2004). A recent World Bank publication (2007) suggested that pre-schooling in Uruguay contributes to improving education outcomes and to reducing the inequalities that emerge in primary and secondary education. It concluded that pre-school education fosters good outcomes among children from disadvantaged contexts and contributes to narrowing the gap between these children and those from privileged backgrounds.

The large scale expansion of public pre-school institutions focused on children from contexts where the rate of coverage was rather low. According to the Continuous Household Survey, public pre-school education expanded greatly in Montevideo: the proportion of children from four to six in pre-schooling increased from 71 percent in 1995 to 84 percent in 1998. It is worth noting that the greatest increase (from 58 to 73 percent) occurred in the three lowest income deciles, while in the higher deciles the rate was around 90 percent in both years (Tansini, 1999). It was expected that one of the consequences of bringing children into education at an early age would be to improve academic performance in the mid term, particularly among children from the most disadvantaged sectors of society.[1] Berlinski et al. (2007), working with the 2001-2005 Uruguayan Household Survey, found "...small gains from pre-school attendance at early ages that magnify as children grow up. By the age of 15, children who have had pre-schooling have accumulated 0.8 extra years of education and are 27 percentage points more likely to have remained in school than children who have not." Moreover, Berlinski et al. (2006), working in Argentina, concluded that "...one year of pre-primary school increases average third year test scores by 8 percent of the mean or by 23 percent of the standard deviation of the distribution of the test scores." Furthermore, they found that "...going to pre-primary school positively affects pupils'

[1] Goodman and Sianesi (2005) found that "...investments in human capital before the age of 5 appear to have had long-lasting positive effects on the children from the 1958 cohort", and specifically that early education leads to improvements in cognitive tests, including both math and reading at age 7, and that the effects diminish but remain significant throughout the schooling years up to age 16. Furthermore they assert that there are gains in adulthood from early education, in terms of educational attainment and labor market performance.

self-control in the third year as measured by behavior such as attention, effort, class participation and discipline."

One main conclusion that can be drawn from the research in this field is that the educational process is difficult to apprehend. In particular, defining and measuring the "output" of the educational process has generated a lot of interesting discussion. In spite of this, and regardless of the definition adopted, it is generally agreed that school outcomes at different ages are affected by the child's social environment and by the educational institution he/she attends. Home conditions seem to be the most important component of the child's social environment, and there is some kind of general agreement about the impact of home conditions on school results (Velez, Schiefelbein and Valenzuela, 1993; Wößmann, 2005). More specifically, it has been suggested that educational and cultural levels in the home have a big influence on a child's future development (Wößmann, 2005). It is also widely accepted that the school a child goes to also has an influence on academic outcomes, but there are different opinions about how important this factor is, and in particular about the extent to which school can compensate for home influences (Harbison and Hanushek, 1992; Hanushek, 1995; Hanushek, Kain and Rivkin, 1998; Wößmann, L., 2005). The weight that is assigned to these various factors will affect decisions about educational policy and will be especially important in the evaluation of the costs and benefits of different policies (Hanushek, E., 1986; Prichett and Deon, 1997; Fuller, 1986).

In recent studies Nagle & Tansini (2001) and Moreira et al. (2007) found significant differences in the academic outcomes of children in primary education at public schools in Montevideo, Uruguay. These differences are linked to educational and cultural levels at home and to whether or not the children had pre-school education. However, this was a partial analysis that did not include an evaluation of the joint effects of the different factors on school results. Moreover, this study did not take account of other aspects related to the school itself that could have an influence on children's performance. It has been pointed out in many studies that institutional variables like the ratio of pupils to teachers and the teacher's education and experience are quite important in explaining school results, but there are also authors who suggest that these variables have less of an influence. The use of a production function approach makes it possible to improve the evaluation of the impact of different variables on school results (Prichett and Deon, 1997).

In this study we evaluate the factors that determine the first year school performance of pupils at public primary schools in Montevideo, and we also assess the factors that determine their school performance after six years at school. The measures of school performance that we use include the probability of passing the first school year and the probability of passing the sixth year on schedule. We focus our analysis on the importance of variables that characterize the child's household, whether or not the child had pre-schooling, and the impact of the school on pupil outcomes.

The study is organized as follows: in the first section we analyze the children's first year outcomes and the school year they reached in 2004, and the connection between these and a series of variables to do with the children's home and whether or not the child previously attended pre-school, the age at which attendance began, and some socio-economic characteristics of the child's school. In the second section we describe the model, the variables and the data sources. Next we present the estimation results for the whole sample and for sub-samples by pre-school education and by the gender

of the child. In the last section we draw conclusions based on the various analyses that were carried out.

2. School performance in Montevideo

In this section we present the academic results of children in their first year of primary school in 1999, and then the results of the same children in 2004, six years later.

2.1. The academic results of first year pupils

As was reported in recent studies of a sample of children in their first year at public primary schools in Montevideo in 1999 (Nagle et al., 2000 and Moreira et al., 2007) 53 percent passed that year with grades between Good and Very Good (this also includes pupils who passed the year because they were over the age limit and other special cases), some 21 percent passed with a final grade above Very Good and 26 percent failed.[2]

These results are certainly influenced by characteristics of the school, by socio-economic factors in the home, and by the social environment in which the child grew up.[3] The socio-economic context of the school in particular seems to have a considerable influence on children's outcomes. Table 1 shows that the highest repetition rate occurs in schools in the lower socioeconomic context (33 percent) followed by those in the middle context (22 percent), and then by those in the higher context (14 percent).

Table 1. Final grades of first year pupils at public primary schools of Montevideo in 1999 by socio-economic context of the school (percentages).

Final Grades	*Socio-economic context*			Total
	Lower	Middle	Higher	
Better than Very Good	15.1	26.7	28.3	21.3
Good and Very Good	51.6	50.4	57.3	52.5
Failed	33.1	22.0	14.0	25.8
Others	0.2	0.9	0.4	0.4
Total	100.0	100.0	100.0	100.0

The proportion of pupils who passed with grades between Good and Very Good (6 to 9 marks) was similar across the three contexts, but there was a considerable difference between schools in the lower context and the other schools when we consider pupils who passed with grades above Very Good (10 to 12 marks). The proportion of pupils who passed with better than Very Good at schools in the lower context was 47 percent lower than in the higher context, while the rate in the middle-context was only 6 percent lower than in higher context schools (see Table 1).

[2] In Uruguayan primary schools grades are awarded that are equivalent to marks out of 12. A mark of 1 to 5 is a fail, a mark of 6 is considered a pass and the grade Good is given, a mark of 7 is Good Very Good, an 8 is Very Good Good, and a 9 is Very Good. Then comes the top bracket: a 10 is Very Good Outstanding, an 11 is Outstanding Very Good, and a 12 is Outstanding.

[3] The socioeconomic contexts are defined by the National Administration of Public Education (ANEP) on the basis of the mother's education and the level of house equipment of the household. See ANEP (1999).

However, these are not the only factors that seem to influence children's performance. Nagle et al. (2000) and Moreira et al. (2007) reported that the first year children in public schools who achieved better results in 1999 "*...are generally those who went to pre-school, and especially those who began pre-school education at an early age"*. In fact, the first year failure rate among children who did not have pre-schooling was double the rate of those who did go to pre-school. About 89 percent of the children in the 1999 cohort had pre-schooling, but there were significant differences between schools in the different socioeconomic contexts. The pre-schooling rate among pupils at schools in the high socioeconomic context was 97 percent, in middle context schools it was 96 percent, but in schools in the lower context it was only 81 percent. Moreover, when we analyze pre-school education by the mother's education, we find that children whose mothers are better educated are more likely to go to pre-school. Some 81 percent of children whose mother did not finish primary school went to pre-school, while 98 percent of children whose mother had more than 12 years of formal education did so.

As can be seen in Table 2, pupils who began pre-schooling before the age of four had the lowest failure rate in the first year (13 percent) whereas children who started pre-school at the age of five had a much higher failure rate (31 percent), and those who did not go to any pre-school institution had a failure rate of 50 percent. A similar pattern emerges when the grades of first year primary school children are analyzed. About 34 percent of pupils who began pre-school before they were four years old passed their first year of primary with grades better than Very Good but only 14 percent of children who went into pre-schooling at the age of five did so, and the corresponding rate among children who did not attend pre-school was only 4 percent. When the results of first year pupils in the lower socioeconomic context are analyzed we get similar outcomes (see Table 2).

Table 2. First year pupils' results by pre-schooling. (percentage)

The whole sample				
Final grades	**Age of pre-school start**			**No Pre-school**
	Before 4 years	**At 4 years**	**At 5 years**	
Good and Very Good	51.8	54.2	54.3	46.2
Better than Very Good	34.4	19.9	14.0	4.1
Failed	13.1	25.9	30.8	49.7
Others	0.6	0.0	0.9	0.0
All	100.0	100.0	100.0	100.0
Only Lower Socio-economic Context				
Final grades	**Age of pre-school start**			**No Pre-school**
	Before 4 years	**At 4 years**	**At 5 years**	
Good and Very Good	58.7	50.0	53.4	44.7
Better than Very Good	25.4	20.2	13.6	3.5
Failed	15.9	29.8	32.4	51.8
Others	0.0	0.0	0.6	0.0
All	100.0	100.0	100.0	100.0

Moreover, children in the same socio-economic context who began pre-schooling earlier systematically obtained higher grades than those who began later or did not have any pre-schooling at all. Furthermore, a comparison of the different socio-economic contexts shows that children in lower socioeconomic context schools who began pre-schooling earlier obtained better results than the average for children in the sample that began pre-school later.

2.2. Academic performance in 2004

Let us examine the performance of the children in our sample with respect to one of the main goals of the Uruguayan educational system, which is that pupils should finish the primary school cycle in six years. The 1999 school records for pupils in the sample show that only slightly over half of them (56 percent) kept up with the expected school schedule and reached the sixth year in 2004 (see Table 3). The situation is even worse in schools in the lower socioeconomic context as only 41 percent of pupils reached the last curricular year on schedule, which contrasts sharply with 65 percent from the middle socioeconomic context and 76 percent from the higher socio-economic context.

Table 3. Results in 2004 of pupils of the 1999 cohort, by socioeconomic context of the schools. (Percentage)

2004 outcomes of the 1999 cohort	Socioeconomic context of the school			Total
	Lower	Middle	Higher	
Passed 6th with better than VG	14.4	26.8	32.1%	21.8%
Passed 6th with VG or less	26.3	36.3	43.5%	32.9%
Repeated 6th year	0.6	1.7	0.4%	0.8%
Attended 6th year in 2004	41.2	64.8	76.0%	55.6%

More than 98 percent of the pupils who attended the sixth year in 2004 passed it, and there were no significant differences by socioeconomic context of the school. In addition, 39 percent of the pupils in the sample who attended sixth year in 2004 passed it with marks above Very Good, and again there were no substantial differences by socioeconomic context. It appears that there are no significant differences by socioeconomic context in terms of the short-term performance of pupils who managed to complete the school cycle on schedule. Nevertheless, when all the children in the 1999 cohort are evaluated by socioeconomic context of the school, differences do emerge.

In 2004, only just over half the children in the sample attended sixth year on schedule and the rest repeated one or more years of primary school, and this generated big differences in the length of the school cycle. More specifically, up to 2004 some 23 percent of the children repeated one year and 28 percent repeated more than one year. Another characteristic of this high failure rate is that most pupils who had to repeat did so in their first year. Indeed, up to 2004, some 68 percent of the repeaters in the sample repeated their first year. Some 43 percent of those who repeated just once in the school cycle did so in first year, and 34 percent of those that repeated more than once did so in the first year. When we examine socioeconomic context, significant differences arise. In the schools in the lower context some 46 percent of the pupils repeated their first year at least once, but at the other end of the scale only 16 percent

of schoolchildren from the higher context did so. Hence it emerges that children from the lower context are disproportionately over-represented among the group who repeated at least once, and even more over-represented among children who did so more than once. Indeed, although pupils at schools in the lower context accounted for 80 percent of those who repeated the first year at least twice, they amounted to only half the pupils in the sample. The main obstacle for schoolchildren seems to be to pass their first year, and this is confirmed by the fact that of the pupils who repeated their first year in 2000 only two thirds passed, and of those who repeated it yet again in 2001 some 80 percent passed.

We suggested above that good academic results in the first year at public schools were positively associated with attending pre-school, and especially with an early start to pre-school education. When we analyze the whole school cycle up to 2004 we find that some 59 percent of the children in the cohort who had pre-schooling reached the sixth year in 2004 but only 26 percent of those who did not go to pre-school reached the sixth year on schedule. In addition, while 45 percent of the children at schools in the lower context who went to pre-school reached the sixth year on schedule, only 25 percent who had no pre-schooling did so (see Table 4).

Table 4. Pupils in their sixth school year by pre-school education and by socio-economic context of the school. (Percentage).

Socioeconomic Context		**Had Pre-schooling**		**Total**
		No	**Yes**	
Low	In sixth year in 2004	25.0	44.8	41.2
	Did not reach sixth year in 2004	75.0	55.2	58.8
	Total low socioeconomic context	100.0	100.0	100.0
Middle	In sixth year in 2004	0.0	65.9	64.8
	Did not reach sixth year in 2004	100.0	34.1	35.2
	Total middle socioeconomic context	100.0	100.0	100.0
High	In sixth year in 2004	57.1	76.5	76.0
	Did not reach sixth year in 2004	42.9	23.5	24.0
	Total high socioeconomic context	100.0	100.0	100.0
Total	In sixth year in 2004	26.0	59.0	55.6
	Did not reach sixth year in 2004	74.0	41.0	44.4
	All pupils	100.0	100.0	100.0

The link between pre-schooling and outcomes becomes even clearer when we consider that while 22 percent of the pupils who had pre-schooling passed their sixth year in 2004 with grades above Very Good, only 3% of those who did not have pre-schooling did so. When we examine the socioeconomic context of the schools we find the same pattern. Moreover, the rate of schoolchildren in the lower context who had pre-schooling and passed their sixth year with grades better than VG is higher than the pass rate among pupils in the other socioeconomic contexts who did not have pre-schooling. When progress in the school cycle is evaluated by pre-school start age and contrasted with children who did not go to pre-school, it emerges that if the child began pre-school at the age of five, by 2004 he/she was an average of five months ahead of children who did not go to pre-school, if the child began pre-school at age 4 he/she

was almost 9 months ahead, and children who began pre-school before the age of 4 were 11 months ahead.

Another factor we should take into consideration when we examine pupil performance is previous school outcomes. These seem to be quite important for subsequent academic results in the school cycle. When we evaluate pupil outcomes in the sixth year considering the final grade they obtained in first year, it emerges that pupils who passed the first year with grades above Very Good are more likely to reach the sixth year on schedule and more likely to pass it with a grade above Very Good. Indeed, in 2004, about 98 percent of the pupils who passed the first year with grades above Very Good were in their sixth year in 2004, and 69 percent passed with more than Very Good, while the corresponding figures for those who obtained less than Very Good in their first year were 43 and 8 percent, respectively. Furthermore, in 2004 some 93 percent of the pupils in schools in the lower socioeconomic context who passed their first year with grades above Very Good were in sixth year in 2004 and 57 percent of them passed sixth year with the highest grades, but only 32 percent of those who passed first year with less than Very Good were in sixth year in 2004 and a mere 6 percent passed with more than Very Good (see table 5). These results clearly suggest that previous outcomes are a very important factor in pupil performance. Moreover, the Spearman rank correlation of the results of the six school years was over 70 percent, which suggests there is a strong correlation in this dimension, and this could indicate that there is a virtuous circle in operation, in other words ***"Those who begin well finish well"***.

Table 5. Outcomes in sixth year in 2004 by pupils' results in first year in 1999, by socioeconomic context of the school. (Percentage)

Socioeconomic context	Outcomes in 6th year	Grades in first year in 1999		Total
		Less than Very Good	Better than Very Good	
Low	Passed 6th with better than VG	6.4	57.1	14.4
	Passed 6th with VG or less	24.5	35.7	26.3
	Repeated 6th year in 2004	0.7	0.0	0.6
	Attended 6th year in 2004	31.5	92.9	41.2
Middle	Passed 6th with better than VG	8.5	74.0	26.8
	Passed 6th with VG or less	40.3	26.0	36.3
	Repeated 6th year in 2004	2.3	0.0	1.7
	Attended 6th year in 2004	51.2	100.0	64.8
High	Passed 6th with better than VG	12.8	75.3	32.1
	Passed 6th with VG or less	51.8	24.7	43.5
	Repeated 6th year in 2004	0.6	0.0	0.4
	Attended 6th year in 2004	65.2	100.0	76.0
Total	Passed 6th with better than VG	8.2	68.5	21.8
	Passed 6th with VG or less	34.1	29.0	32.9
	Repeated 6th year in 2004	1.1	0.0	0.8
	Attended 6th year in 2004	43.4	97.5	55.6

3. The Data and the Model Specification

We have 1999-2005 data on the schools and on the households of the children that were in their first year at public schools in Montevideo in 1999. The information on households comes from two household surveys of a sample of first year pupils at public schools in Montevideo. These surveys were carried out in June 1999 and November 2006 on a sample of 950 households out of the 17,430 first-year pupils at these schools. The sample was stratified into three groups according to the socio-economic context of the school the child was attending: Lower, Middle and Higher, as categorized by the National Administration of Public Education in Uruguay (ANEP), and using socio-cultural information about the households (see Nagle and Tansini, 2000, for a more comprehensive description of the sample). The information about schools, teachers and academic results was gathered directly from each school. Note that the information about teachers and final grades used in this study is for the whole academic year, so the final mark for each child reflects an evaluation made by the teacher of that child's performance over the whole year.

We built several variables to measure the children's academic performance. For their first year at school, the obvious measure is given by the final grades the children obtained. Grades obtained at school, and especially in the first year of primary education, have been often criticized as an inadequate measure of academic performance. We felt that in this study we should not enter this debate so we also used a dummy variable, "passed or failed the first year", as a more general measure of academic performance. In order to measure the children's long-term performance we first focused on their grades in sixth year in 2004. Note that this variable is censored because not all the children in the sample reached sixth in 2004. As an alternative, we considered two uncensored variables: first, a linear measure of performance whereby the grade obtained in the year the child passed in 2004 is multiplied by a factor equal to one for the sixth year, five-sixths for children that only passed the fifth year, four-sixths for those that only passed the fourth year, and so on (Performance 1). Second, we considered a non-linear measure by squaring the factors described above (Performance 2).

With this data we constructed the following explanatory variables:

- **Absences 1999**. This variable is equal to the number of days that a pupil was absent in 1999.
- **Absences 1999-2004**. This variable is equal to the annual average of the number of days that a pupil was absent in the period 1999-2004.
- **Parents' Education**. This variable is equal to the average years of education of the parents.
- **Living with Parents**. A dummy variable equal to one if the pupil is living with both biological parents, and zero otherwise.
- **More than 20 Books**. A variable equal to one for pupils with more than 20 books at home and equal to zero otherwise.
- **Gender**. A dummy variable equal to one for male children and zero for females.
- **Persons per room**. This is an index of crowding in the home.

- **Substitute Teacher**. This is a binary variable equal to one if a substitute teacher was in charge of the class in 1999, and zero otherwise.
- **Pre-School**. This variable equals one for pupils who had pre-school education, and zero otherwise.
- **Pre-School before 3**. This variable equals one for pupils who had pre-school education, and zero otherwise.
- **Middle Socioeconomic context**. This is a dummy equal to one if the school is categorized by the education authorities as having pupils from the middle socioeconomic context, and zero otherwise.
- .**Lower Socioeconomic context**. This is a dummy equal to one if the school is categorized by the education authorities as having pupils from the lower socioeconomic context, and zero otherwise.

We analyzed these data with the help of regression models so as to identify the effects of different factors on the children's academic performance, but a major focus in the whole process is the effect of pre-schooling. We designed these models so as to cater to two main dimensions. First, we aimed to separate short from long run effects, the former to attempt to explain children's performance in the first year of primary school (in 1999) and the latter to try to explain their performance after six years at primary school (in 2004). In our second analytical dimension we considered the effects of different kinds of factors that could explain children's academic performance in both the short and the long term. We kept factors pertaining to the school separate from factors pertaining to the children's background, their households and the context where they grew up.

In order to capture these effects we used a production function approach. That is, we assumed that the children received a number of inputs in their households, the socioeconomic context where they live, and their school. Naturally, we measured the output of this production process (the learning process) by the children's academic performance. That is, we assumed that there is a function

$$y = f\left(x_1, x_2, \ldots, x_k\right),$$

where $x_1, x_2, \ldots, x_n$ are variables measuring the different factors acting on the children to produce an academic performance level indicated by *y*, using the measures outlined above.

We had no information about the functional specification of our production function, so whenever possible we used an Ordinary Least Squares (OLS) estimation of a linear version of our production function. In the case of the children in sixth year in 2004, we used a maximum likelihood estimation of a Tobit model, because not all the children reached this grade by 2004. Finally, the dummy variables, passed or failed, required the maximum likelihood estimation of a probit model. Quite often we divided the sample in sub-samples and estimated Oaxaca-Blinder decompositions, for both lineal or non lineal models, in order to obtain a more detailed picture of the possible distribution of the different effects.

4. Estimations

Our main aim in this study is to discuss the impact of pre-school education on children's subsequent academic performance, and naturally we must consider this effect in the context of many other variables that also exert an influence on children's performance. Moreover, we are interested in both short and long term performance, so we divided our empirical analysis into two parts. In the first we discuss the results in the first year at primary school in 1999, and in the second part we discuss the performance of these children as observed in 2004.

4.1. Short-Run performance

We began with the OLS estimation of a linear model in which the dependent variable is the grades the children obtained in their first year at primary school. The results of this estimation are shown in Table 6.

Table 6. Performance in first year. OLS estimation. (Grades are the dependent variable)

Variables	**Coeff.**	**t**	**P>|t|**
Pre-School	0.59929	2.94	0.0030
Parents' Education	0.13176	4.98	0.0000
Absences	-0.04237	-11.28	0.0000
Living with Parents	0.45982	3.06	0.0020
More than 20 Books	0.52030	2.92	0.0040
Gender	-0.39179	-2.73	0.0060
Persons per Room	-0.19552	-4.33	0.0000
Substitute Teacher	-0.36937	-2.13	0.0340
Middle Context	-0.05700	-0.29	0.7710
Higher Context	-0.17568	-0.91	0.3650
Constant	6.93466	20.16	0.0000
n	945		
R^2-adjusted	0.29453		
F(8,936)	22.24		

These empirical results suggest that pre-school education has a strong positive effect on children's early academic performance. We estimated this effect with a statistical significance level better than 0.3 percent, and this is the parameter with the largest absolute value in the entire regression. Most of the other parameters are estimated with levels of significance better than one percent and with the expected signs. This is the case of the following variables: Living with Parents, More than 20 Books at home and Parent's Education. Moreover, these variables suggest that family and household cultural level play a key role in a child's first year school outcomes. These variables also indicate that the household's disposition and ability to pay attention to and supplement the education that children receive at school is crucial for good results.

In the case of the Substitute Teacher variable we estimated a negative effect, with a significance level better that 3.4 percent. This is also probably linked to the fact that substitute teachers tend to be younger, which could be associated with less experience, and in addition they are less stable in the school than other teachers. Notice that the Absences variable has a small negative effect but that in the estimate there is a fairly strong level of statistical significance. Note that this variable is the number of days the child did not attend school in 1999.

The main and most surprising exceptions are the estimation of the dummy variables for the socioeconomic context of the children. The lower socioeconomic context is the excluded option for these dummy variables, which were estimated at rather low levels of statistical significance. This surprising result, which suggests that socioeconomic context has no effect on academic performance, could be explained by a fairly strong correlation between socioeconomic context and the level of overcrowding in the home (persons per room) because this is one of the variables taken into account when school context is defined. Therefore it is not surprising that the binary variables introduced for the socioeconomic context of schools should turn out to be not significant at traditional levels, which in fact confirms that these variables also capture this effect.

Furthermore, there is also a correlation between socioeconomic context and pre-school education. This result can be assessed by a regression considering only children at schools in the lower socioeconomic context, which is reported in Table A.1 of the Statistical Appendix. In this case we estimated a much larger coefficient for pre-school education (0.84899) and with a stronger level of statistical significance (a t-indicator equal to 4.07). When we estimated the same model for children at schools in the middle or higher socioeconomic contexts, we were not able to reject the null hypothesis that these parameters are equal to zero. Our conclusion is that the positive effect of pre-school education is stronger for children at schools in the lower socioeconomic context than for children in other socioeconomic contexts. These results are not surprising. As mentioned above, only 3 percent of the first year pupils in the middle and higher socioeconomic contexts did not have pre-schooling while almost one fifth of the children at schools in the lower socioeconomic context did not go to pre-school. Moreover, as mentioned above, while 73 percent of the pupils at schools in the lower socioeconomic context who had pre-schooling passed their first year, only 50 percent of those who did not go to pre-school passed their first year.

Thus, a main result so far is that pre-school education plays an important role in children's school performance, especially among children at lower socioeconomic context schools. In order to further explore this hypothesis we divided our sample in two sub-samples, one made up of children who had pre-school education and the other made up of children that did not. Table 7 below shows the estimation of the same model for these two sub-samples.

We should begin our discussion of these results with a warning. The sample of children who did not go to pre-school is relatively smaller, just over ten percent of the observations, so it is no surprise that most of the parameters are estimated with a rather low level of statistical significance. The exception is the coefficient reflecting the negative effect of absences, which is estimated with a fairly high level of significance and with the expected sign.

Table 7. The Pre-School effect. (Grades are the dependent variable)

	With Pre-School			Without Pre-School		
Variables	**Coeff.**	**t**	**P>|t|**	**Coeff.**	**t**	**P>|t|**
Parents' education	0.12203	4.77	0.0000	0.03763	0.42	0.6740
Absences	-0.04279	-8.84	0.0000	-0.03427	-4.43	0.0000
Living with parents	0.59940	3.70	0.0000	-0.47622	-1.37	0.1730
More than 20 books	0.46853	2.75	0.0060	0.47726	0.86	0.3940
Persons per room	-0.23178	-4.17	0.0000	0.00911	0.09	0.9290
Gender	-0.42842	-2.87	0.0040	-0.15630	-0.44	0.6590
Substitute teacher	-0.40349	-2.22	0.0270	-0.45193	-1.25	0.2160
Constant	7.58679	24.22	0.0000	6.97189	9.96	0.0000
n	844			101		
R^2-adjusted	0.273			0.251		
F(7,836) and F(7, 93)	44.82			4.22		
Chow test: F(8,929)	3.434			Prob: 0.0007		

The parameters for the two sub-samples seem to be different. The Chow test gives us significant evidence suggesting that we have two different sets of coefficients, so we tried the Oaxaca-Blinder decomposition for this model. In this case we used a *"three-fold"* decomposition. In this approach we have a first term, *"Endowments"*, where the difference of the average of the variables is evaluated with the parameters of the children who did not go to pre-school. The second term, *"Coefficients"*, evaluates the difference of the parameters at the sample mean of the variables for children who did not go to pre-school. Finally, there is a third term, *"Interaction"*, which measures the interaction between the difference in the variables and the difference in the coefficients. (Jann, 2008)

Table 8. The Pre-School Effect, Oxaca-Blinder Decomposition

Oaxaca-Blinder	**Coeff.**	**t**	**P>|t|**	**%**
Differential:				
Prediction Without Pre-School	5.59406	29.13	0.0000	–
Prediction With Pre-School	7.46919	85.70	0.0000	–
Difference	-1.87514	-8.89	0.0000	–
Decomposition:				
Endowments	-1.35528	-8.65	0.0000	72.3
Coefficients	-1.21556	-3.81	0.0000	64.8
Interaction	0.69570	2.47	0.0140	-37.1

The decomposition of the differences is estimated from the point of view of the children with pre-school education (Table 8). Notice that the average grades predicted for children with pre-school education is about a third greater than the average grades predicted for children without pre-school education. This difference has been esti-

mated with a high degree of statistical significance. Furthermore, all three components were estimated with fairly satisfactory degrees of statistical significance. Notice that the Endowments and the Coefficients components are of a similar magnitude, while the Interaction component is somewhat smaller and has the opposite sign to the other two.

When we analyze the results by gender we find that while the 79 percent of girls passed their first year only 72 percent of boys did so. Moreover, 25 percent of girls passed first year with grades better than Very Good, while only 17 percent of boys did so. When we consider the socioeconomic context of the schools we find that the gap between boys and girls is even larger. While 74 percent of girls at schools in the lower socioeconomic context passed first year, only 63 percent of the boys did so. Furthermore, this evaluation is confirmed by the results shown in Table 6, which clearly suggest that girls and boys performed differently in their first year. Therefore we decided to estimate the model for both sub-samples, and these results are given in Table 9. We can see that the positive effect of pre-school education seems to be stronger for boys than for girls. However, these parameters are estimated at a somewhat lower level of statistical significance (9.2 and 7.4 percent or better, respectively). This is not surprising because we are estimating each model with only a half of the observations.

Table 9. The Gender effect. OLS estimation. (Grades are the dependent variable)

	Boys			**Girls**		
Variables	**Coeff.**	**t**	**P>|t|**	**Coeff.**	**t**	**P>|t|**
Pre-School	0.64535	1.69	0.0920	0.53203	1.79	0.0740
Parents' education	0.14529	4.05	0.0000	0.10654	3.22	0.0010
Absences	-0.04441	-6.15	0.0000	-0.03937	-7.54	0.0000
Living with parents	0.55002	2.49	0.0130	0.42191	2.07	0.0390
More than 20 books	0.47947	2.03	0.0430	0.46376	2.06	0.0400
Persons per room	-0.15734	-2.17	0.0310	-0.23920	-3.43	0.0010
Substitute teacher	-0.22392	-0.89	0.3750	-0.53422	-2.43	0.0150
Constant	6.62303	11.64	0.0000	6.83932	15.64	0.0000
n	472			473		
R^2-adjusted	0.2549			0.3074		
F(8,936)	24.02			30.92		

The structural difference between girls and boys can be tested using a Chow test. In this case we found an *F*-statistics that equals 1.830. That is, the null hypothesis, no structural differences between girls and boys, can be rejected at a level of significance better than 6.8 percent.

However, there are differences between the estimated parameters for boys and girls. For example, the Parents' Education variable has a stronger positive effect for boys than for girls, while having a Substitute Teacher has a significant and negative effect on girls. Speaking very generally, we had the impression that conditions in the household are more important for the performance of boys than for girls, and the opposite is true for conditions at the school. We further developed these results with the help of an Oaxaca-Blinder decomposition, and this is given in Table 10. These results indi-

cate that the predicted performance for girls is almost a 10 percent better than that predicted for boys. This difference is estimated with quite a high level of statistical significance. Moreover, the Interaction component of the decomposition seems to be statistically not different from zero. On the other hand, about two-thirds of the difference in performance is explained by differences in the coefficients, and only a third by difference in the variables (Endowments) for girls and boys.

Table 10. The Gender Effect, Oaxaca-Blinder Decomposition

Oaxaca-Blinder	Coeff.	t	P>|t|	%
Differential				
Prediction Boys	6.93446	60.90	0.0000	–
Prediction Girls	7.60381	64.34	0.0000	–
Difference	-0.66935	-4.08	0.0000	–
Decomposition				
Endowments	-0.25932	-2.71	0.0070	38.7
Coefficients	-0.42396	-3.02	0.0030	63.3
Interaction	0.01393	0.36	0.7170	-2.1

The results obtained up to this point are interesting, and they suggest a number of hypotheses about the academic performance of children in their first year at school. However, we are aware that using grades as a measure of academic performance has been criticized, especially at such an early point in time in the education cycle. Therefore we have used an alternative performance measure, a binary variable that equals one for children passing their first year and zero otherwise. Naturally, the two variables are strongly correlated because children pass only when they reach a minimum grade (six marks out of twelve). On the other hand, our grades variable conveys more information than our alternative dummy variable. However, it will be interesting to see if our conclusions above still hold when using our alternative variable. Therefore we repeated the analysis above using probit estimations for children who passed and failed.

In Table 11 below we present the estimations of our basic model. In this case we present the estimation of the parameters and the marginal contributions (dF/dx) evaluated at the sample averages of the variables. Most of the parameters are estimated within reasonable levels of statistical significance. There are two exceptions: the variable *"More than 20 books at home"*, which is one of the variables designed to capture the educational and cultural environment of the household, and the other, surprisingly, is *Gender*. In general, the level of statistical significance is lower than in the corresponding least squares estimation. This simply reflects the loss of information that occurred by introducing a binary variable instead of a continuous one. However, we cannot compare the magnitude of the parameters between the two approaches because of the non-linearity of the probit. Nor can we compare the least squares estimates of the parameters with the marginal contributions of the probit because the dependent variables are measured with different units and in different ranges. However, if we multiply marginal contributions by average grades we get a result close to the least squares estimates, especially in the case of the coefficient of the "*Pre-school"* variable.

Table 11 Probit estimation: Passed/Failed first year in 1999 (Probit)

Variables	Coeff.	t	P>|t|	d*F*/d*x*
Pre-School	0.24893	1.65	0.0980	0.07715
Parent's Education	0.04943	2.60	0.0090	0.01426
Absences	-0.02879	-8.79	0.0000	-0.00831
Living with Parents	0.21083	2.02	0.0430	0.06248
More than 20 Books	0.11299	0.96	0.3350	0.03230
Gender	-0.11061	-1.10	0.2730	-0.03190
Persons per room	-0.06543	-2.03	0.0420	-0.01888
Substitute Teacher	-0.33144	-2.98	0.0030	-0.10152
Constant	0.98718	3.97	0.0000	–
n	945			
Wald χ^2	157.69	Prob:	0.0000	
Log likelihood	-419.885			
Right Prediction	96.00%			

Not surprisingly, when we included dummy variables for school socioeconomic context their coefficients were estimated with a rather low level of statistical significance. The reason, once again, is that most of the children without pre-school education were from households in the lower socioeconomic context. Moreover, many of our explanatory variables capture this context as well.

We estimated the model separately for the two sub-samples, children with pre-school education and children without pre-schooling. For the sub-sample of children without pre-school education no parameter was estimated with a satisfactory level of significance. A likelihood-ratio test failed to reject the null hypothesis that all the parameters were equal in both models (chi-squared equal to 6.47). These results are presented in Table A.2 of the Statistical Appendix.

Table 12. Oaxaca-Blinder Decomposition of Probit

Observed Difference	0,25919			
Residual Difference	-0,0722			
	Coeff.	**z**	**P>|z|**	**%**
Differences in endowments	0.1677	10.06	0	59.1
Differences in marginal effects	0.1159	0.44	0.661	40.9

The Oaxaca-Blinder decomposition of the Probit estimation (Bartus, 2006, and Fairlie, 2003) in Table 12 shows that the average child with pre-school education has a probability of passing the first year that is about 26 percentage point higher than for a child without pre-school education. Moreover, it was not possible to estimate the

marginal contributions to this difference with an acceptable level of significance. On the other hand the contribution of the difference in endowments shows a strong level of significance and accounts for more than half of this difference.

Thus, even when we use the weaker dummy variable, passed or failed, the empirical evidence strongly suggests that pre-school education has a positive effect on short-term performance at school, that is to say in the first year.

4.2. Long-Term Performance

Our sample can also capture some long-term effects of pre-school education. Thus, using data up to 2004, we specified a few more regression models to reflect the performance of children up to that year at primary school. Note that the primary school cycle is a six-year program.

First, we estimated a model similar to that given in Table 6 but using sixth-year grades as dependent variables. However, this variable is left-censored because it is relevant only for children who were in sixth year in 2004. In order to recover the information about pupils that failed to reach sixth year on schedule we used a tobit estimation. These results are presented on the left side of Table 13. Notice that the "Substitute Teacher" variable was dropped because it was not possible to identify the condition of all the teachers the pupils had during the six years. Note also that the sample size has been reduced to 748. This was done because information on some of the children was missing, because they moved to other locations in the country or to another country, or because it was not possible to locate the family in 2005.

Table 13. Tobit Estimation for sixth year (Dependent variable, grades in Sixth year)

Variables	**Coeff.**	**t**	**P>|t|**	**dy/dx**	**Coeff.**	**t**	**P>|t|**	**dy/dx**
Pre-School	0.80653	0.84	0.399	0.3884	—	—	—	—
Pre-School before 3	—	—	—	—	1.1357	1.84	0.066	0.5858
Parents' education	0.1674	2.19	0.029	0.0832	0.1383	1.77	0.077	0.0688
Absences	-0.3146	-10.12	0.0	-0.1563	-0.3145	10.3	0.000	-0.1565
Living with parents	1.2389	2.38	0.018	0.6011	1.3065	2.51	0.012	0.634
More than 20 books	2.2090	4.21	0.000	1.1105	2.1686	4.14	0.000	1.0917
Gender	-1.2775	-2.77	0.006	-0.6342	-1.2823	-2.79	0.005	-0.6376
Persons per room	0.7265	3.83	0.0	0.3610	-0.7228	-3.83	0.000	-0.3598
Constant	7.6003	5.13	0.000	—	8.3412	7.50	0.000	—
Sigma	5.752755				5.73928			
n	748				748			
Uncensored	442				442			
Loglikelihood	-1619.82				-1618.4915			
Chi-squared(7)	308.18				310.83			

The first important result on the left of the Table above is that we estimated a parameter for the effect of pre-school education at a rather poor level of statistical significance, just under 40 percent. This result is not surprising because we have a smaller sample. Moreover, most of the children without pre-school education are in the censored part of the tobit. We know that while 61 percent of those with pre-school education were in sixth year in 2004, only 28 percent of those who did not go to preschool had this level of performance. We can recover some of the variability of this variable by replacing it with other variables which are quite close to pre-school education. In fact, when we introduce a dummy variable that indicates that a child started preschool education before he or she was three years old, we obtain a parameter estimated at a level of significance better than 6.6 percent, and with a marginal effect of 0.5858 (see the right side of Table 13).

The rest of the parameters are estimated with the expected signs and at reasonable levels of significance. However, it is noticeable that in most cases we estimate stronger effects for the tobit model of the sixth year than the corresponding estimation for the first year results. In particular, it is noteworthy how large the gender coefficient becomes.

However, these results can be improved by using a different performance variable. Therefore we constructed a new variable on the basis of the 2004 grades, no matter which year of attendance they correspond to. If these grades are from different academic years they are multiplied by a factor equal to one for those corresponding to sixth year in 2004, equal to 5/6 for children in fifth-year, 4/6 for those in fourth year, and so on. This new variable (Performance 1) enables us to recover some of the information lost with our previous censored variable. This model could be estimated using ordinary least squares, with the significance level for pre-school education improved to about 14 percent. In order to get more accurate estimations we evaluated another variable, again on the basis of 2004 grades but multiplying them by the square of the factors mentioned above (Performance 2). In this case, reaching a higher year is valued higher than in the previous case. The results of the ordinary least squares estimation of this model are presented in Table 14.

Table 14. School Performance over 6 years. Quadratic measure (Performance 2).

Variables	**Coeff.**	**t**	**P>|t|**
Pre-School	0.52723	1.70	0.0900
Parents' education	0.14645	4.42	0.0000
Absences	-0.09378	-10.34	0.0000
Living with parents	0.62913	3.17	0.0020
More than 20 books	0.80734	3.68	0.0000
Gender	-0.71495	-3.92	0.0000
Persons per room	-0.23005	-3.46	0.0010
Constant	7.01776	12.54	0.0000
n	748		
R^2-adjusted	0.3738		
F(7, 740)	64.32		

In this case, the coefficient of pre-school education is estimated at the much better significance level of 9 percent, which reflects the fact that the new variable conveys more information and has a higher degree of variability. Once again all the parameters are estimated at a satisfactory level of statistical significance, but they are smaller than those estimated for the tobit, and closer to our estimations for the first year.

As mentioned above, the use of grades as a measure of academic performance has been criticized. Therefore we again defined a binary performance measure, which equals one if the children were in sixth grade in 2004 and zero otherwise. We repeated the above analysis using a probit estimation for children who passed and failed. However, we were not able to estimate the parameter for the pre-school education variable at a reasonable level of statistical significance. This is most probably due to the loss of information caused by introducing the binary dependent variable.

Therefore we estimate an alternative model in which we again replace the attended pre-school variable with "Pre-school Before 3", which is a dummy variable equal to one if the pupil started pre-school before the age of three and zero otherwise, in the hope that this new variable would be able to capture the effect of an earlier start to pre-school education. It can be seen in Table 15 that most of the parameters are estimated within reasonable levels of statistical significance, except for Parent's Education. The coefficient of the binary variable reflecting whether the pupils started pre-school before the age of three is estimated with a level of statistical significance better than 2 percent, and it suggests that these children are 13 percent more likely to reach sixth year on schedule.

Table 15. Probit: Attended 6th year in 2004

Variables	**Coeff.**	**t**	**P>|t|**	***dF/dx***
Pre-School before 3	0.3600782	2.25	0.020	0.1336081
Parent's Education	0.0270166	1.41	0.158	0.0104443
Average Absences 1999-2004	-0.0532659	-8.23	0.000	-0.0205921
Living with Parents	0.2204301	1.91	0.056	0.0859309
More than 20 Books	0.4696324	4.00	0.000	0.1789295
Gender	-0.213032	-2.05	0.041	-0.0822627
Persons per room	-0.1223309	-3.14	0.002	-0.0472919
Constant	1.030121	4.14	0.000	–
n	748			
Wald χ^2	238.23	Prob:	0.000	
Log likelihood	-386.92552			
Right Predictions	98.65%			

This result confirms that starting pre-school at an early age contributes to raising the probability that the pupil will achieve better results, not only in first year but throughout the whole school cycle. Indeed, 81 percent of the children who began pre-schooling before the age of three were in sixth year in 2004, 54 percent of those who started pre-school between three and five years old reached this level on schedule, while only 26 percent of those who did not go to pre-school did so. We include a table

in the Statistical Appendix (Table A.3) that shows the relationship between the age at which children started pre-school and performance. That is to say, the earlier the child begins pre-school the stronger the positive effect on the probability of achieving good results in the school cycle. It was mentioned above that pre-school education in Uruguay has now been extended to all children aged four and five, but this result indicates that extending it still further to include younger age bands would increase the probability of children getting good grades in their school cycle. This coincides with what the Uruguayan education (ANEP) authorities have pointed out

In addition, these results suggest that the family plays an important role. In particular, the cultural level of the household, denoted by whether there are more than 20 books in the home, has the highest positive marginal effect on the probability of a pupil reaching sixth year in 2004, and this is supplemented by a smaller positive marginal effect if the pupil lives with his/her biological parents. Both these findings are significant at least at 5 percent. Both these variables probably capture the household's ability to supplement the education the child receives at school, in both level of competence and in time, and perhaps that the educational level of the household also has an influence on how the parents values the role of schooling in their own life in general and in the education of their children in particular.

The People per Room variable captures two important aspects of the household. First, it gives an indication of household income because we can easily assume an inverse relationship between the average income of a household and our crowding variable. Besides this, the variable almost certainly captures the presence of other children in the home, so the pupil has to compete for attention and this may have a negative impact on the amount of time available in the household to supplement the education the child receives at school. The negative sign of this variable, and its significance, clearly suggest that these effects are significant for children's school performance.

5. Conclusions

Pre-school was not universal or compulsory in Uruguay until 1999, but according to information from the Household Survey of the National Institute of Statistics, in 1995 the proportion of children between 4 and 6 years old in pre-school education was just over 70 percent. The educational reform program initiated in 1995 defined the universalization of pre-school for five- and four-year-olds as one of the most important goals, although in practice this only became universal for five-year-olds in 1999. This measure was mainly aimed at enhancing children's readiness to start school as many children, especially in disadvantaged socioeconomic groups, seemed to be insufficiently prepared. It is true that the pre-school rate was already relatively high in 1995, but this was mainly due to the large numbers of children attending private pre-school institutions. In particular, the option of attending a public pre-school was limited to children aged 5, but the coverage rate for this age group was relatively low. As a result of the reform, the pre-school rate in Montevideo of children between 4 and 6 years old increased dramatically in the 1995-1998 period (to 84 percent). Moreover, the highest growth rate was in the three lowest income deciles, where the rise was from 58% to 73%, while in the other deciles the rate held steady at around 90%. In homes where the household head and spouse had an average of more than 9 years of education, the rate of children in pre-schooling in 1995 was already above 80%, while in homes with lower educational levels it was 58% in that year, and rose to 73% by

1998. The rate of attendance at pre-school of the children in the 1999 cohort under study was about 89 percent. However, the pre-schooling rate among pupils in schools in the two higher socioeconomic contexts was 97 and 96 percent, respectively, and in the schools of the lower context it was only 81 percent.

These policy measures were aimed at enhancing school performance, especially among children from disadvantaged groups. Nevertheless, when we analyze the outcomes of the 1999 cohort of schoolchildren who attended first year at public schools we find that a quarter had to repeat the first year. In particular, we found that half of those who did not attend pre-school repeated the first year as against 31 percent of those who started pre-school at five, 26 percent of those who began at 4 years old and only 16 percent of those who started pre-school before the age of 4. Moreover, an analysis of the progress of these schoolchildren also shows that there were substantial differences in school performance, especially when we consider that only just over half of these children completed the primary school cycle on schedule (six years), because of the high repetition rate. This situation gives even more cause for concern when we consider that the proportion of children at schools in the unfavorable socioeconomic context who completed the cycle on schedule was only 42%. Thus the repetition rate is very worrying indeed. Between 1999 and 2004 in the cohort as a whole 25% repeated more than once, and among children at unfavorable context schools some 33% did so. However, when we disaggregate by pre-schooling we find that 59 percent of children who attended pre-school reached sixth year on schedule (2004) in contrast to only 26 percent of children who did not go to pre-school. Furthermore, among children who started pre-school before 3 years old, some 91 percent passed first year in 1999 and 80 percent of them reached sixth year on schedule.

We can conclude from the bivariate analysis that there is strong empirical evidence to support the hypothesis that pre-school education is important for the academic performance of children in Montevideo's public primary schools. Furthermore, an econometric analysis, based on a production function approach, confirms that this conclusion holds for short-term performance, results in the first year at school, as well as for long-term performance, results after six years at school. It should be noted that the long-term effects of pre-school education on academic performance seem to be somewhat weaker. This could be due to the accumulated effect of other variables acting in the meantime that compensate for the lack of pre-school education. This also suggests that there could be a space for remedial measures to help children who did not receive pre-school education.

The inclusion of other variables that reflect conditions in the home and at school suggest that the family's education and cultural level are crucially important for the good performance of the child. Furthermore, most of the parameters for these variables are estimated with a satisfactory level of statistical significance and with the expected signs, for both the short and the long term, in accordance with the main trends of the effects suggested in the literature.

It should also be noted that the performance of boys and girls differ significantly. Moreover, factors associated with conditions in the home are more important for the academic performance for boys than for girls, while the opposite is true for factors associated with conditions at the school.

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A. Statistical Appendix

Table A.1. Performance in 1st year for low context schools

Variables	Coeff.	t	P>|t|
Pre-School	0.84899	4.07	0.0000
Parents' education	0.15473	3.07	0.0020
Absences	-0.04302	-9.81	0.0000
Living with parents	0.25257	1.19	0.2360
More than 20 books	0.14802	0.52	0.6010
Gender	-0.20857	-0.99	0.3210
Persons per room	-0.12344	-2.24	0.0260
Substitute teacher	-0.35394	-1.56	0.1190
Constant	6.53662	14.06	0.0000
N	336		
R2-adjusted	0.26915		
F(8,936)	21.47		

Table A.2. Probit estimation: Passed/Failed first year in 1999 by pre-school attendance

	With Preschool				*Without Preschool*			
Variables	**Coeff.**	**t**	**P>|t|**	***dF/dx***	**Coeff.**	**t**	**P>|t|**	***dF/dx***
Parent's Education	0.04899	2.46	0.014	0.01298	0.03924	0.55	0.580	0.01564
Absences	-0.02877	-7.98	0.000	-0.00762	-0.02809	-3.63	0.000	-0.01120
Living with Parents	0.24046	2.14	0.033	0.06615	0.04543	0.16	0.870	0.01811
More than 20 Books	0.08669	0.71	0.478	0.02285	0.46913	1.08	0.278	0.18130
Gender	-0.12719	-1.17	0.241	-0.03373	0.03163	0.11	0.909	0.01261
Persons per room	-0.07212	-2.03	0.042	-0.01911	-0.02391	-0.31	0.760	-0.00953
Substitute Teacher	-0.34428	-2.83	0.005	-0.09847	-0.29063	-1.02	0.307	-0.11553
Constant	1.25705	5.30	0.000	–	0.84554	1.54	0.123	–
n	844				101			
Wald χ^2	123.42	Prob:	0		-59.62	Prob:	0.009	
Log likelihood	-358.48036				-59.619195			
Right Prediction	96.23%				96.72%			

Table A.3. **Reaching sixth year in 2004 by pre-school starting age**

Reached Sixth Year in 2004	***Started Pre-school before 3 year old***	***Started Pre-school between 3 and 5 years old***	***Did not go to pre-school***	***Total***
Not reach 6th	19.4	45.6	74.0	44.4
Reached 6th	80.6	54.4	26.0	55.6
Total	100	100	100	100

Table A.4. Basic Statistics for first year pupils in 1999.

Variable	Obs	Mean	Std. Dev.	Min	Max
First Year Grades in 1999	945	7.268783	2.529849	2	12
Passed First year in 1999	945	0.766138	0.423510	0	1
Attended Pre-school	945	0.893122	0.309122	0	1
Parent's Education	945	7.867196	3.425831	0	18
Absences 1999	945	23.397880	17.447210	0	132
Living with Parents	945	0.666667	0.471654	0	1
More than 20 Books	945	0.421164	0.494007	0	1
Gender (Male=1)	945	0.500529	0.500265	0	1
Persons per room	945	2.932769	1.547891	1	10
Substitute Teacher	945	0.239153	0.426793	0	1
Middle Context	945	0.243386	0.429354	0	1
Lower Context	945	0.462434	0.498851	0	1
Year 1999: Did not go to pre-school					
First Year Grades in 1999	101	5.594059	1.877116	3	12
Passed First year in 1999	101	0.534654	0.501286	0	1
Parent's Education	101	5.579208	2.063653	0	14
Absences 1999	101	33.247520	22.772530	1	132
Living with Parents	101	0.554455	0.499505	0	1
More than 20 Books	101	0.128713	0.336552	0	1
Gender (Male=1)	101	0.603960	0.491512	0	1
Persons per room	101	3.938119	1.858937	1.5	9
Substitute Teacher	101	0.396040	0.491512	0	1
Middle Context	101	0.079208	0.271410	0	1
Lower Context	101	0.841584	0.366952	0	1
Year 1999: Attended Pre-school					
First Year Grades in 1999	844	7.469194	2.524424	2	12
Passed First year in 1999	844	0.7938389	0.4047874	0	1
Parent's Education	844	8.140995	3.45471	0	18
Absences 1999	844	22.21919	16.32007	0	126
Living with Parents	844	0.6800948	0.4667161	0	1
More than 20 Books	844	0.4561611	0.4983698	0	1
Gender (Male=1)	844	0.4881517	0.500156	0	1
Persons per room	844	2.812461	1.462025	1	10
Substitute Teacher	844	0.2203791	0.4147481	0	1
Middle Context	844	0.2630332	0.4405413	0	1
Lower Context	844	0.4170616	0.4933656	0	1

Table B.5. Basic Statistics for first year pupils in 2004.

Variable	Obs	Mean	Std. Dev.	Min	Max
Reached sixth year in 2004	748	0.590909	0.491995	0	1
Tobit Variable (grades sixth year)	748	5.228610	4.640476	0	12
Performance 1	748	7.217246	2.658273	2	12
Performance 2	748	6.778855	3.069313	0.67	12
Went to Pre-school	748	0.907754	0.289567	0	1
Start Pre-School before 3 years	748	0.173797	0.379188	0	1
Parent's Education	748	8.086230	3.497214	0	18
Average Absences 1999-2004	748	18.326870	11.885490	0.5	111.3
Living with Parents	748	0.704546	0.456552	0	1
More than 20 Books	748	0.450535	0.497880	0	1
Gender (Male=1)	748	0.487968	0.500190	0	1
Persons per room	748	2.837322	1.462700	1	10
Year 2004: Did not go to Pre-school					
Reached sixth year in 2004	69	0.289855	0.457019	0	1
Tobit Variable (grades sixth year)	69	2.115942	3.449366	0	11
Performance 1	69	5.251208	2.002577	2	11
Performance 2	69	4.437198	2.374972	0.67	11
Start Pre-School before 3 years	69	0.000000	0.000000	0	0
Parent's Education	69	5.775362	1.954513	0	14
Average Absences 1999-2004	69	28.814010	14.978620	9.2	90.3
Living with Parents	69	0.637681	0.484192	0	1
More than 20 Books	69	0.144928	0.354607	0	1
Gender (Male=1)	69	0.565217	0.499360	0	1
Persons per room	69	3.864734	1.719809	1.5	9
Year 2004: Went to Pre-school					
Reached sixth year in 2004	679	0.621502	0.485370	0	1
Tobit Variable (grades sixth year)	679	5.544919	4.630981	0	12
Performance 1	679	7.417035	2.636286	2	12
Performance 2	679	7.016814	3.032979	1	12
Start Pre-School before 3 years	679	0.191458	0.393739	0	1
Parent's Education	679	8.321060	3.534597	0	18
Average Absences 1999-2004	679	17.261170	10.991330	0.5	111.3
Living with Parents	679	0.711340	0.453474	0	1
More than 20 Books	679	0.481591	0.500030	0	1
Gender (Male=1)	679	0.480118	0.499973	0	1
Persons per room	679	2.732916	1.393642	1	10