Is grade repetition a second chance ?

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Abstract

This paper estimates the treatment effect of grade repetition on subsequent schooling performances in France. Being held back an additional year in the same grade is expected to help repeaters to acquire the necessary skills teachers believe these students lack.

In this paper, I correct for potential selection issues associated with grade retention, using a multi-stage econometric model, which also takes into account the hierarchical structure of school systems. I find that early grade repetition (first or second grade) leads to a modest increase in test scores in the very short-run (in third grade)

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but this positive effect is only transitory as it disappears 3 or 4 years after the retention in grade (in sixth grade).

1 Introduction

Grade repetition is the practice of requiring a student to remain in the same grade level for an extra school year rather than being promoted to a higher grade along with his age peers. Students are held back most frequently when they have not adequately mastered knowledge and skills expected at that grade. Retention is a remedial policy designed to improve the performance of these low-achieving students.

France is one of the European countries where grade retention is the most frequent and where the proportion of "late" students with respect to an "age norm" is very high: almost 20% of the pupils have repeated at least one year and were then qualified as "late" at the end of primary school in 2000 (Paul and Troncin 2004).

The specific purpose of the present paper is to evaluate the causal effect of grade retention on subsequent schooling achievement: I want to determine whether repeaters would have benefited more from having been promoted to the next grade, i.e. I want to know the difference between the observed value of the outcome variable for repeaters and the value of the outcome if repeaters had not been retained [1].

[1]Indeed, in this paper, I compare grade repetition to social promotion but I do not consider other alternatives measures such as summer schools or special tutoring that may

Concerning the impact of grade retention on the individual, research indicates mixed evidence: there is a large body of research indicating that grade repetition is strongly correlated with later poor performance (Holmes 1989, Jimerson et. al. 1997, Caille 2004a, Cosnefroy and Rocher 2004). Nevertheless, some studies have also found small and positive effect of grade repetition (Fertig 2004, Jacob and Lefgren 2004). Then, the efficacy of grade repetition is still an open question.

However there is a very important methodological issue which concerns the handling of selection bias: indeed repeaters are not likely to be a randomly selected group of children and it is possible that repeaters and passers would have different outcomes, even in the absence of retention. This is what is called selection bias and it might arise because of observable factors, like gender, or unobservable characteristics like motivation.

The choice of the methodology then depends on the justification of the selection on observables assumption: if the unconfoundedness assumption can be justified, i.e. if the selection into retention is believed to be based solely on observables, methods like matching, regressions or regression discontinuity models may be used.

In particular, one clear way to deal with the sample selection issue of retention is to use the existence of deterministic rules for grade repetition (selection on observables) : two papers, Jacob and Lefgren (2004) and Manacorda (2007), use a regression discontinuity design to estimate the causal impact of grade

be more effective to deal with poor performance.

retention, respectively in Chicago and in Uruguay. In these two places, retention is tied to exogenous rules: in Chicago, for grade 3 and 6, student below standardized tests cut-off are held back; in Uruguay, in Junior High School, a pupil missing more than 25 days in a school year will automatically be forced to repeat that grade.

However, such deterministic rules do not always exist for retention. For instance, in France, grade repetition decision is taken by schooling staff members on the basis of teachers' judgement and after agreement of the parents. When no deterministic rules are available, there is a choice the researcher has to made about how to handle selection bias. If one believes his dataset is rich enough so that he observes every variables that affect both retention and outcomes, then matching or regression methods should be used.

However, if the data do not permit to justify this selection on observables assumption, selection on unobservables too has to be handled with specific methods like instrumental variables and selection models. The idea is to find some variable or variables (the excluded instrumental variables, or excluded instruments) that meet two criteria: first, instruments have to affect the regressor of interest -grade repetition propensity-, and second, instruments must not have any direct impact on observed outcome -schooling outcomes. The instrumental variables affect the outcome only indirectly through the retention decision. Fertig (2004) implements an Instrumental Variables approach using a two-step estimation procedure in which the probability of retention in grade 5 is instrumented by a "Physical Maturity"indicator vari-

able. His results show a significant positive effect of grade repetition on educational attainment which translates into the effectiveness of 5^{th} grade repetition in Germany.

In order to study the impact of retention on schooling outcomes, I use data from a French Education Ministry database, called 1997 Panel, which is a large-scaled survey conducted among primary schools by the statistics department within the French Ministry of Education. The treatment I focus on is retention in very early primary school (grades 1 and 2) and the outcome I consider are 3^{rd} and 6^{th} grade national test scores.

The dataset is very rich in information concerning not only the children and their families, but also the schools: in particular, I am able to observe a measure of schooling achievement at the very beginning of grade 1, which may be be a very powerful determinant of both retention in grade 1 or 2 and subsequent schooling achievement. However, I can't rule out a priori the possibility that there may exist unobservable variables, such as motivation or teacher's attitude toward retention, that could affect both retention decision and the outcome variables considered here. I then need to take into account the resulting endogeneity of retention with an appropriate method. Moreover, I do not want to rely on the assumption that all controls are exogenous. More specifically, I would like to worry about potential endogeneity of initial achievement in grade 1: just like retention, previous achievement might be expected to be correlated with unobservables which also affect subsequent schooling test score in grades 3 and 6, such as parental involvment for in-

stance. I then construct a simultaneous equation model where both the two endogeneity issues are tackled through exclusion restriction as in an IV approach, and where the hierarchical structure of schooling and the relationship between the two endogenous explanatory variables are taken into account. Indeed, there is a clear link between repetition and initial achievement as retention is highly merit based (Gomes-Neto and Hanushek 1994). Hence, I build a three equation model where my three outcomes variables are 1^{st} grade test score, $1^{st}/2^{nd}$ grade repetition and 3^{rd} or 6^{th} grade test scores. In this model, I pay attention to the impact of initial achievement on retention and to the impact of both grade 1 performance and repetition on either grade 3 or grade 6 scores.

The estimation of this three-equation model exhibits a significantly positive but only transitory effect of grade failure on later schooling achievement. The positive short-run effect of grade retention in terms of achievement quickly disappears.

The remainder of this paper is organized as follows. Section 2 briefly describes my data and key variables. Section 3 explains my empirical framework and the identification strategy I used. The following section analyses both the determinants of grade retention and the causal effect of grade repetition. Section 4 also implements endogeneity tests and section 5 provides some robustness checks. Finally section 6 concludes.

2 Data and descriptive statistics

I use data from the French Education Ministry 1997 Panel. This survey is a nationwide representative panel of approximately 9 600 pupils enrolled in 1st grade in 1997 for the first time in a public or private school in metropolitan France in 1400 primary schools.

The large dataset covers the educational process from the beginning of primary school to its end by referring to the school years 1997 to 2004 and contains information on the grade attended, on test scores obtained in 1st, 3rd and 6th grades and on the grade repeated during primary school. Moreover, the data provide numerous variables to control for observed heterogeneity, thanks to a large set of information concerning not only the child but also the parents and schools i.e. background and contextual information about the student, his or her family, classroom and school.

The information contained in the data is coming from several sources. First, school directors fill forms every year about the sampled children with information on the child's family, the grade attended and information about scholar inputs (city size, academy, department, class size...). Second, a questionnaire has been send to sampled students' parents in 1999 and provides detailed information about the family background such as parental occupation and education, family structure, sibling size, birth order, gender and parental ethnicity. Last, I observe the results of standardized tests taken during the first weeks of enrollment in both 1st, 3rd and 6th grade[2]. Pupils

[2]I have access to test scores in the beginning of 1st, 3rd and 6th grade which in fact can

who did not repeat 1st or 2nd grade took grade 3 and grade 6 tests in 1999 and 2002 while those who repeated 1st or 2nd grade took grade 3 and grade 6 tests in 2000 and 2003. 3rd and 6th grade tests are not exactly the same across years so that I can not compare global test scores and need to restrict to common items. I have further rescaled test scores in order that they both lie between 0 and 100.

The raw number of sampled student was 9641. Of them, 8970 were in 3rd grade either in 1999 or in 2000. I further restricted to the 7110 children for whom a score is reported in grade 3 test. Moreover not every of these 7110 pupils has a non missing result for the test score in 6th grade so that when studying the causal impact of 1st/2nd grade on 6th achievement, my sample is restricted further to 6700 observations.

Table 1 describes the main features of the sample in terms of covariates and outcomes variables and Table 2 examines the correlation between the several test scores which are used in the model. As can be seen with these descriptive statistics, 6% of the children in my sample have repeated in 1st/2nd grade: a descriptive analysis of the differences in achievement be-

be considered as the beginning or the end of schooling stages: in France, primary school is composed of five years divided into two educational stages known as "cycles". The first of these cycles is called "cycle des apprentissages fondamentaux" (fundamental learnings stage) is composed of the last year of kindergarten (called "Grande Section")-which is not compulsory- and of the two first years of primary school (1st grade and 2nd grade). The next "cycle" is the "cycle des approfondissements" (improvement stage) and corresponds to the last three years of primary school (3rd, 4th and 5th grades). Moreover, the length of primary school can be reduced or prolonged of one year only: no more than one repetition in allowed during primary school, so that a child who already repeated in grade 1 or 2 is not allowed to repeat in grades 3, 4 or 5.

tween repeaters and promoted shows that grade failers have lower test scores in 1^{st} grade before they repeat and still have lower achievement scores in 3^{rd} grade and 6^{th} grade after repetition. But as stressed in the introduction, the negative correlation between repetition and subsequent achievement is not enough to conclude to a negative impact of grade repetition; it is possible that repeaters perform worse than promoted students for other reasons than just repetition per se.

3 Model, Methodology and Identification

3.1 Model

The objective of this study is to determine how a student who has repeated a grade in early primary school would have fared in subsequent education levels, had he been promoted instead. Hence, I want to estimate the treatment effect of grade repetition in primary school. More precisely, I want to estimate the causal impact of $1^{st}/2^{nd}$ grade repetition on either grade 3 or 6 test score.

Here, treatment is grade repetition in grade 1 or 2 which I denote by R and the outcome variable is either 3^{rd} or 6^{th} grade test score which I denote by A_2. The explanatory variables I used are composed of initial achievement in 1^{st} grade, A_1, and of X, a vector of exogenous variables containing family, individual, peers and schools characteristics. Then, the equation of interest relating outcome and treatment is :

$$A_{2i} = \alpha A_{1i} + \rho R_i + X_i'\beta + \epsilon_i$$

where the parameter ρ is the parameter of interest or treatment parameter, corresponding to the effect of grade repetition on the outcome variable.

By introducing A_1 as an explanatory variable, my equation has a Value-Added interpretation (Hanushek 1971, 1979) and X then corresponds to the schooling inputs observed over a limited period, between 1$^{\text{st}}$ grade and the grade associated to A_2.[3]

I could estimate directly this model by OLS. However, as already remarked in the introduction, the traditional endogeneity issue of grade repetition may occur. The main problem with the OLS approach is that if students are selected into repetition on the basis of factors that are unobservable to the researcher and also influence educational outcomes, such as maturity or parental involvement, then ρ is likely to be biased because of the potential correlation between R and ϵ. OLS estimation then leads to inconsistent estimates of the model's parameters. It is necessary to use an Instrumental Variable estimation technique to take into account the endogeneity of reten-

[3]An alternative approach is simply to analyze $\Delta A = A_{2i} - A_{1i}$, which effectively constrains α to one. I do not impose that constraint here for several reasons, even if it has the benefit to eliminate individual effects. First, in actual application it is common to employ test measures of achievement, and these test measures are not necessarily based on the same scale of measurement. Second, the impact of past inputs may decline over time, implying, say, that the impact of the first grade teacher may be more important in determining first grade achievement than third grade achievement. Furthermore, the estimate of α is around 0.7 when the outcome is 3$^{\text{rd}}$ grade test score and around 0.55 when the outcome is 6$^{\text{th}}$ grade test score.

tion and obtain consistent estimates.

Moreover, to the classical retention endogeneity issue, I add another endogeneity issue which is less classical: initial achievement A_1 may also be an endogenous variable as it may be that unobserved family or individual variables affect both past and current achievement. It could result in correlation between the lagged achievement term A_1 and the error term ϵ and OLS estimates may be biased.

I then have two potentially endogenous variables, R and A_1. I could deal with these two endogeneity problems by finding two valid instruments and using classical 2SLS estimation procedure. But, with this approach I would completely miss the clear relationship between R and A_1: one of the most powerful determinants of grade retention is the individual achievement during the grade. Several studies have highlighted the fact that repetition is merit-based, in particular Gomes-Neto and Hanushek (1994) which show that children who are retained in a grade are those that perform the worst in that grade.

Then in order to take into account both the endogeneity of R and A_1 in the A_2 equation and the causal link between A_1 and R , I build a simultaneous

three equation model as:

$$\begin{aligned} A_{1i} &= x'_{0i}\beta_1 + \epsilon_{1i} \\ R_i &= \mathbf{I}\{R_i^* = \delta_1 A_{1i} + w_{0i}\gamma_1 + u_{1i} > 0\} \\ A_{2i} &= \alpha_2 A_{1i} + \rho R_i + x'_{1i}\beta_2 + \epsilon_{2i} \end{aligned}$$

where $\mathbf{I}\{\}$ is the indicator function which equals 1 if the expression inside the brackets is true and 0 otherwise.

The first equation, $A_{1i} = x'_{0i}\beta_1 + \epsilon_{1i}$, is a linear equation corresponding to the modelling of 1^{st} grade achievement. This score A_1 is measured at the very beginning of 1^{st} grade so that it can be considered as the achievement level of a student before 1^{st} grade schooling inputs really act on students' output.

The second equation, $R_i = \mathbf{I}\{R_i^* = \delta_1 A_{1i} + w_{0i}\gamma_1 + u_{1i} > 0\}$, is a binary probit model dealing with the repetition probability: I define R_i as the binary variable which equals 1 if pupil i repeats 1^{st} or 2^{nd} grade, and 0 otherwise.

The third equation, $A_{2i} = \alpha_2 A_{1i} + \rho R_i + x'_{1i}\beta_2 + \epsilon_{2i}$, has already been discussed: this is a linear equation which model either 3^{rd} or 6^{th} grade test scores. These two outcomes are very important as they are measured at the very beginning of the scholar year and correspond to the achievement level of a pupil at the end of the fundamental learnings stage (1^{st} and 2^{nd} grades) and at the end of the improvement stage (3^{rd}, 4^{th} and 5^{th} grades).

My three equation model is consistent with the sequential and hierarchical structure of the education process. Indeed, educational system is defined through an ordered sequence of human capital stages that need to be completed successfully in order to have access to the next stage: human capital at a certain stage is built on the formal human capital which acts as an input (Driskill and Horowitz 2002, Cameron and Heckman 2001).

In order to be consistent with the Value-Added interpretation , x_1 is a vector of both family, individual and school inputs that affect the student between the beginning of 1^{st} grade and the beginning of 3^{rd} grade: these inputs correspond to the inputs used by pupils in 1^{st} and 2^{nd} grade. In a similar fashion, x_0 and w_0 are vectors of exogenous explanatory variables corresponding to family, individual and schooling inputs that respectively affect achievement at the beginning of 1^{st} grade and the likelihood of grade repetition. As achievement in 1^{st} grade is measured at the very beginning of 1^{st} grade, the only schooling variables that could have affected it are those associated to previous schooling i.e. kindergarten characteristics. And the schooling inputs that potentially affect $1^{st}/2^{nd}$ grade repetition are those associated with 1^{st} grade characteristics only.

Moreover, residuals $(\epsilon_{1i}, u_{1i}, \epsilon_{2i})$ are assumed to follow a multivariate Gaussian law with non-zero correlation: For a child i, $\begin{pmatrix} \epsilon_{1i} \\ \epsilon_{2i} \\ u_{1i} \end{pmatrix} | \, x_{0i}, w_{0i}, x_{1i} \sim$

$N\left(\begin{pmatrix}0\\0\\0\end{pmatrix}, \sum\right)$ with the variance-covariance matrix $\sum$ as:

$$\sum = \begin{pmatrix} \sigma^2_{\epsilon_1} & \rho_{\epsilon_1\epsilon_2}\sigma_{\epsilon_1}\sigma_{\epsilon_2} & \rho_{\epsilon_1 u_1}\sigma_{\epsilon_1} \\ \rho_{\epsilon_1\epsilon_2}\sigma_{\epsilon_1}\sigma_{\epsilon_2} & \sigma^2_{\epsilon_2} & \rho_{\epsilon_2 u_1}\sigma_{\epsilon_2} \\ \rho_{\epsilon_1 u_1}\sigma_{\epsilon_1} & \rho_{\epsilon_2 u_1}\sigma_{\epsilon_2} & 1 \end{pmatrix}$$

It is further assumed that the random terms are independent across children.

I use a probit model to estimate my repetition probability equation and Linear Regression models to estimate the tests scores in 1^{st} and 3^{rd} or 6^{th} grade. I use the joint normality of the error terms to compute the likelihood of my simultaneous equation model and estimate it my maximum likelihood. By this joint estimation, I achieve two desirable properties. First, I obtain appropriate standard errors that reflect the simultaneous estimation of schooling achievements. And second, I permit correlation of the errors across equations and with estimates of these correlations I would be able to test for endogeneity.

However, parametric identification in such a model relies on the existence of identifying variables: here, I need variables that have an impact of 1^{st} grade test scores but neither on $1^{\text{st}}/2^{\text{nd}}$ grade repetition nor on subsequent test scores (in 3^{rd} or 6^{th} grade) in order to identify the impact of an additional point in 1^{st} grade test scores on both the probability of grade repetition and

subsequent test scores ; and I also need variables that affect only the probability of grade repetition and not the after-repetition test scores. This issue, which corresponds to the determination and justification of valid instruments for both prior schooling achievement and grade repetition, is the main task and will be discussed in the following section devoted to the identification strategy.

3.2 Identification

As already noticed, with my simultaneous three equation model previously defined, I need to impose some variables exclusion to avoid identification failure. In fact, what I need is to find two sets of variables, one of which affects only test scores in 1^{st} grade and the other that affects grade repetition decision but not the subsequent achievement outcome.

The first group of variables I consider contains the variables that arguably have direct impact only on 1^{st} grade test score but not on formal schooling stages. Their exclusion from formal schooling outcomes equations help identify the effect of initial achivement on subsequent schooling outcomes.

I assume that kindergarten schooling, i.e. the number of years of kindergarten attendance and the kindergarten status (private/public), can be assumed to have a direct impact only on 1^{st} grade test scores and not on the following schooling (grade repetition in $1^{st}/2^{nd}$ grade, test scores in 3^{rd} or 6^{th} grade) once 1^{st} grade test score are included as explanatory variables.

This is consistent with a Markovian assumption in the educational process which implies that only the last schooling stage affects the current stage. Hence, these kindergarten associated variables are used as instruments in order to identify the effect of the test scores in 1^{st} grade on repetition in $1^{st}/2^{nd}$ grade and on test scores in 3^{rd} or 6^{th} grade and are then excluded from former schooling outcomes. This exclusion restriction is the basis of identification in the maximum likelihood approach I am going to use to estimate my simultaneous equations model.

The second group of excluded variables is composed of the variables that may have impact on the propensity of grade repetition but not on formal schooling. Following the existing literature, I choose quarter of birth. Quarter of birth is assumed to have a direct impact on 1^{st} grade test scores and $1^{st}/2^{nd}$ grade repetition but not on subsequent test scores as I believe the impact of quarter of birth declines with time. This belief has been documented in the empirical literature: both Bedard and Dhuey (2004) and Sprietsma (2003) study the impact of relative maturity on schooling outcomes and in particular the potential channels by which it propagates. Their results show that relative age of a child in his class does have a significant long-term impact but most of the effect of relative age comes from programs such as grade repetition and selection of pupils into different grades, as well asintra-class ability grouping. Indeed, during the very first days of school, relative age is quite widespread and the oldest students are likely to be much more mature than the youngest students. As relative maturity is likely to be an important

determinant of achievement acquisition during the first grades, it may play a crucial role in the decision of grade repetition. To sum up, these two papers point out that grade repetition is one of the most powerful channels through which relative age may have long term effect on student achievement.

4 Estimation results

4.1 Who repeats in 1st/2nd grade? The Determinants of Grade Repetition

This section analyses the underlying factors affecting student grade repetition. The literature on grade retention presents a fairly consistent portrait of the retained students. In particular, the literature suggests that males, minority students, students from lower socio-economic homes are at higher risk of being retained in grade (Gomes-Neto and Hanushek 1994, Paul and Troncin 2004). I examine the relative contribution of these background, socioeconomic, and school factors on the probability of being retained in grade. Which factors significantly affect grade retention? To address this question, I use the multi-stage education model I discussed in the previous section, and in particular I focus on the estimates of the probit regression associated to the grade retention probability. Tables 3 and 4 report the estimation results for the determinants of grade repetition in 1st or 2nd grade. For expositional purposes, I translated the parameters estimates in the probit model into

estimates of marginal effects evaluated at the means.

The main result, which is not very surprising, is that the better test scores you get on 1^{st} grade, the lower is your probability of being held back in $1^{st}/2^{nd}$ grade: increasing 1^{st} grade test score by one standard deviation leads to a decrease of 3-4 percentage points in the probability of grade repetition. This finding suggests that promotion partly has a basis of merit and confirms the results in Gomes-Neto and Hanushek (1994) where test scores were found negatively related with following grade retention. Moreover, quarter of birth is also a significant variable which acts as a proxy for maturity: the later a child is born, the higher is his repetition probability. Concerning the impact of gender, I obtain that girls have a significantly lower probability of grade repetition than boys (around -1% in absolute terms), everything else being equal.

Another interesting result worth noting is that when 1^{st} grade test scores are directly included as an input of $1^{st}/2^{nd}$ grade repetition, family variables such as birth order, sibling size and parental education and occupation turn insignificant. However, family ethnic origins and family structure do matter: having an African origin father tends to lower the repetition probability by 0.6-0.9 percentage points and living in a dismantled family structure induces a 0.7-1 percentage points increase in the probability of being retained in $1^{st}/2^{nd}$ grade.

In terms of primary school quality, I find that there is insignificant evi-

dence of both the effect of school location and the effect of class size on the probability of retention. However, holding everything else equal (in particular 1^{st} grade test scores), private schools seem to have a higher probability of grade repetition than public schools (+0.6-0.7 percentage points).

4.2 The achievement consequences of repetition: results

In this section I discuss the effects of grade repetition on several subsequent schooling achievement measures by comparing the outcomes of grade repeaters with those of non repeaters in terms of subsequent achievement. For this purpose, I estimate the simultaneous equation model I have built in a previous section, which tackles the endogeneity issues associated to grade repetition and previous achievement. I begin by examining the impact of $1^{st}/2^{nd}$ grade retention on achievement in 3^{rd} grade which corresponds to the short-run effect of repetition and then I explore medium-run academic effects of repetition by looking at its impact on 6^{th} grade achievement.

4.2.1 Short-term achievement gains

When studying the impact of grade repetition on 3^{rd} grade test score, I find that over the whole population, 1^{st} or 2^{nd} grade repeaters score 6.5 points or 0.46 standard deviation higher in 3^{rd} grade test score than what they would have if they had not repeated (table 5). In the estimated model, I compare

students having the same achievement level in 1st grade, one was retained in grade, the other passed and I obtain that the one who repeated gets a higher score in 3rd grade: in terms of short-run achievement, repetition seems to be an effective measure.

Table 5 also examines the heterogeneity of effect of retention across a variety of subgroups by estimating the model on several sub-samples. Several results are noticeable. First, it appears that girls benefit more than boys from repetition as the associated achievement gain is larger for girls. Second, the achievement gain due to grade repetition does not depend on the social status of the parents: whatever are the diplomas and the job status of the parents, the student achieves the same positive short-run effect of grade retention. Third, it seems that there is achievement gain neither for the African origin students nor for the children coming from a dismantled family structure: students from these two categories just progress exactly in the same manner as if they had not repeated. Fourth, it appears that students who attend a private school and/or a Priority Zone district before repetition benefit more from this policy as they achieve a larger gain.

To sum up, examining the achievement effects in 3rd grade of repetition in 1st or 2nd grade, I show that retained students are performing at the same or higher level when they reach the 3rd grade than are promoted students. So, I can conclude to a short-term effectiveness of grade repetition in terms of achievement.

4.2.2 Medium-term achievement losses

I have just shown that grade repetition is a positive policy in terms of short-run achievement gain, but when looking to medium-run effects, retention turns out to really hurt the academic progression of the repeaters: over the whole sample, I obtain that grade repeaters score a statistically significant almost 8 points or about 0.48 standard deviation lower in 6^{th} grade test score than non-repeaters. Grade repetition then seems to have only transitory positive effects on achievement as these initial associated gains in achievement quickly translate into losses a few years later.

Again I analyse the variety of effects of retention across several subgroups (table 5). Several results were already present in the last sub-section: girls are less hurt by grade retention, children attending a private school and those located in a Priority Zone district experiment lower losses in achievement in 6^{th} grade. Concerning the social status of the parents, I now observe that children from high status family are less hurt by grade repetition: they get a lower loss due to retention than get the children from low status families. And finally, it appears that $1^{st}/2^{nd}$ grade repetition has no effect on 6^{th} grade test score of African origin children and of students coming from a dismantled family structure.

As I have just shown, by looking at the effect of 1^{st} or 2^{nd} grade repetition on both 3^{rd} and 6^{th} grade achievement, retention seems to induce a short-run gain but this catching-up effect is not long-lasting as in 6^{th} grade repeaters

are performing at the same or lower level than non-retained children: in the medium-run retention appears to be an ineffective measure in terms of achievement. Indeed, grade retention improves achievement temporarily, but over time, grade repeaters fall further behind other low achieving students who were promoted.

One potential reason for short-run achievement gain may be that the year after repetition, repeaters are working through the same curriculum a second time and literally repeat the same lessons and material they experienced the previous year. However even if repeating a grade enables the retained students to do better on the material they are studying for the second time, it may not be able to produce more general advances in knowledge that would enable them to make more satisfactory achievement progress in subsequent grades and would help them to understand more complex material: the improvements seen in the repetition year soon fade away. This point was already suggested by Alexander et al. (1994) who cast doubt on the long-term effectiveness of grade repetition.

4.2.3 Tests of endogeneity

The argument in favour of my multi-stage econometric model is that both repetition and past achievement may be potentially endogenous. Moreover when building my model, I take into account the hierarchical nature of education and the interactions that can occur between the different schooling outcomes. Indeed, my model has a particular form with three potentially

endogenous variables.

In order to validate the form of my model, I need to test the three endogeneity assumptions.

Looking at the estimated covariance between the error terms of both the potentially endogenous variable equation and of the outcome equation of interest, I can test whether the potentially endogenous variable is really endogenous or not. Indeed, if this estimated covariance is not null, then the endogeneity is proved. From tables 3 and 4, I can see that both the repetition variable and the 1^{st} grade test score are not endogenous in the later test scores (in 3^{rd} and in 6^{th} grade) and moreover, 1^{st} grade test score is also an exogenous explanatory variable of the repetition decision.

This result seems rather counterintuitive but may be driven by the fact that the controls I use may be enough to purge for unobserved heterogeneity. Indeed, the dataset is very rich in terms of covariates and I control for 1^{st} grade test score, parental job status, ethnicity and diploma, sibship status and school characteristics. However the next section is devoted to check whether or not the exogeneity is coming from the invalidity of the instrumental variables or a mispecification in the way the model is constructed.

5 Robustness checks

5.1 Other instruments

In the presence of weak instruments, IV estimates may be no improvement over OLS. It may be that the instruments I use are not valid: in particular it is possible that quarters of birth may not be good instruments to identify the causal effect of retention on later test scores. I then use alternative variables which are proxy measures of the rank of the student in the class. These variables comes from the work of Keslair (2007) who construct two proxies for the rank in the class: first, as I do not observe every child in the class, but only one third, I can only observe the rank of the student over the observed classmates in 1^{st} grade. With this information, I construct a dummy variable indicating whether the child is the last in terms of 1^{st} grade test score among his observed classmates. There is also a second variable Keslair constructed which counts whether the child's 1^{st} grade test score is well below the average score of the class: this dummy variable values one if the child's test score is below the average score of the class minus one half of a standard deviation.

The idea behind these instruments is that repetition decision is partly based on the rank in the class in the sense that teachers may hold back only the last children of the class. But there is no reason why the rank of a student may have any impact on his subsequent schooling achievement. In table 6, I have computed repetition rates depending on the two measures of the rank of the child in the class. I call "Last" the dummy variable which

equals one if the student is the last in terms of 1st grade test score among his sampled classmates and "Low" the dummy variable which equals one if the child's test score is below the average score of the class minus one half of a standard deviation. Descriptive statistics results are quite clear: a huge part of repeaters were badly ranked in their 1st grade class in terms of test scores.

When estimating my three equations model using the proxies for rank as instruments for repetition, I obtain tables 7 and 8[4]. Several results are noticeable. First, the two rank variables are highly significant in the repetition equation: being the last or in the very low part of the test score distribution really increases the probability of being retained, in addition to the effect of the score itself. In fact, being badly rank in the class leads to a 2 percentage points increase in the average probability of retention.

Second, the effect of grade repetition on 3rd and 6th grades are highly similar to those obtained using quarter of birth as instrument: 1st or 2nd grade repeaters score about 0.40 standard deviation higher in 3rd grade test score and 0.43 to 0.56 standard deviation lower in 6th grade test score than students who had not been held back.

Last, I still obtain that both repetition and 1st grade score are endogenous neither in the 3rd grade nor in the 6th grade test score equation. So that exogeneity results are not coming from a default in the instruments I first

[4]Quarters of birth are now used as controls and then appear in the three equations of my simultaneous model.

use, namely quarters of birth.

5.2 Estimation on subsamples: the last part of the distribution of 1st grade test score

From tables 9 and 10, I can see grade repetition is highly concentated on the lowest part of the distribution of 1st grade test score. Over all the population, repetition rate is around 6% but when I focus on the pupils whose test score lies below the median, repetition rate increases to 12% whereas for those whose score lies above the median this proportion is less than 1%. In addition, I can see that the vast majority (almost 94%) of repeaters are located under the median of 1st grade scores. Moreover, when looking at the repetition rate by quartile of 1st grade score, I observe retention is concentrated in the first quartile and to a lesser extent in the second quartile where retention rate is respectively more than 20% and almost 5% and where respectively 74% and 20% of the repeaters are located.

For these reasons, I run estimations of my three equation model on subsamples composed of pupils under and above the median of 1st grade test scores and I also run it by quartile of 1st grade score. Results can be found in table 11. I can show that retention has no effect on the achievement of rather high performing students: indeed, only the children from the grade 1 test last quartile experience the positive short-run effect and the medium-term negative effect of retention. It seems that these effects of repetition are

only valid for poor-achievers whereas for the other less poor-achievers repetition seems to have no impact at all. Furthermore, correlation estimates which are not reported in table 11 are all non significant, indicating that neither grade retention nor initial achievement are endogenous in the outcome variable equation.

6 Conclusion

In France, the school system is characterized by remarkably high repetition rates: retention rate in primary school was of order 20% in 2000 and a large fraction of retentions affects 1^{st} and 2^{nd} grade.

This paper uses the French Education Ministry 1997 Panel, a nationally representative panel data base, to analyze the academic causal effects of retention for students in early primary school both in the short and in the medium term. To achieve this goal, I build a model which extends traditional Value-added model by incorporating the treatment of grade repetition. I pay particular attention to endogeneity issues by considering that both grade repetition and previous achievement are endogenously determined.

With my simultaneous equations model at hand, I first study the determinants of grade repetition and find that grade repetition in 1^{st} or 2^{nd} grade is mainly driven by weak academic performance and low maturity, measured by quarters of birth. Next, when studying the direct impact of repetition on academic performance, I highlight that grade repetition is a short-run effec-

tive measure as, holding everything else equal (in particular 1st grade test scores), repeaters obtain significantly better test scores in 3rd grade. However, this short-run positive effect of grade failure does not appear to last long.

Even if, in the short term, repeaters tend to partially catch up, this initial achievement gain vanishes after a few years: in 6th grade, repeaters are performing at the same or lower level than otherwise identical individuals who were not retained in grade. Grade repetition appears to be associated to short-term gains and long-term problems because grade-repeaters eventually fall further behind promoted peers who had very similar achievement profiles in the year prior to grade repetition, so that retention seems to be counterproductive in students' medium-term achievement progress.

Then, if repetition does not help weak students, why is this policy still implemented? Two arguments can justify the use of this ineffective measure. On the one hand, repetition persists because teachers often believe that grade repetition is in the students' best interests and is preferable to promotion when students have achieved poorly. Teachers' beliefs in grade repetition are surely coming from their personal experience with it: they only see the temporary achievement gains that appear during the retention year, when grade repeaters are still in their classes. However, they do not see these temporary benefits fade away when repeaters move on and attend subsequent grades.

On the other hand, the second argument which helps understanding why

retention is still used in France and other countries corresponds to incentive effect of grade repetition. Indeed, repetition can be seen as a punishment and the threat of retention may create an incentive for students to increase their schooling effort and then their schooling performance. For this incentive mechanism to work, one need grade repetition to have really bad consequences for repeaters so that they have an incentive to exert more effort in school.

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Table 1: Summary statistics (Selected sample N=7110)

	Mean	Std Dev	Min	Max
1st grade test score	68.48	14.01	3.75	99.13
3rd grade test score	67.16	14.87	0	100
6th grade test score	67.95	16.16	3.05	98.52
1st/2nd grade retention	0.06			
Quarter of birth				
1st quarter	0.25	_	_	_
2nd quarter	0.26	_	_	_
3rd quarter	0.25	_	_	_
4th quarter	0.24	_	_	_
Gender				
Male	0.51	_	_	_
Female	0.49	_	_	_
Parental structure				
Couple	0.86	_	_	_
Other	0.14	_	_	_
Mother's diploma				
without qualification	0.29	_	_	_
high school dropouts or vocational degree	0.42	_	_	_
high school graduate	0.21	_	_	_
college	0.08	_	_	_
Father's diploma				
without qualification	0.33	_	_	_
high school dropouts or vocational degree	0.41	_	_	_
high school graduate	0.15	_	_	_
college	0.11	_	_	_
Mother's job				
has never worked	0.13	_	_	_
farmer or craftswoman	0.04	_	_	_
white or blue collar	0.55	_	_	_
middle manager or executive	0.28	_	_	_
Father's job				
farmer or craftsman	0.11	_	_	_
white collar	0.13	_	_	_
blue collar	0.37	_	_	_
middle manager	0.17	_	_	_
executive	0.18	_	_	_
missing occupation	0.04	_	_	_
Father's ethnicity				
french	0.87	_	_	_
african	0.05	_	_	_
other	0.08	_	_	_
Mother's ethnicity				
french	0.91	_	_	_
african	0.04	_	_	_
other	0.05	_	_	_

Table 1 (continued)

	Mean	Std Dev	Min	Max
Sibship size and birth order				
only child	0.15	_	_	_
1st of 2 children	0.22	_	_	_
2nd of 2 children	0.25	_	_	_
1st of at least 3 children	0.05	_	_	_
2nd of at least 3 children	0.10	_	_	_
3rd at least of at least 3 children	0.23	_	_	_
Kindergarten status				
Public	0.80	_	_	_
private	0.14	_	_	_
both	0.06	_	_	_
Kindergarten duration				
0 or 1 year	0.01	_	_	_
2 years	0.05	_	_	_
3 years	0.64	_	_	_
at least 4 years	0.30	_	_	_
1st grade school status				
public	0.86	_	_	_
private	0.14	_	_	_
1st grade city size				
<10 000	0.33	_	_	_
10 000 – 100 000	0.25	_	_	_
100 000 – 2 000 000	0.28	_	_	_
Paris and its suburb	0.14	_	_	_
1st grade size of the class	22.31	3.59	6	35
1st grade Priority Zone district	0.11	_	_	_

Table 2: Cross Tabulations

	Correlation Coefficient		
	1st grade score	**3rd grade score**	**6th grade score**
1st grade score	1.00000	0.66343***	0.63298***
3rd grade score		1.00000	0.75193***
6th grade score			1.00000

*significance at 10% ; **significance at 5% ; ***significance at 1%

Table 2 (continued)

	Empirical frequencies : Mean (Standard deviation)			
	1st grade score	**1st/2nd grade retention rate**	**3rd grade score**	**6th grade score**
All observations	68.48	6.04%	67.16	67.95
	(14.01)	(0.24)	(14.86)	(16.16)
1st/2nd grade repetition=0	69.66	_	67.80	70.11
	(13.20)	_	(14.60)	(14.55)
1st/2nd grade repetition=1	49.25	_	57.28	47.34
	(12.77)	_	(15.41)	(16.20)
Gender= female	69.19	5.20%	68.41	68.36
	(13.80)	(0.22)	(14.28)	(15.73)
Gender= male	67.79	6.85%	65.94	67.54
	(14.19)	(0.25)	(15.32)	(16.56)
Born in First Quarter	71.64	3.37%	69.53	69.42
	(13.17)	(0.18)	(14.38)	(16.13)
Born in Second Quarter	69.91	5.39%	68.21	68.65
	(13.82)	(0.22)	(14.47)	(15.73)
Born in Third Quarter	67.12	7.48%	65.94	67.15
	(14.33)	(0.24)	(15.11)	(16.35)
Born in Fourth Quarter	65.45	7.95%	64.86	66.60
	(13.92)	(0.27)	(15.06)	(16.29)
parental structure				
2 parents	68.93	5.47%	67.75	68.70
	(13.94)	(0.22)	(14.70)	(15.92)
other	65.60	9.46%	63.55	63.10
	(14.13)	(0.29)	(15.35)	(16.82)
Mother's diploma				
without qualification	63.69	11.20 %	60.69	58.51
	(14.48)	(0.31)	(15.54)	(16.55)
high school dropouts or vocational degree	68.30	5.68%	67.04	67.67
	(13.46)	(0.23)	(13.88)	(15.01)
high school graduate	72.43	1.55%	72.52	74.77
	(12.72)	(0.12)	(12.77)	(12.75)
college	75.79	1.00%	77.17	80.05
	(12.06)	(0.09)	(11.01)	(11.44)
Mother's job				
has never worked	62.74	12.53%	59.30	58.88
	(14.94)	(0.33)	(15.57)	(17.67)
farmer or craftswoman	69.87	5.68%	67.75	69.16
	(13.64)	(0.23)	(14.93)	(14.20)
white or blue collar	67.16	6.87%	65.51	65.87
	(13.67)	(0.25)	(14.54)	(15.52)
middle manager or executive	73.37	1.44%	73.85	76.40
	(12.76)	(0.11)	(12.39)	(12.84)
Father's job				
farmer or craftsman	69.14	4.84 %	76.75	68.81
	(13.65)	(0.21)	(14.35)	(14.45)
white collar	67.38	6.38%	66.25	67.18
	(13.48)	(0.24)	(13.93)	(14.99)
blue collar	65.26	9.18%	62.88	62.27
	(14.08)	(0.28)	(14.71)	(16.27)
middle manager	70.98	2.86%	70.63	72.57
	(13.08)	(0.16)	(13.44)	(14.44)
executive	74.17	1.59%	74.79	77.92
	(12.91)	(0.12)	(12.64)	(12.21)
missing occupation	63.89	11.27%	60.67	61.49
	(13.83)	(0.31)	(16.38)	(16.24)

Table 2 (continued)

	Empirical frequencies : Mean (Standard deviation)			
	1st grade score	**1st/2nd grade retention rate**	**3rd grade score**	**6th grade score**
Father's ethnicity				
french	69.13	5.59%	68.20	68.93
	(13.90)	(0.22)	(14.43)	(15.92)
African	61.99	9.73%	56.45	57.91
	(14.12)	(0.29)	(15.40)	(16.70)
other	65.07	8.68%	62.01	63.12
	(13.80)	(0.28)	(15.69)	(15.58)
Sibship size and birth order				
only child	69.44	5.00%	68.21	68.89
	(13.62)	(0.21)	(13.91)	(15.17)
1st of 2 children	69.10	4.66%	68.43	69.84
	(14.30)	(0.21)	(14.45)	(15.18)
2nd of 2 children	69.45	4.62%	68.49	69.01
	(13.45)	(0.21)	(14.25)	(15.27)
1st of at least 3 children	68.23	4.86%	66.97	69.19
	(14.30)	(0.21)	(15.62)	(17.80)
2nd of at least 3 children	67.72	8.08%	66.40	66.69
	(14.19)	(0.27)	(15.26)	(16.81)
3rd at least of at least 3 children	66.63	8.86%	64.25	64.79
	(14.26)	(0.28)	(15.71)	(17.42)
Kindergarten duration				
0 or 1 year	63.28	13.15%	63.11	65.83
	(16.33)	(0.34)	(15.72)	(16.40)
2 years	66.89	10.24%	65.55	65.09
	(14.00)	(0.30)	(15.43)	(17.97)
3 years	68.02	6.18%	66.86	68.08
	(13.97)	(0.24)	(14.67)	(15.94)
at least 4 years	69.88	4.88%	68.20	68.17
	(13.92)	(0.20)	(15.10)	(16.25)
Kindergarten status				
public	68.43	5.88%	67.22	68.00
	(13.98)	(0.23)	(15.01)	(16.16)
private	70.59	5.20%	68.81	70.12
	(13.58)	(0.22)	(13.19)	(14.24)
both	70.37	4.68%	69.63	70.01
	(14.30)	(0.21)	(14.46)	(16.45)
1st grade school status				
public		5.98%	66.94	67.61
		(0.23)	(15.09)	(16.38)
private		6.34%	68.53	70.00
		(0.24)	(13.31)	(14.55)
1st grade Priority Zone district		9.45%	58.46	58.46
		(0.29)	(16.09)	(16.50)
1st grade non Priority Zone district		5.62%	68.21	69.04
		(0.23)	(14.36)	(15.76)
1st grade city size				
<10 000		5.49%	68.14	67.65
		(0.22)	(14.28)	(15.70)
10 000 – 100 000		7.54%	66.51	67.25
		(0.26)	(14.96)	(16.30)
100 000 – 2 000 000		6.08%	66.46	68.17
		(0.23)	(15.21)	(16.46)
Paris and its suburb		4.59%	67.35	69.59
		(0.20)	(15.24)	(16.33)

Table 3: Joint estimation - global test scores in 1st and 3rd and grade repetition

estimated coefficients				
	1st grade score	**1st/2nd grade repetition rate**		**3rd grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Intercept	66.12***	1.04		19.95***
	(0.788)	(1.235)		(3.230)
1st grade test score				
score		-0.06***	-0.0019	0.68***
		(0.018)		(0.048)
1st/2nd grade repetition				6.52***
				(1.046)
Quarter of birth				
1st quarter	Ref.	Ref.	Ref.	
2nd quarter	-1.92***	0.19**	0.0077	
	(0.431)	(0.102)		
3rd quarter	-4.19***	0.25***	0.0102	
	(0.439)	(0.121)		
4th quarter	-6.48***	0.26**	0.0105	
	(0.455)	(0.156)		
Kindergarten duration				
0-1 year	-5.51***			
	(1.617)			
2 years	-0.22			
	(0.746)			
3 years	Ref.			
4-5 years	0.87**			
	(0.348)			
Kindergarten status				
Only public	Ref.			
Only private	0.77			
	(0.503)			
Both public and private	0.13			
	(0.833)			
Gender				
Male	Ref.	Ref.	Ref.	Ref.
Female	1.59***	-0.09**	-0.0091	1.64***
	(0.304)	(0.045)		(0.260)
Parental structure				
Couple	Ref.	Ref.	Ref.	Ref.
Parents not in couple	-2.22***	0.19**	0.0076	-1.22***
	(0.489)	(0.095)		(0.424)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 3 (continued)

estimated coefficients				
	1st grade score	**1st/2nd grade repetition rate**		**3rd grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Mother's diploma				
Without qualification	Ref.	Ref.	Ref.	Ref.
High school dropouts or vocational degree	3.58***	-0.12	-0.0050	2.56***
	(0.468)	(0.10)		(0.429)
High school graduate	5.45***	-0.46***	-0.0183	3.84***
	(0.583)	(0.167)		(0.560)
college	6.95***	-0.23	-0.0094	5.18***
	(0.802)	(0.263)		(0.749)
Missing	1.91***	-0.06	-0.0025	1.71***
	(0.585)	(0.101)		(0.509)
Mother's job status				
Never worked	Ref.	Ref.	Ref.	Ref.
Farmer-craftswoman	3.49***	-0.08	-0.0034	1.54**
	(0.948)	(0.198)		(0.648)
Blue or white collar	2.35***	-0.11	-0.0047	1.48***
	(0.522)	(0.093)		(0.411)
Middle manager- executive	4.46***	-0.37**	-0.0148	2.99***
	(0.631)	(0.159)		(0.509)
Father's job status				
Farmer- craftsman	Ref.	Ref.	Ref.	Ref.
White collar	-0.69	0.06	0.0022	-0.05
	(0.601)	(0.121)		(0.546)
Blue collar	-1.68***	0.12	0.0059	-1.36***
	(0.523)	(0.101)		(0.456)
Middle manager	1.31**	-0.08	-0.0047	0.91*
	(0.582)	(0.134)		(0.485)
Executive	3.24***	-0.16	-0.0069	2.21***
	(0.611)	(0.168)		(0.525)
missing	-0.57	0.13	0.0076	-0.98
	(0.843)	(0.181)		(0.960)
Father's ethnicity				
French	Ref.	Ref.	Ref.	Ref.
African	-2.06***	-0.22**	-0.0065	-2.67***
	(0.792)	(0.106)		(0.672)
Other	-1.00*	-0.05	-0.0019	-0.77
	(0.529)	(0.116)		(0.553)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 3 (continued)

	estimated coefficients			
	1st grade score	**1st/2nd grade repetition rate**		**3rd grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Sibship size and birth order				
Only child	Ref.	Ref.	Ref.	Ref.
1st of 2	-1.42***	-0.08	-0.0013	-0.45
	(0.511)	(0.106)		(0.380)
2nd of 2	-1.13**	0.04	0.0032	-0.58
	(0.509)	(0.103)		(0.370)
1st of at least 3	-1.70**	-0.18	-0.0071	-0.32
	(0.788)	(0.175)		(0.597)
2nd of at least 3	-2.29***	0.28**	0.0114	-1.07**
	(0.619)	(0.122)		(0.501)
3rd at least of at least 3	-2.04***	0.20**	0.0083	-1.46***
	(0.516)	(0.104)		(0.401)
1st grade school status				
Public school		Ref.	Ref.	Ref.
Private school		0.18**	0.0072	-0.74**
		(0.087)		(0.370)
1st grade city size				
<10 000		Ref.	Ref.	Ref.
10 000-100 000		0.07	0.0027	-0.45
		(0.078)		(0.335)
100 000- 2 000 000		0.01	0.0010	-0.66*
		(0.080)		(0.344)
Paris and suburbs		-0.06	-0.0037	-0.69
		(0.110)		(0.440)
1st grade class size				
Class size		0.01	0.0003	0.01
		(0.008)		(0.037)
1st grade zone				
Non Priority Zone		Ref.	Ref.	Ref.
Priority Zone		-0.04	-0.0016	-3.05***
		(0.090)		(0.452)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 3 (continued)

Estimated Correlation Coefficient			
	1st grade score error term	**1st/2nd grade repetition error term**	**3rd grade score error term**
1st grade score error term	12.95***	-0.040	-0.025
	(0.108)	(0.249)	(0.058)
1st/2nd grade repetition error term			-0.023
			(0.046)
3rd grade score error term			10.689 ***
			(0.090)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 4: Joint estimation - global test scores in 1st and 6th and grade repetition

estimated coefficients				
	1st grade score	**1st/2nd grade repetition rate**		**6th grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Intercept	64.95***	1.56		25.08***
	(0.961)	(4.064)		(3.395)
1st grade test score				
score		-0.04**	-0.0031	0.55***
		(0.018)		(0.049)
1st/2nd grade repetition				-7.86***
				(0.983)
Quarter of birth				
1st quarter	Ref.	Ref.	Ref.	
2nd quarter	-2.21***	0.14**	0.0021	
	(0.456)	(0.066)		
3rd quarter	-4.53***	0.17**	0.0113	
	(0.458)	(0.077)		
4th quarter	-7.07***	0.21**	0.0143	
	(0.471)	(0.085)		
Kindergarten duration				
0-1 year	-5.67***			
	(1.778)			
2 years	-0.39			
	(0.597)			
3 years	Ref.			
4-5 years	0.80**			
	(0.366)			
Kindergarten status				
Only public	Ref.			
Only private	1.06**			
	(0.522)			
Both public and private	-0.40			
	(0.972)			
Gender				
Male	Ref.	Ref.	Ref.	Ref.
Female	1.71***	-0.18***	-0.0121	0.07 ***
	(0.320)	(0.065)		(0.286)
Parental structure				
Couple	Ref.	Ref.	Ref.	Ref.
Parents not in couple	-2.34***	0.21**	0.0136	-2.33***
	(0.532)	(0.087)		(0.468)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 4 (continued)

estimated coefficients				
	1st grade score	**1st/2nd grade repetition rate**		**6th grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Mother's diploma				
Without qualification	Ref.	Ref.	Ref.	Ref.
High school dropouts or vocational degree	4.10***	-0.22**	-0.0140	2.73***
	(0.489)	(0.102)		(0.466)
High school graduate	5.93***	-0.51***	-0.0338	4.34***
	(0.616)	(0.172)		(0.607)
college	6.68***	-0.40*	-0.0270	5.61***
	(0.855)	(0.143)		(0.802)
Missing	2.83***	-0.07	-0.0046	1.17**
	(0.617)	(0.093)		(0.541)
Mother's job status				
Never worked	Ref.	Ref.	Ref.	Ref.
Farmer-craftswoman	4.10***	-0.25	-0.0167	2.09**
	(0.998)	(0.296)		(0.871)
Blue or white collar	2.97***	-0.06	-0.0044	1.80***
	(0.540)	(0.194)		(0.484)
Middle manager- executive	5.31***	-0.24	-0.0163	4.11***
	(0.657)	(0.335)		(0.618)
Father's job status				
Farmer- craftsman	Ref.	Ref.	Ref.	Ref.
White collar	-0.61	-0.02	-0.0015	0.48
	(0.632)	(0.113)		(0.596)
Blue collar	-1.95***	0.11	0.0056	-1.63***
	(0.550)	(0.100)		(0.503)
Middle manager	1.51**	-0.23	-0.0157	1.85***
	(0.622)	(0.296)		(0.554)
Executive	3.42***	-0.27	-0.0184	4.07***
	(0.632)	(0.229)		(0.593)
missing	-1.25	0.14	0.0094	0.85
	(1.166)	(0.175)		(0.989)
Father's ethnicity				
French	Ref.	Ref.	Ref.	Ref.
African	-2.53***	-0.14**	-0.0092	-1.09
	(0.813)	(0.803)		(0.718)
Other	-1.23*	-0.01	-0.0020	-0.19
	(0.679)	(0.127)		(0.591)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 4 (continued)

estimated coefficients				
	1st grade score	**1st/2nd grade repetition rate**		**6th grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Sibship size and birth order				
Only child	Ref.	Ref.	Ref.	Ref.
1st of 2	-1.38**	0.07	0.0046	0.64
	(0.547)	(0.124)		(0.461)
2nd of 2	-1.51***	0.15	0.0104	-0.37
	(0.536)	(0.124)		(0.457)
1st of at least 3	-1.49*	0.11	0.0073	1.10
	(0.882)	(0.173)		(0.747)
2nd of at least 3	-2.40***	0.35**	0.0232	-0.75**
	(0.664)	(0.164)		(0.574)
3rd at least of at least 3	-2.31***	0.32***	0.0213	-0.65
	(0.559)	(0.153)		(0.480)
1st grade school status				
Public school		Ref.	Ref.	Ref.
Private school		0.21**	0.0063	-0.82**
		(0.101)		(0.401)
1st grade city size				
<10 000		Ref.	Ref.	Ref.
10 000-100 000		-0.04	-0.0028	0.63*
		(0.070)		(0.372)
100 000- 2 000 000		0.01	0.0009	0.96**
		(0.070)		(0.378)
Paris and suburbs		-0.08	-0.0054	-0.84*
		(0.098)		(0.490)
1st grade class size				
Class size		0.01	0.0002	0.15***
		(0.007)		(0.040)
1st grade zone				
Non Priority Zone		Ref.	Ref.	Ref.
Priority Zone		0.02	0.0019	-2.94***
		(0.078)		(0.493)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 4 (continued)

Estimated Correlation Coefficient			
	1st grade score error term	**1st/2nd grade repetition error term**	**6th grade score error term**
1st grade score error term	13.189***	-0.079	0.014
	(0.113)	(0.258)	(0.062)
1st/2nd grade repetition error term			-0.009
			(0.043)
6th grade score error term			11.256***
			(0.108)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 5: the impact of grade repetition on 3rd and 6th grade achievement by subsamples

	Impact of 1st/2nd grade repetition on 3rd grade test score	**Impact of 1st/2nd grade repetition on 6th grade test score**
All	+6.52***(1.046)	-7.86***(0.983)
Gender		
Male	+5.64***(1.709)	-7.79***(1.311)
Female	+6.58***(1.607)	-5.54***(1.440)
Parental structure		
couple	+6.09***(1.137)	-8.10***(1.056)
Parents not in couple	+7.47 (6.162)	-3.50 (2.551)
Mother's diploma		
No or low diploma	+6.46***(1.410)	-7.56***(1.348)
High diploma	+7.31**(3.046)	-4.48***(1.577)
Father's diploma		
Low status	+7.47***(1.377)	-7.88***(1.294)
High status	+7.10***(2.098)	-5.97***(2.068)
Mother's job		
Low status	+7.19***(1.338)	-6.83***(1.237)
High status	+7.17***(2.294)	-5.12***(1.498)
Father's ethnicity		
French	+6.78***(1.142)	-8.34***(1.054)
African	+3.74 (7.023)	-6.93 (6.379)
1st grade school status		
Public school	+5.21***(0.982)	-8.29***(1.047)
Private school	+8.11***(2.540)	-4.17**(2.012)
1st grade zone		
Non Priority Zone	+5.97***(0.638)	-8.07***(1.055)
Priority Zone	+10.16***(3.272)	-5.11 (4.264)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Low diploma= High school dropouts or vocational degree

High diploma= High school graduates or College

Low status job= Farmer, Craftsman, Blue or White collar

High status job= Middle manager or Executive

Table 6: Descriptive statistics on the rank

Empirical frequencies : Average Standard deviation				
Rank	**1st grade score**	**1st/2nd grade retention rate**	**3rd grade score**	**6th grade score**
Last	51.44	22.58%	56.17	56.77
	(11.79)	(0.42)	(14.56)	(15.78)
Non Last	70.95	3.31%	68.98	70.94
	(12.47)	(0.17)	(14.07)	(14.43)
Low	47.70	32.19%	55.37	55.83
	(11.84)	(0.47)	(15.49)	(16.20)
Non Low	69.36	4.62%	67.86	69.69
	(13.37)	(0.21)	(14.51)	(15.06)

Table 7: three equation model estimation - effect on 3rd grade - IV=Rank

estimated coefficients				
	1st grade score	**1st/2nd grade repetition rate**		**3rd grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Quarter of birth				
First	Ref.	Ref.	Ref.	Ref.
Second	-2.01***	0.17*	0.009	0.22
	(0.441)	(0.101)		(0.966)
Third	-4.16***.	0.24**	0.013	-0.50
	(0.443)	(0.116)		(1.962)
Fourth	-6.34***	0.24*	0.013	-1.24
	(0.454)	(0.144)		(2.843)
Rank				
Last		0.40***	0.022	
		(0.071)		
1st grade test score		-0.04***	-0.002	0.71**
		(0.017)		(0.242)
1st/2nd grade repetition				5.44***
				(1.030)
Quarter of birth				
First	Ref.	Ref.	Ref.	Ref.
Second	-2.01***	0.19**	0.007	0.22
	(0.437)	(0.097)		(0.541)
Third	-4.16***.	0.25**	0.010	-0.51
	(0.444)	(0.103)		(0.934)
Fourth	-6.34***	0.25**	0.010	-1.24
	(0.456)	(0.121)		(1.390)
Rank				
Low		0.46***	0.019	
		(0.094)		
1st grade test score		-0.04***	-0.002	0.72**
		(0.013)		(0.206)
1st/2nd grade repetition				5.50***
				(1.038)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 7 (continued)

Estimated Correlation Coefficient when IV=Rank			
	1st grade score error term	**1st/2nd grade repetition error term**	**3rd grade score error term**
	Rank=Last		
1st grade score error term	12.976*** (0.109)	-0.004 (0.226)	-0.0003 (0.510)
1st/2nd grade repetition error term		1	-0.021 (0.046)
3rd grade score error term			10.662*** (0.089)
	Rank=Low		
1st grade score error term	12.976*** (0.109)	-0.033 (0.166)	-0.0001 (0.251)
1st/2nd grade repetition error term		1	-0.029 (0.047)
3rd grade score error term			10.662*** (0.090)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 8: three equation model estimation - effect on 6^{th} grade - IV=Rank

estimated coefficients				
	1^{st} grade score	**$1^{st}/2^{nd}$ grade repetition rate**		**6^{th} grade score**
	Coeff.	**Coeff.**	**Marginal Effect**	**Coeff.**
Quarter of birth				
First	Ref.	Ref.	Ref.	Ref.
Second	-2.03***	0.16*	0.007	-0.11
	(0.492)	(0.085)		(0.523)
Third	-4.10***.	0.22**	0.011	0.66
	(0.494)	(0.090)		(0.717)
Fourth	-6.52***	0.21**	0.011	1.82
	(0.503)	(0.091)		(1.098)
Rank				
Last		0.37***	0.023	
		(0.087)		
1^{st} grade test score		-0.06***	-0.001	0.61***
		(0.018)		(0.138)
$1^{st}/2^{nd}$ grade repetition				-9.14***
				(1.299)
Quarter of birth				
First	Ref.	Ref.	Ref.	Ref.
Second	-2.09***	0.16**	0.008	0.50
	(0.505)	(0.089)		(1.208)
Third	-4.14***.	0.28*	0.013	0.94
	(0.582)	(0.156)		(2.336)
Fourth	-6.51***	0.27**	0.011	1.61
	(0.597)	(0.153)		(3.914)
Rank				
Low		0.51***	0.020	
		(0.104)		
1^{st} grade test score		-0.05**	-0.002	0.57***
		(0.023)		(0.011)
$1^{st}/2^{nd}$ grade repetition				-7.04***
				(1.207)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 8 (continued)

Estimated Correlation Coefficient when IV=Rank			
	1st grade score error term	**1st/2nd grade repetition error term**	**6th grade score error term**
	Rank=Last		
1st grade score	12.924***	0.359	-0.175
error term	(0.119)	(0.306)	(0.154)
1st/2nd grade repetition		1	-0.033
error term			(0.106)
6th grade score			11.272***
error term			(0.298)
	Rank=Low		
1st grade score	12.922***	0.054	-0.008
error term	(0.119)	(0.321)	(0.768)
1st/2nd grade repetition		1	-0.055
error term			(0.064)
6th grade score			11.008***
error term			(0.120)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis

Table 9: Repetition rate by 1st grade test score

1st grade test score	**repetition rate**
decile 1	37.14%
decile 2	15.55%
decile 3	8.23%
decile 4	5.80%
decile 5	2.69%
decile 6	1.15%
decile 7	1.19%
decile 8	0.61%
decile 9	0.13%
decile 10	0.25%
below median	11.80%
above median	0.66%
quartile 1	21.26%
quartile 2	4.73%
quartile 3	1.09%
quartile 4	0.21%

Table 10: proportion of repeaters by 1st grade test score

1st grade test score	**proportion of repeaters**
decile 1	42.01%
decile 2	22.74%
decile 3	13.28%
decile 4	10.86%
decile 5	5.23%
decile 6	1.96%
decile 7	2.44%
decile 8	0.98%
decile 9	0.24%
decile 10	0.49%
below median	93.89%
above median	6.11%
quartile 1	73.84%
quartile 2	19.80%
quartile 3	5.38%
quartile 4	0.98%

Table 11: Estimation of the 3-equation model by 1st grade test score

	1st grade test score			
	<median			>median
Effect of 1st/2nd grade retention				
On 3rd grade	5.51 ***			-2.916
	(2.114)			(5.300)
On 6th grade	-7.48***			-16.63
	(2.382)			(13.689)
	quartile 1	**quartile 2**	**quartile 3**	**quartile 4**
Effect of 1st/2nd grade retention				
On 3rd grade	6.15***	4.65	-6.87	2.20
	(1.864)	(6.921)	(10.878)	(7.330)
On 6th grade	-8.57**	-8.13	-17.99	-6.64
	(3.928)	(9.295)	(11.592)	(9.274)

*significance at 10% ; **significance at 5% ; ***significance at 1%

Standard errors are in parenthesis