Impacts of school management on educational development: a longitudinal analysis from the teacher's perspective[*]

Larissa da Silva Marioni [†]   Ricardo da Silva Freguglia [‡]
Ana Beatriz Monteiro Costa [§]

Abstract

This paper analyzes the influence of school management in Portuguese and mathematics skills of students in public and private schools. Using longitudinal microdata of GERES (2005-2008) and checked for unobservable characteristics, the results indicate that the management variable - measured as a component of variables relating to the director answered by teachers - is significant to explain the students' proficiency. The management has small but negative impact on proficiency in Portuguese and it has no significant impact in mathematics. Regarding to the individual effect of management variables, we observed that some of them - e.g. having full professional confidence in the director - have significant and positive impact on Portuguese and math proficiencies. In addition, special attention from the director to the administrative rules positively impacts the Portuguese grades and director stimulate innovative activities has a positive impact on math proficiency.

Keywords: school management, proficiency, fixed effects, GERES.
JEL: I21, I24

Resumo

Este trabalho investiga a influência da gestão escolar na proficiência de português e de matemática dos alunos de escolas públicas e privadas. Para tal, utilizam-se os microdados longitudinais do GERES (2005-2008), projeto que acompanha os alunos de uma amostra de escolas durante os quatro primeiros anos do Ensino Fundamental, controlando a heterogeneidade não-observada. Os resultados apontam que a variável de gestão - medida como um componente de variáveis relativas ao diretor respondidas pelos professores - é importante para explicar a proficiência dos alunos. A gestão tem impacto pequeno, mas negativo na proficiência de português e em matemática não tem impacto significativo. Vale notar que algumas variáveis de gestão, individualmente, têm impacto significativo e positivo nas proficiências de português (ter plena confiança profissional no diretor, o diretor dar atenção especial a aspectos relacionados com as normas administrativas) e matemática (diretor estimular atividades inovadoras).

Palavras-chave: gestão escolar, proficiência, efeitos fixos, GERES.
Área 12 - Economia Social e Demografia Econômica

[†]Department of Economics, Federal University of Juiz de Fora.
[‡]Department of Economics, Federal University of Juiz de Fora; CNPq researcher.
[§]Department of Economics, Federal University of Juiz de Fora.

1 Introduction

Access to a good educational system is crucial for the development of individuals and of the nation. Most countries that grew at rates greater than or equal to Brazil's present higher educational expansion rates than the Brazilian ones. The low educational level and the slow expansion of the educational system in the country are the national development characteristics that differentiate it from other processes of other Latin American and Asian countries with similar incomes (Barros and Mendonça, 1997).

More educated individuals have a lower propensity to commit crime, are less likely to be unemployed and have better opportunities in the labor market. These benefits are extended to the rest of society (Hanushek, 2002). For Barros and Mendonça (1995), individuals participate in a process of generating and reproducing inequality that occurs in two steps. According to the innate ability of individuals and resources invested in their preparation, at the end of the first stage these individuals are at different levels, that is, they finish the first step at unequal conditions. This first step is associated with childhood until adolescence, where the formation of human capital of the individual occurs. Thus, the level of human capital is different according to their (innate) heterogeneous skills and according to the resources invested in this individual. The second step is linked to the labor market. The authors show that wage inequality in Brazil could be reduced up to 50% if income differentials by education level were eliminated.

Studies have found that students' performance can be explained by an education production function (EPF). In this function, the factors that determine the proficiency of the students can be divided into three main groups: students' individual and family characteristics, school's characteristics and the community's characteristics (FELÍCIO and Fernandes, 2005). These groups are treated as educational inputs that explain the proficiency of the students and the quality of education. The education production function is specified as:

$$A_t = f(F_t, S_t, O_t, \varepsilon_t) \tag{1}$$

where A_t is the educational result, F_t is the vector of characteristics and the family background accumulated over t time, S_t is the vector of school inputs and of teachers accumulated over t time, O_t is the vector of other relevant inputs, such as factors of class, accumulated over t time, and ε_t is the random error term at t time (Krueger, 1999; Hanushek, 2002; Todd and Wolpin, 2003)

The Coleman Report (1966) initiated the debate and research on the relationship between school attributes and school performance. In his report, Coleman et al. (1966) show that the school environment of the child consists of many elements ranging from the table that the student sits, the colleague next to him and the teacher is in front of the class. The most prominent point in the study was the minimization of the role of the school with regards to inequality of proficiency.

From the Coleman Report several authors have sought to study and prove the existence of positive relationships between the school supplies and school performance. However, not all studies achieved the expected results and explanations have been proposed to justify the weak relationship between the school and the students' learning. Among them, that EPF is concave, i.e. investments in school inputs benefit students' learning only to some extent, after this maximum point, more inputs do not affect the performance of the students. Another point is that there are difficulties to find variables that indicate the quality of the school, therefor it becomes difficult to capture the effect of the school in the students' performance (FELÍCIO and Fernandes, 2005).

The studies began to address other characteristics that influence the students' school per-

formance, without disregarding the role of the school, although small, its role could not be forgotten. The main significant variables for explaining different learning levels of students are socioeconomic status, gender, race, and education of parents.

According to Barros and Mendonça (1997)), an improvement in the educational system can be obtained by increasing volumes destined to education and/or the efficiency that they are used. As in Brazil, education costs are high, therefore the inefficiency must be related to how those resources are used, and one of the reasons for this educational inefficiency is school management.

The relationship between school management and educational performance has been emphasized in Brazil since the 1980s because of the process of re-democratization. There began a process of diffusion of innovations in school management and this had different intensities in different state education systems of Brazil, especially with regards to the direct transfer of resources to the schools, election of Directors and collegiate implementation

What actually happened inside the school was for a long time in the background and interest in what makes a school more effective and if it can have an impact on educational determinant began being investigated in Brazil, following the investigation that for some time was already relevant in both the United States and in Europe (Xavier et al., 1994).

Educational results are persistently below average, especially in developing countries, this arouse interest about which are the inputs that affect children's learning in school so that effective public policies be implemented. One of the hypotheses that exist to justify this difference in levels of proficiency is regarding management practices.

To understand the role of school managers, that is, the role of Directors, in the performance of the students, it is possible to determine school management practices that can be applied in schools with low academic performance. If the role of the Directors is really important, ways to manage the schools in order to maximize student learning should be considered a priority in educational discussions.

And what is understood by management? According to Bloom et al. (2011), management is a broad term that includes standardized procedures for control of production and even elements related to the administrator's characteristics. This complexity brings difficulties in measuring management and assessing how the administration affects the results. Given that, the literature seeks to check if management practices can be universal or if efficiency is derived from specificities of each organization and the environment in which they are inserted.

Lück (2009) considers that school management encompasses not only the Director. The author considers that a democratic management also includes the active participation of teachers on co-leadership pedagogical responsibilities. According to Willms (2003) the quality of leadership in school is a relevant factor in evaluating schools and thus their educational results.

However, in research related to the field of education, there are few jobs that prioritize school management as explanation for the proficiency of the students[1]. Clark et al. (2009) states that due to the difficulty of defining the quality of school management and, due to the lack of high-quality data in which empirical strategies may be based, the literature on the influence of managers in the success of students is scarce. Thus, this work seeks to investigate the influence of school management in Portuguese language and mathematics proficiency of students from a GERES longitudinal microdata project, *Estudo Longitudinal da Geração Escolar 2005*. Considering the works of Lück (2009); Willms (2003) and the database available, school management will be defined by the perception of teachers on school leadership, namely the quality of the directors in the teachers' perspective.

The work is divided as follows: in addition to this introduction, the topic two discusses

---

[1](T. M. Soares and Teixeira, 2006; Azoulay, Zivin, and Wang, 2010; Tavares, 2012)

theoretical referential about education and school management. The third topic introduces the database used. The fourth topic the methodology is presented, in the fifth topic the analysis of the results is carried out, and the sixth the final considerations are presented.

2 Literature

According to Lück (2000) school management is a dimension that aims to promote organization, mobilization and articulation of both human and material conditions essential to school educational processes that promote students' learning. Souza (2006) states that the school management is understood as a political process, and democratic management is the ability of managers to use this power to act together for the development of the students.

According to Tavares (2012), assuming that the school industry is relatively rigid in relation to technology production function[2], a hypothesis to explain the difference in results between schools with the same inputs is given by differences in the forms of management. The empirical research of the EPF presented evidence that the elements of school management are linked to educational results.

It is important to separate the works that address research in developed countries and those which address research in developing countries. Developed countries have already achieved higher levels of progress and their education systems are more consolidated and mature, despite still having room for improvement.

Since the 1980s, studies in economics of education began to highlight the leading role of managers. It was found in these studies that the role of directors as leaders would be critical to the creation of conditions necessary for academic development of the students. To measure the "directors as leaders" various aspects and characteristics of managers were considered, such as capacity to plan and coordinate staff, monitoring students and parental and community involvement (Blank, 1987).

In order to examine which attributes of educational leaders influence students' learning, Eberts and Stone (1988), observed a positive effect of the experience of directors, as well as a positive association between years of teaching experience of directors and the performance of students. However, the authors found negative correlation between university degrees of directors and performance of students. According to the authors this would be explained by the fact that the most qualified directors were being allocated to schools of worse quality. In general, the investigators found that the behavior of directors influenced the performance of the students. Among the activities developed by the directors, the instructional leadership and conflict resolution influenced positively on the performance of students.

Ballou and Podgursky (1995),examined the association between the characteristics of the directors and their performance at work, evaluated by teachers and other members of the school. The characteristics associated with a quality manager relate to monitoring the performance of teachers, to recognizing the efforts of teachers and the other leadership dimensions. As well as Eberts and Stone (1988), the authors found negative correlation between university degrees of the directors and their performance. However, Ballou and Podgursky (1995) found no correlation between experience and performance of the directors.

According to Hoxby (1996) there is some indirect evidence relating to school management and the performance of students, trade unions, for example, give public schools greater market power, increase the amount of input, but reduces productivity. The characteristics of the school principal and the form of entering this career are also linked to the results of proficiency, di-

---

[2](Hanushek, 1979)

4

rectors with experience in management positions exert positive influence on students' grades. Schools in which the directors were chosen by the teachers and parents or who entered through public service exams offer better performance than the schools where the directors were nominated by administrative organs.

The profile of a school manager is related to school performance, Béteille et al. (2011) point out that the experience of a school director in management positions has positive impacts on students' grades. Student learning is greater in institutions in which the directors give greater importance to the participation of teachers in elaborating the pedagogical plan and are more open to suggestions from the school community.

According to Coelli and Green (2012), the directors may affect the results of the students in various ways. As leaders in the schools, they influence aspects such as supervision and retention of teachers, introduction and development of pedagogic projects, discipline of students, and allocation of students and teachers in classes.

In Brazil, democratic management of public education was institutionalized with the Federal Constitution of 1988 and since then, the school structure has undergone changes in its conjecture, for it no longer was based on administration and went on to be based on the management principles, which have more democratic characteristics. Educational management is determined as indicated in the *Lei de Diretrizes e Bases* (LDB) 1996 [3]. These guidelines established, in the form of a law, the responsibilities of educational institutions and ensure the versatility of forms of organization (Vieira, 2007).

In recent years changes have occurred with regard to school management in Brazil, both at the municipal level and the state level. The states are responsible for developing and executing educational policies, taking into account national plans, and high school is its main assignment. The municipalities have as their assignments early childhood education and are responsible for developing the education system, incorporating national and state plans. However, these innovations in management practices do not follow a central standard, state systems have implemented these changes in management differently and with different speeds, which makes it difficult to assess the impact on school performance (Xavier, Sobrinho, Marra, and Médici, 1994).

For Xavier et al. (1994) quality management begins at the highest ranks and depends on strategic cultural and technical changes so that it can function properly. The school must make a high investment, however, quality should not be acquired at any cost, but adjusted to the needs of users.

According to Barros and Mendonça (1997) the board is also fundamental to school management, this is composed by the principal, representatives of the teachers and the school staff, representative of the parents and students. The board serves to keep the objective function of the school close to the community in which it operates, it participates in the school development plan and serves to supervise and monitor its implementation by the director. The interaction between parents and community members in school decisions strengthens the school-family relationship, since the participation of faculty and staff allows them to feel more motivated, and consequently, more engaged in school activities. A more democratic management, whose directors are more likely to listen to suggestions from school community and give more importance to the participation of teachers in the pedagogical plan, can have a positive influence on student performance.

The task of managing is linked to educational leaders and it relies on them the practices necessary to move from an educational system of repeating grades to a system of educational excellence. The commitment of educational leaders is crucial to the strengthening of management programs. It is necessary that school directors have leadership training, teachers and

---

[3]The 1988 Constitution and the 1996 LDB establish that education is as social right guaranteed to all Brazilians.

supervisors have training in elaborating development plans, teamwork techniques, daily routine management and methodology, and troubleshooting.

Analyzing indirectly the effect of school management, J. F. Soares (2004) states that the teacher's relationship with the director and the teachers' perception of internal problems at school are factors that have positive effects on the average level of proficiency of students. The author considers such factors defining characteristics of a good teacher, however these factors are intrinsically linked to managers and, therefore, somehow also define the quality of the directors.

T. M. Soares and Teixeira (2006) examine the performance of students according to three profiles of school management - management, traditional and democratic. The authors use data from the Evaluation Program of Basic Education of the Minas Gerais Educational Assessment System (*Programa de Avaliação da Educação Básica do Sistema Mineiro de Avaliação Educacional*) for the year 2002, that is, they worked with state schools of Minas Gerais. They conclude that strongly democratic principles contribute not only to the better student performance but also to fairness in relation to their socio-economic levels.

Focusing on the practices of "good management", Tavares (2012) analyzes the impact of a pilot program of educational management in state schools of São Paulo. The author finds evidence that there are positive and significant impacts on students' grade in mathematics, arising from the participation of the school in the school management program deployed in them. In addition, these positive effects influence, especially students with great learning deficiencies. Performance monitoring and goal setting, combined with the bonus policy for school teams are the management practices that impact positively on the students' results.

The system for electing a director varies as to the requirements and qualifications that he or she must satisfy; level of education, experience in the administrative area and time as a school teacher are some of the most common. The teacher's participation is also important for the management of the school. The school must involve teachers in managerial meetings and not designate them just to teach. Including faculty and staff in school decisions can make them feel more motivated and engage more in school activities. However, most schools make the mistake of disregarding teachers in the managerial aspect and this may cause a problem in the future, because the investment and effort to include them later tends to be greater.

3   Database

The micro-data used in this work are from Project GERES - *Geração Escolar* (School Generation). The GERES is a project that accompanies students in a sample of schools during the first four years of Elementary School it is, therefore, a longitudinal study which allows you to keep track of student learning over time. The goals of this project are: i) to identify the school characteristics that maximize student learning and minimize the impact of social background on learning; ii) to identify the school factors that decrease the likelihood of students repeating grades; iii) to identify the characteristics of the school that reduce the probability of absenteeism.

GERES accompanied students from 2005 until 2008 through annual tests to estimate the levels of proficiency in mathematics and Portuguese, students who in 2005 was in the first grade of elementary school. In addition to the tests, questionnaires were also applied on teachers, directors, parents and students in order to evaluate the effects of family and school factors on learning. Sample schools are public and private, and are located in five major Brazilian cities - Belo Horizonte (MG), Rio de Janeiro (RJ), Campo Grande (MS), Salvador (BA) and Campinas (SP). GERES was developed in partnership with the *Universidade Federal de Minas Gerais*

Table 1: Balanced GERES Sample

		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Portuguese	Students	5,792	5,792	5,792	5,792	5,792
	Schools	209	209	208	208	208
Mathematics	Students	5,813	5,813	5,813	5,813	5,813
	Schools	207	207	206	207	207

Source: GERES (2005-2008)

(UFMG), Pontifical Catholic University of Rio de Janeiro (PUC-Rio), *Universidade Federal do Mato Grosso do Sul* (UEMS), *Universidade Federal da Bahia* (UFBa), *Universidade Estadual de Campinas* (UNICAMP) and *Universidade Federal de Juiz de Fora* (UFJF).

For this article, however, only data from students who participated in all five waves was used. Since no school in Salvador was part of the last wave, students in this town were not considered. Student who participated in the five waves of Portuguese were 5,792 and 5,813 students participated in five waves of mathematics. table 1 presents the number of students and schools that were present in each wave.

The first wave, diagnosis, was carried out in March 2005 and the second wave was carried out in November 2005. Waves were also carried out in November 2006, 2007 and 2008. The survey took care to distinguish "added school value" and "selection effect", that is, students who do not pass continue to be part of the sample if they remain in the same school or transfer to schools that also form part of the sample, students who transferred to a school that is not part of the sample are lost, which may represent a selection bias, because the school may present a better performance not because it improved, but due to the exclusion of students with low performance.

Proficiency variables were estimated based on Item Response Theory (IRT), this allows, for example, GERES students' grades to be compared with grades estimated in the SAEB. The socioeconomic variable consists of information about the mother's schooling, the father's occupation and presence of goods at home, and it was also built based on IRT (T. M. Soares, 2005). The average value of this variable does not have a direct interpretation, however, one can tell from the standard deviation that there is great variation among families. The other variables are categorical, and can be seen in annex 1. As well as in Ballou and Podgursky (1995), the management component of this work was built on questions answered by teachers about the quality of the directors.

Tables 2 and 3 present the variables used in the workplace and their descriptive statistics, both for students who participated in the five waves of Portuguese (table 2) and for students who participated in the five waves of mathematics (table 3):

Tables 4 and 5 show the correlation matrices of the variables selection. Table 4 shows the correlation between the variables of student proficiency in Portuguese and in table 5 is shown the correlation between the variables of student proficiency in mathematics.

Table 2: Portuguese Descriptive Statistics

VARIABLE	Observations	Medium	SE	Minimum	Maximum
DEPENDENT VARIABLE					
Level of Proficiency in Portuguese	28960	144.98	32.71	47.80	222.96
STUDENT VARIABLE					
Socioeconomic level*[4]	28945	0.18	0.63	-1.45	1.66
Sex*	28720	1.58	0.87	1	9
Race*	28720	2.05	1.20	1	9
Age of the student*	28720	3.39	0.70	1	9
TEACHER VARIABLE					
Age	28960	3.88	1.67	1	9
Sex	28960	2.19	1.18	1	9
Postgrad	28960	2.76	2.50	1	9
Experience	28960	5.47	1.31	1	9
Has another job	28960	2.55	1.90	1	9
MANAGEMENT VARIABLE					
Management	28960	-0.12	2.27	-6.70	7.85

Source: GERES (2005-2008)
NOTE: *These variables were excluded from the Fixed Effects analysis.

Table 3: Mathematics Descriptive Statistics

VARIABLE	Observations	Medium	SE	Minimum	Maximum
DEPENDENT VARIABLE					
Mathematics Level of Proficiency	29065	179.41	70.84	19.52	396.55
STUDENT VARIABLES					
Socioeconomic Level*	29060	0.18	0.63	-1.45	1.66
Sex*	29025	1.58	0.87	1	9
Race*	29025	2.04	1.19	1	9
Age of the student*	29025	3.39	0.70	1	9
TEACHER VARIABLES					
Age	29065	3.88	1.68	1	9
Sex	29065	2.19	1.19	1	9
Postgrad	29065	2.77	2.50	1	9
Experience	29065	5.48	1.31	1	9
Has another job	29065	2.55	1.90	1	9
MANAGEMENT VARIABLE					
Management	29065	-0.12	2.28	-6.70	7.85

Source: GERES (2005-2008)
NOTE: *These variables were excluded from the Fixed Effects analysis.

Tables 4 and 5 show the correlation matrices of the variables selection. Table 4 shows the correlation between the variables of student proficiency in Portuguese and in table 5 is shown the correlation between the variables of student proficiency in mathematics.

---

[4]With exception to the teachers' questionnaires, the other questionnaires were not applied every year, therefore, it is not possible to accompany the evolution of the socioeconomic level of the families and this variable was excluded from the analysis of fixed effects for this reason.

Table 4: Portuguese Correlation Matrix

Variable	Portuguese	nse	Sex	Race	Age	Age T	Sex T	Titles	Exp	Another Job	Management
Portuguese	1										
nse	0.3482	1									
Sex	-0.0044	-0.0269	1								
Race	-0.0809	-0.1339	0.0619	1							
Age	-0.0341	-0.0889	0.0881	0.0998	1						
Age Teacher (Age T)	0.0627	-0.0759	-0.0094	0.0124	0.0087	1					
Sex Teacher (Sex T)	0.0831	0.0212	-0.0043	0.0003	-0.0002	0.4204	1				
Postgrad	-0.0182	-0.0227	0.009	0.0121	0.0304	0.3843	0.3214	1			
Experience (Exp)	0.0409	0.0114	0.0023	0.0027	0.0041	0.629	0.3686	0.3828	1		
Another Job	0.1466	-0.0464	-0.0065	0.0185	0.0222	0.5065	0.45	0.4698	0.4632	1	
Management	-0.0117	0.0399	0.0003	-0.0074	-0.0056	0.4207	0.3737	0.3325	0.3984	0.4932	1

Source: GERES (2005-2008)

Table 5: Mathematics Correlation Matrix

Variable	Mathematics	nse	Sex	Race	Age	Age T	Sex T	Titles	Exp	Another Job	Management
Mathematics	1										
nse	0.3163	1									
Sex	-0.0426	-0.0295	1								
Race	-0.071	-0.1343	0.0549	1							
Age	-0.0364	-0.0868	0.0809	0.101	1						
Age Teacher (Age T)	0.0751	-0.078	-0.0086	0.0131	0.0085	1					
Sex Teacher (Sex T)	0.0869	0.0182	-0.0043	-0.001	-0.0019	0.419	1				
Postgrad	-0.014	-0.023	0.0076	0.0124	0.0315	0.3838	0.3208	1			
Experience (Exp)	0.0461	0.0109	0.0027	0.0045	0.0051	0.627	0.3649	0.3823	1		
Another Job	0.1497	-0.0473	-0.0073	0.0201	0.0233	0.5062	0.4468	0.4694	0.4655	1	
Management	-0.0192	0.041	0.0003	-0.0063	-0.005	0.4208	0.3709	0.3309	0.399	0.4932	1

Source: GERES (2005-2008)

Fonte: GERES (2005-2008)

Socioeconomic status and the professor having another job offer the greatest degree of correlation with the grades of students in Portuguese language and in mathematics, both positives. For the management component, the lowest correlation is with the titles of the professor, in the two proficiencies. Non-correlated variables are gender of the student and age teacher, and race of the student and sex of the teacher, both in mathematics. But the highest correlation variables are age of the teacher and teacher's experience, both in Portuguese language and mathematics. Which makes sense, since usually with increasing age the years of teaching professionally also increase.

4 Metodologia

The methodology used in this work involves estimation with Ordinary Least Squares (OLS), Random Effects (RE), Fixed Effects (FE) with the objective of capturing the influence of management practices for Portuguese language and mathematics proficiency of the students.

The model proposed in the OLS is as follows:

$$Y_{it} = \alpha + \beta_1 A_{it} + \beta_2 P_i t + \beta_3 G_{it} + u_{it} \tag{2}$$

where Y_{it} is the proficiency of student i in Portuguese in the year t and the math proficiency of the student i in the year t, α is the constant of the model, A_{it} is the vector of characteristics of the student, P_{it} is the vector of characteristics of teachers, G_{it} is the management component, and u_{it} is the error term for the model.

Before estimating the regressions proposals, a main management component is built from variables answered by teachers concerning the principal. The goal of factor analysis is to describe the original variability of a vector X in a smaller number of random variables m, called common factors and that relate directly to the original vector X through a linear model. According to Mingoti (2005) one can transform the random vector $X \in R^n$ into another vector $Y \in R^m$, to $m \leq n$ projecting X in m orthogonal directions of most variance, the so-called principal components. Such components are individually responsible for the variance of the observations; part of the variance of the data set is explained by a reduced number of components, allowing disposal of what is remaining without loss of information[5]. The two random vectors, X and Y, have the same variance, however, vector Y is composed of non-correlated random variables. After identifying the core components, the scores (numeric values) can be calculated for each sample element enabling the analysis through the usual statistical techniques. The number of components can be determined, according to Henry Kaiser's rule, where the eigenvalues must be greater than 1.

Using the panel provides more information, for it is composed of cross section information and time information, and this causes it to have more variability, except for collinearity between the variables, more degrees of freedom and greater efficiency of estimators. In the balanced panel there is information for all individuals and for all periods of time. It is possible to treat the problem of omitted variable, correlated or not with the explanatory variables.

The problem of equation (2) is the possible correlation between the error u_{it} and the explanatory variables, which invalidates the hypotheses of equation (3) and thus does not maintain the causality relationship:

$$E(u_{it}|A_i) = 0; E(u_{it}|P_i) = 0; E(u_{it}|G_i) = 0 \qquad (3)$$

The OLS model does not separate the error variance from the specific effect of management variance. Therefore, if there are unobserved management effects, endogeneity might occur because there are omitted variables that the researcher cannot observe and with that, the estimates become inconsistent and skewed[6] (Wooldridge et al., 2006). If the Breusch Pagan test proves the existence of unobserved effects, then one must use the random effects model (RE) or the fixed effects model (FE), for they are able to treat this unobserved effect [7]. In the case of fixed effects, the proposed equation considers the characteristics unobserved c_i:

$$Y_{it} = \alpha + \beta_1 A_{it} + \beta_2 P_{it} + \beta_3 G_{it} + c_i + u_{it} \qquad (4)$$

The chance of identifying the model of equation (4) requires that the correlation between explanatory variables (A_i, P_i, G_i) and the error term (u_i) be picked up by an explanatory variable that does not vary between years (c_i), i.e., $E(u_{it}|c_i, A_i, P_i, G_i) = 0$. estimation by fixed effects, the term c_i is eliminated, resulting in the fixed effects estimator. The feasibility of using fixed effects in the analysis is guaranteed by the fact that the questions analyzed are answered by

---

[5]It is a great technique for linear dimension reduction, relative to the mean squared error.

[6]The OLS estimator is the between estimator that uses the variation in time between each cross-section. To verify the presence of not-observed effects a Breusch Pagan (1980) is carried out, made from a Lagrangian multiplier and has as a null hypothesis the non-existence of an unobserved effect.

[7]To choose which model to use, the RE or the FE, one can make the Hausman test (1978), whose null hypothesis is that the estimators are not systematically different. If one does not reject the null hypothesis, then the estimator RE is consistent and efficient, while the FE estimator is consistently null, and RE estimator is consistent and efficient, while the FE estimator is consistent only, then the RE is best suited. If you reject the null hypothesis, then the RE estimator is inefficient as the FE is consistent, the latter being the more appropriate. The test has χ^2 distribution with N degrees of freedom, where N is the number of estimated coefficients.

Table 6: Management variables

Variable		SE	% variance*
management	*overall*	2.27	
	between	1.36	35.00
	within	1.83	65.00

Source: GERES (2005-2008)

NOTE: *The calculation is done dividing the variance between/within by the total variance.

For more details, see Cameron and Trivedi (2009).

teachers, and given that students change their teachers, the answers to the questions also change (table 6).

5 Results

5.1 Descriptive Analysis

Figure 1 shows the evolution of the proficiencies of Portuguese language and mathematics along the waves. Given that proficiency in mathematics grows more than Portuguese, and considering that the proficiency scales in GERES are different[8], the analysis of the disciplines will be conducted separately.

Graph 1: Average student proficiency
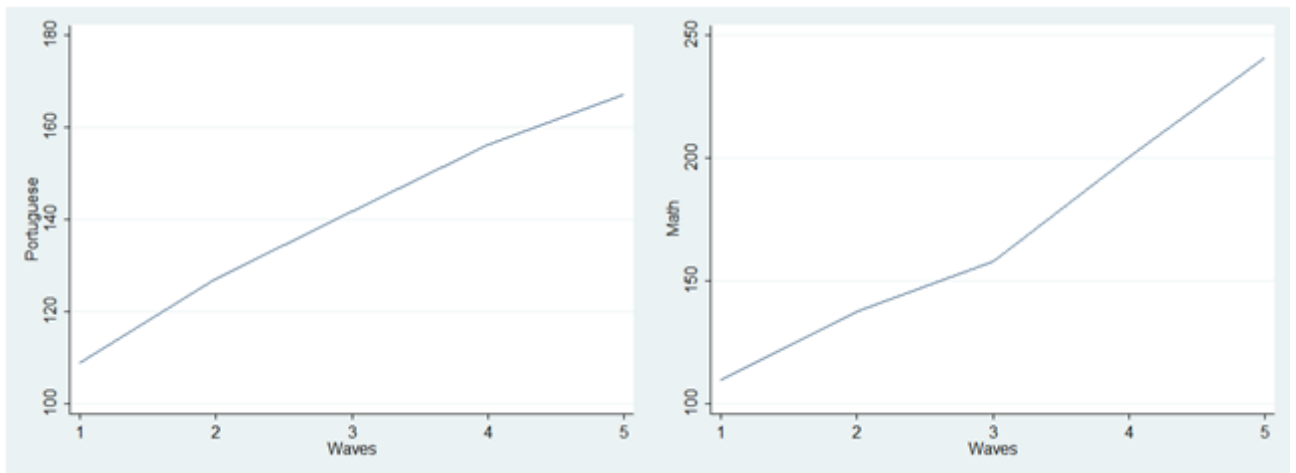
Source: GERES (2005-2008)

Figure 2 shows the density of average proficiency. There is a greater concentration on the performance of Portuguese language. In math grades are less concentrated. In Figure 3, the evolution of the density of proficiencies during waves is apparent. In the tests applied in the first year (waves 1 and 2), the students had their grades more concentrated mathematics. In the three years following (waves 3, 4 and 5), the students' proficiency in Portuguese becomes more concentrated. Such behavior of proficiencies may be related to increased emphasis on learning

---

[8]For details about the construction of the scale see Brooke and Bonamino GERES (2011).

Portuguese at the beginning of the first stage of elementary education and mathematics was emphasized only at the end.

Graph 2: Density ofaverage student proficiency
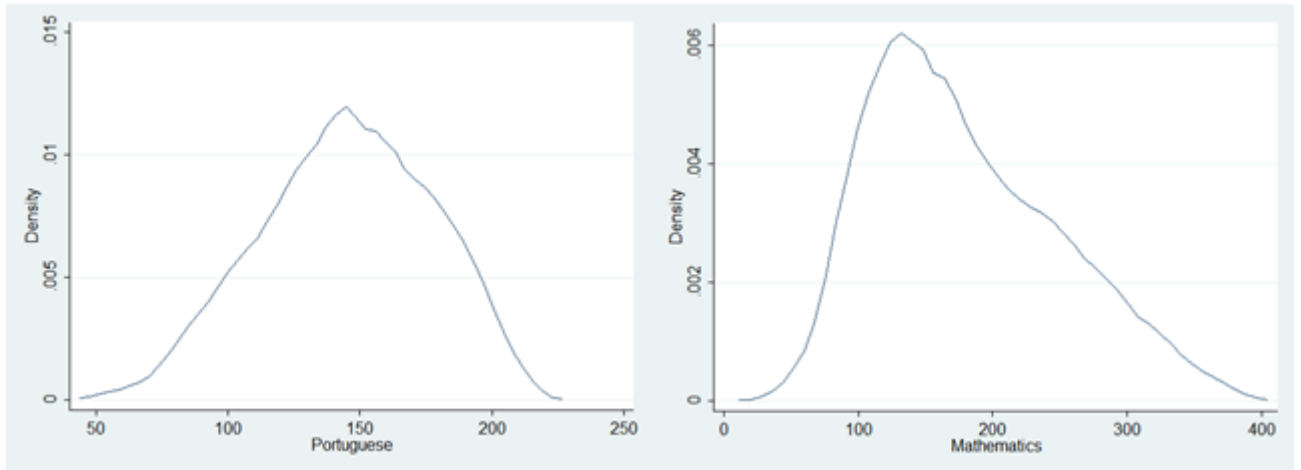
Source: GERES (2005-2008)

Graph 3: Density of student proficiency along the waves
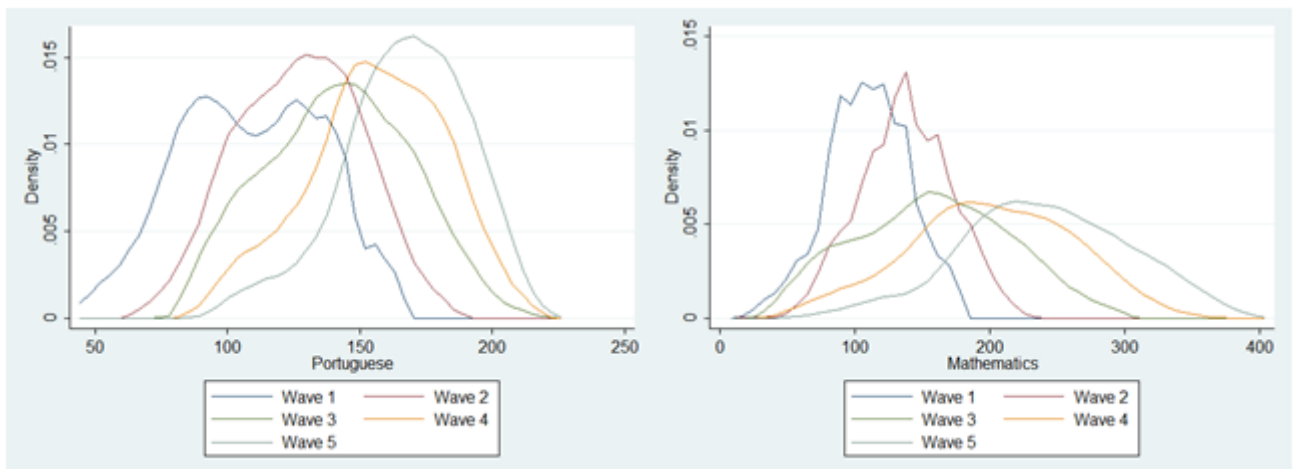
Source: GERES (2005-2008)

5.2   Empirical Analysis

Table 7 presents the composition of management components from the variables answered by teachers. The component explains 80.39% of the total variance. This variance is considered high (Mingoti, 2005) and the component may be considered a good index for the quality of school management.

Section 5.2 presents the results of the regressions estimated by Ordinary Least Squares (OLS), Random Effects (RE), Fixed Effects (FE) for the previously described variables.

The estimation by Ordinary Least Squares shows students' proficiency without controlling for unobserved effect. However, the Breusch Pagan test indicates the existence of unobserved

Table 7: Management Components

ORIGINAL VARIABLES	Management Components
I have full confidence in the director.	0.3593
The director succeeds that the teachers commit to the school.	0.3575
The director stimulates innovating activities.	0.3615
The director gives special attention to aspects pertaining student learning.	0.3568
The director gives special attention to aspects pertaining administrative norms.	0.3459
The director gives special attention to aspects pertaining school maintenance.	0.3488
I feel respected by the director.	0.3538
Directors, teachers and other faculty members collaborate for the wellbeing of the school.	0.3444
Eigenvalue	643.086
Explained variance	0.8039

Source: GERES (2005-2008)

heterogeneity of individuals in the model, since there was the rejection of the null hypothesis. Thus, the methods of Random Effects and Fixed Effects are favored in the analysis. When comparing the coefficients of the OLS, RE and FE models, one realizes that there is difference in magnitude between them, which corroborates the hypothesis that there is a bias of not controlling for the unobserved effects.

The Hausman test indicates the Fixed Effects model as the most appropriate, because it rejected the null hypothesis and thus the RE estimator is inefficient while the FE is consistent. This way, you can see that there are differences in the proficiencies of Portuguese language and mathematics arising from management.

The control variables and the non-management variables are as expected and observed in literature. It is worth mentioning that the socioeconomic level variable (NSE) is significant in all estimates, however, the fixed effects estimation it is excluded from the analysis because we were not able to follow its evolution, since this information is only available for one year. The control coefficients, with few exceptions, increased the coefficient, in absolute terms, if comparing the OLS to the FE.

The management component, if compared between OLS and FE, presents reduction in the estimated coefficient. Thus, part of the change in proficiency that was attributed to management was actually due to unobserved characteristics. These characteristics were overestimating the impact of management. For mathematics, management impacts positively when there is no control of variables unobserved, however, when this is done, management is no longer significant. For Portuguese language management had also positively impacted without the unobserved control effects, but with control of fixed effects it started to have negative impact on students' proficiency.

The results indicate negative impact of school management on students' proficiency in Portuguese language and there is no impact on mathematics. As has been discussed, other articles have already found a negative relationship between variables related to the directors and the students' proficiency (Eberts and Stone, 1988; Ballou and Podgursky, 1995; Clark et al., 2009). In Brazil, Biondi and de Felício (2007) found that the process by which the director assumes the direction of the school has negative effect on the average performance of students in mathematics.

However, this work presents some limitations. The management component is restricted due to the difficulty of measuring school management. Coelli and Green (2012) arouse the attention on endogeneity and measurement errors in studies that base their analysis on the teachers' perception about leadership and school conditions. The controversy about the effects of school management on the student performance are found both in national and international litera-

ture. These mixed effects may occur due to differences between the results, controls or sample characteristics (Clark et al., 2009).

Table 8: Results of the OLS, RE, FE estimations (continues)

VARIABLES	PORTUGUESE			MATHEMATICS		
	(1) OLS	(2) RE	(3) FE	(1) OLS	(2) RE	(3) FE
Management	0.177**	-0.0638	-0.112**	0.461***	0.140	0.0597
	(0.0704)	(0.0543)	(0.0560)	(0.148)	(0.134)	(0.143)
NSE	16.66***	17.12***	-	32.35***	33.16***	-
	(0.194)	(0.356)	-	(0.413)	(0.731)	-
Student's gender						
Female	4.628***	4.688***	-	-0.0825	0.0200	-
	(0.241)	(0.455)	-	(0.499)	(0.909)	-
Ignored	-4.822***	-4.809*	-	-20.84***	-20.93***	-
	-1.444	-2.750	-	-2.908	-5.000	-
Student's race						
Pardo	-1.515***	-1.584***	-	-2.583***	-2.702***	-
	(0.275)	(0.517)	-	(0.571)	-1.038	-
Black	-7.113***	-7.117***	-	-15.62***	-15.62***	-
	(0.438)	(0.839)	-	(0.896)	-1.638	-
Yellow	-1.023	-0.941	-	0.931	1.096	-
	(0.701)	-1.328	-	-1.496	-2.705	-
Indigene	-2.736***	-2.600**	-	-4.632***	-4.367**	-
	(0.540)	-1.011	-	-1.106	-1.998	-
Ignored	-1.682	-1.529	-	-2.646	-2.674	-
	-1.522	-2.814	-	-3.417	-5.937	-
Student's age						
8 years	6.927*	7.837	-	13.27*	14.85	-
	-3.897	-7.574	-	-6.893	(13.16)	-
9 years	-4.165***	-4.354***	-	-6.178***	-6.353**	-
	(0.659)	-1.190	-	-1.393	-2.499	-
11 years	0.221	0.447	-	0.243	0.533	-
	(0.275)	(0.518)	-	(0.567)	-1.026	-
12 or more	-6.472***	-6.407***	-	-14.79***	-14.72***	-
	(0.857)	-1.617	-	-1.810	-3.246	-
Ignored	-1.692	-1.585	-	-21.69***	-21.68***	-
	-1.873	-3.421	-	-3.933	-6.490	-
Teacher's age						
Until 29 years	0.286	-0.449	-0.590*	0.925	-0.785	-1.225
	(0.393)	(0.332)	(0.351)	(0.735)	(0.731)	(0.835)
50 or more	-1.008***	0.181	0.409	-2.377***	-0.252	0.259
	(0.326)	(0.248)	(0.257)	(0.701)	(0.607)	(0.643)
Ignored	0.362	1.706	2.017*	-0.868	0.729	1.251
	-1.261	-1.055	-1.095	-2.357	-2.268	-2.535
Teacher's gender						
Male	-4.544***	-1.096	-0.517	-8.711***	-3.434*	-2.313
	-1.032	(0.702)	(0.704)	-2.402	-1.876	-1.865
Ignored	-1.166	-3.207***	-3.509***	0.0619	-3.284**	-3.938**
	(0.930)	(0.705)	(0.733)	-1.862	-1.593	-1.743

Source: GERES (2005-2008)
NOTE: ***significant at 1%; **significant at 5%; *significant at 10%.

In order to check the robustness of the result to the management component we did a regression with fixed categorical variables that comprise the component effects. According to Table 9, we can see that some management variables, when analyzed individually, had a positive impact on students proficiency. Both Portuguese language and math, students whose teachers say they have confidence in the director have higher scores than students whose teachers do not trust the directors. Have a commitment to the school had a negative coefficient in the categories analyzed in both disciplines.

For Portuguese language, in addition to confidence, the variables related to administrative rules and the maintenance of school also had a positive sign. This indicates that students whose teachers agree or are neutral regarding the special attention of the director related to administrative rules and the maintenance of school had higher grades to those students whose teachers

Table 8: Results of the OLS, RE, FE estimations (conclusion)

VARIABLES	PORTUGUESE			MATHEMATICS		
	(1) **OLS**	**(2)** **RE**	**(3)** **FE**	**(1)** **OLS**	**(2)** **RE**	**(3)** **FE**
Teacher's postgraduation						
Did postgraduate	1.631***	0.145	-0.151	3.603***	1.229**	0.606
	(0.260)	(0.206)	(0.214)	(0.542)	(0.478)	(0.519)
Ignored	-3.053***	-0.714*	-0.278	-6.208***	-2.921***	-2.090**
	(0.492)	(0.381)	(0.397)	(0.976)	(0.856)	(0.942)
Teacher's Experience						
Until 1 year	-5.113***	-0.828	-0.111	-10.31***	1.548	4.174*
	-1.557	-1.174	-1.192	-2.923	-2.000	-2.191
From 1 to 2 years	3.377***	1.065	0.694	3.431*	-2.368	-3.606*
	(0.999)	(0.736)	(0.763)	-1.996	-1.732	-1.888
From 3 to 4 years	-1.836***	1.152**	1.706***	-0.673	6.309***	8.008***
	(0.645)	(0.485)	(0.509)	-1.300	-1.121	-1.236
From 5 to 10 years	-1.573***	-0.114	0.194	-2.825***	0.441	1.304
	(0.402)	(0.324)	(0.337)	(0.801)	(0.728)	(0.802)
From 11 to 15 years	-1.558***	-0.451*	-0.291	-2.128***	0.747	1.368**
	(0.326)	(0.256)	(0.267)	(0.676)	(0.615)	(0.671)
Ignored	4.510***	1.930*	1.324	4.439*	-2.525	-4.317
	-1.374	-1.144	-1.200	-2.696	-2.568	-2.855
Another job						
Yes	1.309***	0.382*	0.243	3.099***	1.259**	0.885
	(0.315)	(0.227)	(0.232)	(0.679)	(0.545)	(0.566)
Ignored	0.0478	-0.127	-0.0241	6.618***	9.598***	10.39***
	-1.006	(0.828)	(0.869)	-1.686	-1.705	-1.964
Waves' dummies	yes	yes	yes	yes	yes	yes
City's dummies	yes	yes	-	yes	yes	-
Constant	100.7***	101.3***	109.7***	100.1***	100.8***	109.4***
	(0.518)	(0.646)	(0.581)	(0.992)	-1.270	-1.362
Observations	28,945	28,945	28,96	29,06	29,06	29,065
R-squared	0.618	0.615	0.803	0.647	0.6451	0.812
Breusch Pagan (χ^2)		22690.08			18337.44	
Hausman (χ^2)			604.84			573.9

Source: GERES (2005-2008)
NOTE: ***significant at 1%; **significant at 5%; *significant at 10%.

do not agree with these statements.

Table 9: Results of the estimation with the management variables

VARIABLES	PORTUGUESE FE	MATH FE	VARIABLES	PORTUGUESE EF	MATH FE
MANAGEMENT			**MANAGEMENT**		
Confidence			**Administrative rules**		
Neutral	0.112	2.196	Ignored	1.210	4.250
	(0.557)	-1.380		-1.268	-3.234
Partially agree	1.193*	3.341**	**School's maintenance**		
	(0.630)	-1.553	Neutral	0.863	-4.432***
Fully agree	1.527**	5.587***		(0.600)	-1.530
	(0.682)	-1.695	Partially agree	1.554***	-0.933
Ignored	-0.465	7.798***		(0.598)	-1.563
	-1.217	-2.863	Fully agree	1.755***	-1.168
Commitment				(0.617)	-1.625
Neutral	-1.668***	-1.627	Ignored	0.616	3.902
	(0.516)	-1.239		-1.172	-2.880
Partially agree	-3.208***	-2.494*	**Respected by the director**		
	(0.576)	-1.382	Neutral	-0.119	-3.790**
Fully agree	-3.351***	-3.580**		(0.650)	-1.591
	(0.606)	-1.460	Partially agree	-0.621	-6.327***
Ignored	-3.167***	-7.603***		(0.651)	-1.609
	-1.147	-2.698	Fully agree	-0.333	-7.731***
Innovative activities				(0.661)	-1.643
Neutral	-1.034*	7.428***	Ignored	0.579	-6.781**
	(0.550)	-1.277		-1.163	-2.720
Partially agree	-0.499	6.695***	**Colaboration**		
	(0.600)	-1.392	Neutral	-0.848	0.684
Fully agree	-0.600	6.153***		(0.702)	-1.637
	(0.643)	-1.499	Partially agree	-0.434	1.152
Ignored	1.251	8.532***		(0.717)	-1.691
	(0.996)	-2.677	Fully agree	-0.304	1.710
Learning				(0.727)	-1.710
Neutral	0.609	2.676**	Ignored	-0.0947	-11.87***
	(0.498)	-1.191		-1.302	-3.373
Partially agree	0.403	0.0369			
	(0.561)	-1.331			
Fully agree	0.333	1.317	**CONTROLS**		
	(0.581)	-1.411	Teacher's age	yes	yes
Ignored	-1.022	-4.712**	Teacher's gender	yes	yes
	(0.985)	-2.358	Postgraduation	yes	yes
Administrative rules			Experience	yes	yes
Neutral	1.276*	-1.368	Another job	yes	yes
	(0.742)	-1.882	*Waves' dummies*	yes	yes
Partially agree	0.872	-1.768	Constant	110.0***	108.1***
	(0.727)	-1.842		(0.931)	-2.248
Fully agree	0.630	-0.109	Observations	28,96	29,065
	(0.738)	-1.880	R^2	0.804	0.814

Source: GERES (2005-2008)
NOTE: ***significant at 1%; **significant at 5%; *significant at 10%.

Moreover, in addition to aspects related to the commitment of the school, the fact that teachers agree or be neutral in relation to the director stimulate innovative activities showed negative signal for the proficiency of Portuguese. This variable is that it has increased participation in the composition of the management variable is constructed as component (Table 7). So the fact that variable have a significant and negative impact on the proficiency of Portuguese may have influenced the negative outcome of the management component presented in Table 8.

The other variables of management, namely, the director gives special attention to issues related to student learning, I feel respected by the director and officers, teachers and other members collaborate to school work well not have significant impact on the Portuguese proficiency.

Mathematics, in turn, two other variables had significant and positive impact on the analysis, innovative activities and aspects related to students learning. Thus, students whose teachers did not disagree that the director encourages innovative activities had higher math grades to those

students whose teachers disagree with this statement. Likewise, students that teachers do not disagree that the director gives special attention to issues related to students learning have higher scores than those students that teachers disagree with this statement.

However, some management variables also had a negative impact on math proficiency beyond the commitment of the school. Are the variables related to the aspect of school maintenance and directors respect for the teachers. This implies that students whose teachers did not disagree that the director gives special attention to issues related to school maintenance and/or disagree with not being respected by the director showed lower grades to those students whose teachers disagreed with one or both claims.

The variables that highlight the attention of director for the aspects related to the administrative rules and the collaboration of principals, teachers and other school members to work well had no significant impact on mathematics.

Table 10 summarizes the impact of the management variables.

Table 10: Summary of the impact of management variables

VARIABLES	Categories	Impact	
		Portuguese	Mathematics
Professional confidence in director		+	+
Commitment with school		-	-
Innovative activities	1 "Disagree"	-	+
Aspects related with students' learning	2 "Neutral"	No impact	+
Aspects related with administrative rules	3 "Partially agree"	+	No impact
Aspects related with school maintenance	4 "Fully agree"	+	-
Respected by the director		No impact	-
Collaboration for school work well		No impact	No impact

Source: GERES (2005-2008)

6   Conclusions

This project investigated the impact of school management variables on the educational performance of Portuguese and mathematics students from public and private schools that participate in the GERES project. In view of the difficulty of obtaining information relative to management, there are few works with this objective and therefore studies with this focus gain relevance.

Using a balanced longitudinal panel (from the GERES Project School Generation), estimates were made controlling the unobserved characteristics at fixed effects method. The main outcome of the work refers to the impact of school management component - measured as variables relating to principal answered by teachers - on students' proficiency. Management has little impact, but negative in Portuguese proficiency and in mathematics has no significant impact. However, to check the impact of management, variables individually was observed and some of these have significant and positive impact on Portuguese and math proficiencies. For example, having full professional confidence in the director positively impacts both proficiencies, the director give special attention to aspects related to the administrative rules positively impacts the note of Portuguese and director stimulate innovative activities has a positive impact on math proficiency. It was also noted that the control of the unobserved skills is necessary in order to make consistent estimates.

The impact of management variables is not completely divergent from the results presented in the pertaining literature. However this work presents some limitations. The management component used is restricted, because there may be measurement errors of the true quality of school management, since the analysis is made by teachers' perception. It is also possible that

there is no negative causal relationship between school management and performance, since even controlling for fixed effects there may be omitted variables.

Even considering these limitations, it was found that the researched management variable is significant to explain students' proficiency in Portuguese. Since the variable has importance to student learning, it should be studied in greater depth. Also one cannot forget the results since there are examples in both national and international literature on school management-related variables that impact negatively the performance of the students. That is, this work contributes to advance the analysis working with a longitudinal database and filtering effects of students fixed in time to examine the impact school managers participating in the GERES project on students' proficiency.

References

Azoulay, P., Zivin, J. S. G., and Wang, J. (2010). Superstar extinction. *The Quarterly Journal of Economics*, *125*(2), 549–589.

Ballou, D., and Podgursky, M. (1995). What makes a good principal? how teachers assess the performance of principals. *Economics of Education Review*, *14*(3), 243–252.

Barros, R. P. d., and Mendonça, R. S. P. d. (1995). Os determinantes da desigualdade no brasil.

Barros, R. P. d., and Mendonça, R. S. P. d. (1997). O impacto de gestão escolar sobre o desempenho educacional. *Washington: BID*, *39*.

Béteille, T., Kalogrides, D., and Loeb, S. (2011). *Stepping stones: Principal career paths and school outcomes* (Tech. Rep.). National Bureau of Economic Research, Inc.

Biondi, R. L., and de Felício, F. (2007). *Atributos escolares eo desempenho dos estudantes: uma análise em painel dos dados do saeb*. MEC–Ministério da Educação, INEP–Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira.

Blank, R. K. (1987). The role of principal as leader: Analysis of variation in leadership of urban high schools. *The Journal of Educational Research*, 69–80.

Bloom, N., Eifert, B., Mahajan, A., McKenzie, D., and Roberts, J. (2011). *Does management matter? evidence from india* (Tech. Rep.). National Bureau of Economic Research.

Clark, D., Martorell, P., and Rockoff, J. (2009). School principals and school performance. working paper 38. *National Center for Analysis of longitudinal data in Education research*.

Coelli, M., and Green, D. A. (2012). Leadership effects: School principals and student outcomes. *Economics of Education Review*, *31*(1), 92–109.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., and York, R. (1966). Equality of educational opportunity. *Washington, dc*, 1066–5684.

Eberts, R. W., and Stone, J. A. (1988). Student achievement in public schools: Do principals make a difference? *Economics of Education Review*, *7*(3), 291–299.

FELÍCIO, F., and Fernandes, R. (2005). O efeito da qualidade da escola sobre o desempenho escolar: uma avaliação do ensino fundamental no estado de são paulo. *Encontro Nacional de Economia*, *33*, 2005.

Hanushek, E. A. (1979). Conceptual and empirical issues in the estimation of educational production functions. *Journal of human Resources*, 351–388.

Hanushek, E. A. (2002). Publicly provided education. *Handbook of public economics*, *4*, 2045–2141.

Hoxby, C. M. (1996). How teachers' unions affect education production. *The Quarterly Journal of Economics*, 671–718.

Krueger, A. B. (1999). Experimental estimates of education production functions. *Quarterly Journal of Economics*, *114*(2).

Lück, H. (2000). Perspectivas da gestão escolar e implicações quanto à formação de seus gestores. *aberto, Brasília*, *17*(72), 11–33.

Lück, H. (2009). Dimensões da gestão escolar e suas competências. *Curitiba: Editora Positivo*.

Mingoti, S. A. (2005). *Análise de dados através de métodos de estatística multivariada: uma abordagem aplicada*. Editora UFMG.

Soares, J. F. (2004). Qualidade e eqüidade na educação básica brasileira: a evidência do saeb-2001. *Archivos analíticos de políticas educativas*, *12*(38), 1–24.

Soares, T. M. (2005). Utilização da teoria da resposta ao item na produção de indicadores sócio-econômicos. *Pesquisa Operacional*, *25*(1), 83–112.

Soares, T. M., and Teixeira, L. H. G. (2006). Efeito do perfil do diretor na gestão escolar sobre a proficiência do aluno. *Estudos em Avaliação Educacional*, *17*(34), 155–186.

Souza, Â. R. (2006). Perfil da gestão escolar no brasil. *São Paulo*, *302*.

Tavares, P. A. (2012). Os impactos de práticas de gestão escolar sobre o desempenho educacional: evidências para escolas estaduais paulistas. *São Paulo School of Economics Working Paper*.

Todd, P. E., and Wolpin, K. I. (2003). On the specification and estimation of the production function for cognitive achievement*. *The Economic Journal*, *113*(485), F3–F33.

Vieira, S. L. (2007). Gestão, avaliação e sucesso escolar: recortes da trajetória cearense. *estudos avançados*, *21*(60), 45–60.

Willms, J. D. (2003). *Monitoring school performance: A guide for educators*. Routledge.

Wooldridge, J. M., Souza, R. C., and Ferreira, J. A. (2006). *Introdução à econometria: uma abordagem moderna*. Pioneira Thomson Learning.

Xavier, A. C. d. R., Sobrinho, J. A., Marra, F., and Médici, A. C. (1994). *Gestão escolar: desafios e tendências* (No. 145). Instituto de Pesquisa Econômica Aplicada.

7 Appendix

Appendix 1: Categories of the variables

VARIABLES STUDENT	CATEGORIES	VARIABLES TEACHER	CATEGORIES
Sex	1 "Male" 2 "Female"	Sex	1 "Male" 2 "Female"
Race	1 "White" 2 "Mixed" 3 "Black" 4 "Yellow" 5 "Indigenous"	Age	1 "29 years or less" 2 "30 to 49 years" 3 "50 years or more"
		Postgrad	1 "Did not complete postgrad" 2 "Finished some sort of postgrad"
Student age	1 "8 years" 2 "9 years" 3 "10 years" 4 "11 years" 5 "12 years or more"	Experience	1 "Less than 1 year" 2 "From 1 to 2 years" 3 " From 3 to 4 years" 4 " From 5 to 10 year" 5 " From 11 to 15 years" 6 "Over 15 years"
		Has another job	1 "Yes" 2 "No"

Source: GERES (2005-2008)

Appendix 2: Factorial Analysis: Main components

ORIGINAL VARIABLES	Comp1*	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8
I have full confidence in the principal	0.366	-0.328	0.061	0.164	-0.158	0.031	-0.182	-0.818
The principal succeeds that the teachers commit to the school.	0.362	-0.191	0.158	-0.365	-0.494	0.125	-0.512	0.391
The principal stimulates innovating activities.	0.360	-0.343	-0.216	-0.206	-0.203	0.116	0.772	0.113
The principal gives special attention to aspects pertaining student learning	0.355	-0.287	-0.232	-0.265	0.768	-0.135	-0.222	0.099
The principal gives special attention to aspects pertaining administrative norms	0.345	0.559	-0.327	0.055	0.076	0.668	-0.060	-0.059
The principal gives special attention to aspects pertaining school maintenance	0.349	0.493	-0.284	-0.096	-0.206	-0.705	0.014	-0.072
I feel disrespected by the principal	0.353	-0.135	0.033	0.838	0.013	-0.091	-0.030	0.383
Principals, teachers and other faculty members collaborate for the well being of the school	0.340	0.287	0.826	-0.116	0.228	-0.008	0.233	-0.021
Self-evaluation	6.222	0.431	0.325	0.287	0.215	0.199	0.173	0.149
Explained Variance (%)	0.778	0.054	0.041	0.036	0.027	0.025	0.022	0.019

Source: GERES (2005-2008)

NOTE: *First component, then the so-called 'management component', explains by itself 77% of the total variance of the original variables.