

Public school management, leadership, and educational results in Brazil

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ABSTRACT

This study emphasizes the relationship between an internal school factor — the principal's leadership (as perceived by the school's teachers) — and an external school factor — the principals' selection process — with the students' academic results. Using data provided by external national assessments (*Prova Brasil*), test editions from 2007, 2009 and 2011, this quantitative study initially describes principals' profiles (considering all schools evaluated as to the fifth grade of elementary school). The research included the construction of a principal's leadership index through factor analysis and a variable that indicates how the principal was selected. Finally, a linear regression was developed in order to relate these variables to the fifth-grade students' performance in math (average per school). It was found that, after controlling for students' socioeconomic status, an internal school factor (a principal's leadership) and an external school factor (the principals' selection process) analyzed in this study have statistically significant associations with students' results, positive in the first case and negative in the second one.

KEYWORDS

public school management; leadership; principals; *Prova Brasil*.

GESTÃO ESCOLAR, LIDERANÇA DO DIRETOR E RESULTADOS EDUCACIONAIS NO BRASIL

RESUMO

Este estudo ressalta a relação entre um fator intraescolar — a liderança do diretor (percebida pelos professores da escola) — e um fator extraescolar — as políticas de provimento do cargo de direção da escola — com os resultados acadêmicos dos alunos. Utilizando-se dos dados das edições de 2007, 2009 e 2011 da Prova Brasil, o estudo, de natureza quantitativa, inicialmente descreve o perfil dos diretores das escolas avaliadas somente no 5º ano do ensino fundamental. O trabalho envolveu a criação do índice de liderança do diretor por meio da análise fatorial e da variável indicativa do provimento de cargo do diretor. Por fim, desenvolveu-se uma regressão linear buscando relacionar essas variáveis ao desempenho dos alunos do 5º ano (proficiência média em matemática na Prova Brasil). Foi possível verificar que, quando controlado o nível socioeconômico dos alunos, os fatores intraescolar e extraescolar analisados possuem associações estatisticamente significativas com os resultados dos alunos do 5º ano.

PALAVRAS-CHAVE

gestão escolar; liderança; direção; Prova Brasil.

DE ESCUELA, LIDERAZGO DEL DIRECTOR Y RESULTADOS EDUCATIVOS EN BRASIL

RESUMEN

Este estudio pone de relieve la relación entre un factor intraescolar — el liderazgo del director (percibido por los maestros de la escuela) y un factor extraescolar — el acceso del director a su puesto — a los resultados académicos de los estudiantes. Utilizando los datos de las ediciones de 2007, 2009 y 2011 de la *Prova Brasil*, el estudio cuantitativo inicialmente describe el perfil de los directores de las escuelas evaluadas en el quinto año. El trabajo consistió en la creación del índice de liderazgo del director por través del proceso de análisis factorial y un variable indicativo de la forma de acceso al puesto de director. Una regresión lineal fue desarrollada relacionando estas variables con el desempeño de los estudiantes del quinto año (promedio por escuela). Se encontró que, controlando por el nivel socioeconómico de los estudiantes, los factores intraescolar y extraescolar analizados tienen una asociación estadísticamente significativa con los resultados de los alumnos.

PALABRAS CLAVE

gestión de escuela; liderazgo; dirección de escuela; *Prova Brasil*.

INTRODUCTION

Over the last 20 years in Brazil, the public education system has undergone significant changes that are among the most important social challenges to the country. Despite the fact that over the last decade of the 20th century almost all children (97%) aged 7 to 14 years have gained access to primary education, school performance indicators have repeatedly been lower than those mandated by national and international evaluation systems (Barbosa, 2009; Brooke and Soares, 2008; Oliveira and Araújo, 2005; Soares and Alves, 2013).

In this context, several proposals for reform have been subject of both public and academic discussions seeking improvements in the quality of the public education system, and feature increased focus on the work done within the schools themselves as a means to reverse this situation. Among the various aspects of school work, management — specifically school management — has occupied a prominent place in the educational policy agenda since the 1990s (Freitas, 1998).

Beginning with a quantitative study based on data provided by the last editions of *Prova Brasil* (2007, 2009 and 2011), this study takes into account the principals' leadership in municipal and state public schools of Brazil, also considering the relevance of this theme as highlighted in national and international literature (Medeiros, 2007; Brooke and Soares, 2008; Franco *et al.*, 2007; Leithwood, 2009; Rosistolato, Prado and Fernández, 2015; Urick and Bowers, 2014).

Using multilevel analysis, the study discusses the principal's leadership based on two indicators. The first indicator refers to an internal aspect of the school: the teachers' perceptions of the principal's job, which we describe as principal's leadership, to be discussed below. The second one refers to how the principal took up the office, that is, an external factor determined by local educational policies. We then attempt to verify how these two indicators are associated with students' performance on math tests in the last editions of *Prova Brasil*. It is from this perspective that we investigate the relationship between the principal's leadership — recognized and legitimized as such by the teachers of their — with school performance. To do so, we assume the conception of Marks and Printy (2003) about principal's leadership and select variables from the contextual questionnaires of *Prova Brasil* to build the principal's leadership index, based on a factorial analysis of teachers' answers, as will be detailed in the following sections.

For the body of research, contextual questionnaires were filled out by the principal, teachers, and fifth-grade students of municipal and state public elementary schools which participated in the 2007, 2009 and 2011 editions of *Prova Brasil*. These schools had only fifth-grade students analyzed, thus the study covers the early years of elementary school. This work presents the development of an exploratory statistical study and its results, in addition to suggesting topics for future research in this field.

SCHOOL MANAGEMENT

Numerous national and international studies in educational sociology have indicated that although family background plays a significant role in a student's

academic performance, some intra-school factors could minimize the effect of social origin, promoting efficacy and fairness in the provision of education (Brooke and Soares, 2008; Sammons, 2008). It has been noted that extra-curricular factors (socioeconomic conditions, parental schooling, etc.) were found to not correspond solely to academic success or failure, and studies on the effectiveness of public education have prioritized the investigation of intra-school factors. Authors who sought to measure this effect have indicated that, controlling for variables indicative of the students' characteristics of origin, 10% to 20% of the variance in results could be explained by school's internal aspects (Creemers and Reezgit, 1996). Several studies have been carried out in this area aiming to isolate the socio-demographic characteristics of the populations attending public schools, thus identifying school factors that promote effective learning for all students.

Sammons (2008) conducted an extensive survey on results of research from several countries in this area. The author synthesized eleven key efficacy factors that should be considered together, that is, in various possible associations between them: professional leadership; shared goals and visions; learning environment; concentration in teaching and learning; teaching and clear objectives; high expectations; positive incentives; monitoring progress; student rights and responsibilities; home-school partnership; and learning-oriented settings. The author draws attention to questions regarding the context where these characteristics were identified, noting that these studies are not directly transferable to other contexts (Sammons, 2008).

In the field of national educational research, this discussion is more recent. Alves and Franco (2008) have analyzed the context and research progresses on school effectiveness in Brazil and presented a review of national literature on this subject. Based on this survey, the authors summarize internal school factors associated with effectiveness addressed by national studies: school resources; school organization and management; academic climate; teacher training and salary; pedagogical emphasis. From this survey, significant clues about the positive effects of the first three factors on students' academic development have been found in national studies. The authors (Alves and Franco, 2008) cite, specifically, the research conducted on Brazilian schools that points out the perception of the principal's leadership and dedication as a feature directly associated with school effectiveness.

For the purpose of this study, we highlighted school management — commonly associated with or identified as principal's leadership — as relevant to students' academic outcomes, taking into account the remarks by Sammons (2008, p. 351-352, our translation):

Almost all school effectiveness studies show leadership as being a key factor in both primary and secondary schools. Gray (1990) states that “the importance of leadership is one of the clearest messages in school effectiveness research”. The study of the literature reveals that three characteristics were often found associated with successful leadership: strong purpose; involvement of other employees in decision-making; and professional authority in teaching and learning processes.

Several authors claim that principals can play an important role in school work organization by leading and coordinating their routines. The mobilization of other professionals towards a more effective teaching-learning, through the articulation of planning, organization and monitoring/evaluation, indirectly influences the students' performance (Soares and Teixeira, 2006).

Having devoted the last two decades to studies on school leadership and the role of a principal, Leithwood (2009, p. 17, our translation) emphasizes the attention given to the theme:

School leadership is currently the subject of unprecedented attention. The agenda of educational reform, in its ongoing evolution, seems to have captured the fact that the role of leadership is itself an important goal, and, at the same time, a means for other things to happen.

The author highlights the relevance of classroom practices among factors that can influence students' results more directly, but points out that the performance of principals also has an effect on students' learning, albeit indirectly. Considering recent studies on the effects of a principal's work on learning effectiveness, Leithwood points out that, although school leadership only accounts for 3% to 5% of variance in student learning between schools, it represents a quarter of the total variance when adjusted for variables related to students' origins and when only internal school factors were analyzed (Leithwood, 2009).

Soares (2007, p. 153) also highlights the importance of management as an internal factor related to school effectiveness. He considers that "inside the school, there are two important processes that interact and produce student performance: school management and teaching". According to the author, the responsibility of principals involves managing pedagogical aspects, the people who make up the school community, and the physical and financial aspects that organize the institution. Thus, management actions imply guaranteeing the proper functioning of the school "so that the resources available can be used to meet students' learning needs" (Soares, 2007, p. 153). The tasks of reconciling and maintaining an environment conducive to learning, sharing goals with teaching staff, and favoring collective work development (so that agents feel included in the process) have been pointed out as strategies for effective management.

Sammons (2008) also considers that the impact of school management quality on the improvement of students' academic outcomes is not direct, but enabled by truly behind-the-scenes work that seeks to guarantee the development of other characteristics identified as essential for school effectiveness, namely: shared goals and visions; learning environment; positive incentives; home-school partnership; learning-oriented settings; and monitoring of students' academic progress. That being said, our study seeks to deepen knowledge about the association between a principal's leadership skills (as measured by teachers' perception) and the academic results achieved by the school.

Among numerous international papers on this subject, Leithwood, Patten and Jantzi (2010) and Leithwood and Sun (2012) studied the different types of

school leadership and their impact on students' performance and school climate. It is worth mentioning instructional leadership (focusing on pedagogical issues) and Transformational Leadership (which implies mobilization and teacher participation), the latter showing a moderate but significant and positive effect on school routine. These studies also showed the positive effects of variables such as "goals shared by the whole team" on learning improvement. In this same direction, other research has emphasized the relevance of a relationship between a school's principal and teachers in improving school's outcomes (Hulpia, Devos and Keer, 2011; Jackson and Marriot, 2012; Price, 2012), corroborating the importance of investigating how teachers perceive and relate to their principals' leadership.

Marks and Printy (2003) propose the concept of integrated leadership, bringing together pedagogical (instructional) and transformational leadership. The main goal is to combine different practices seen in effective schools, thus improving the measurement and effects of leadership on student's learning outcomes. Therefore, from this point of view, school principals should consider all dimensions of leadership (pedagogical and/or instructional management, trust and recognition, relationships with school agents, administrative management, etc.). It is from this perspective that this study aims to investigate the relationship between the principal's leadership — recognized and legitimized as such by the teachers they lead — and school performance. By applying the concepts by Marks and Printy (2003), we chose variables from the contextual questionnaires of *Prova Brasil* to compose the Principals' Leadership Index, based on teachers' responses to such instruments, and used a factorial analysis, to be described in the following sections.

METHODOLOGY AND RESEARCH DATA

The data used in this study were collected from the last three accessible editions of *Prova Brasil* (2007, 2009, and 2011), through the contextual questionnaires answered by principals, teachers, and students of the grades evaluated. As Franco (2001, p. 130) points out, since only teachers in the grades tested by *Prova Brasil* (5th and 9th grades) filled in the questionnaires, their answers provide only a partial view of the school (and its principal). Important to point out that the perceptions of this group of teachers (on average four to seven teachers per school) about the school principal may not coincide with those of the faculty, which might generate bias in data interpretation.

Aware of this limitation, we decided to work with data regarding all Brazilian schools tested by *Prova Brasil* (in 2007, 2009, and 2011) but only in the fifth grade of elementary school. This outline also took into account the fact that the teachers who answered the questionnaires were responsible only for the grades being evaluated. As fifth grade teachers teach all subjects and are in school every day, the index of unanswered questionnaires was much lower than among ninth-grade teachers. Thus, even with the possibility of bias, we can assume that the insights may be plausible approximations to those of the school's faculty in an exploratory investigation, given the limitations of data available.

The following Table 1 shows data used in the present study.

The data, provided by the National Institute of Educational Research Anísio Teixeira (INEP) were organized and worked statistically using the software *Statistical Package for Social Sciences* (SPSS) version 19.

Initially, data from the questionnaires answered by principals in the 2007, 2009, and 2011 editions of *Prova Brasil* throughout the country were analyzed, including more than 5,600 municipalities distributed in all 26 states and one Federal District. We outlined the profile of these principals (socio-demographic characteristics, how they got to the position at the school, training, and professional experience) and analyzed the evolution of this information in the period (2007 to 2011). Then, using data from the teachers' questionnaires, a factor analysis was conducted to synthesize fifth grade teachers' perceptions about their principal, building our first indicator of principal leadership: the principal's leadership index (PLI).¹ When creating PLI, we considered teachers' answers, in a concordance scale, for the items presented in Table 2, and respective factorial loads. The PLI was then aggregated per school for each edition of *Prova Brasil*. Thus, the final PLI represents the average index of respondent teachers' perceptions about the leadership of each school's principal.

The description of Brazilian principals' profile based on answers to the contextual questionnaire of *Prova Brasil*, presented in the next section, shows different possibilities of access to this position, according to different state and municipal legislation. The means to a principal taking over their role in a school (referral, proof of technical ability, election, and others) may be related to their work performance. Positive correlations between selection criteria for school principals (technical criteria combined or not with election) and the existence of school councils, class councils along with pedagogical projects have already been demonstrated (Gomes,

Table 1 – Schools and Questionnaires of Prova Brasil

	Schools evaluated	Municipal and state schools with only fifth grade evaluated ²	Teachers who answered the questionnaire
2007	47,596	20,960	168,751
2009	58,374	25,913	89,146 ³
2011	56,222	24,433	150,881

Source: *Prova Brasil* 2007, 2009 e 2011 (Brazil, 2008, 2010, 2012).
Elaboration of the authors.

- 1 Extraction Method: Principal Component Analysis.
- 2 We decided not to consider federal schools in this study given their very specific characteristics, especially regarding working conditions.
- 3 Preliminary studies with data from the 2009 edition of *Prova Brasil* indicated high indexes of missing data in contextual teacher's questionnaires, but we found that these were equally distributed among the evaluated schools, with no significant bias between regions, systems, teachers or school structures.

2015). The relevance and timeliness of this theme are explicit in the current National Education Plan (PNE 2014-2024), whose Goal 19, in strategy 1, prioritizes

voluntary funding by the federal government in educational area to federated entities that approved specific legislation regulating this subject, thus complying with national legislation and considering, when assessing school principals, technical criteria of merit and performance and the school community participation. (Brasil, 2014)

Given the importance of this information in legitimizing a school principal's role in the performance of their duties, we sought to investigate to what extent the means of choice of a principal could be related to student outcomes. For this purpose, a binary variable (IND_PRIN) was defined to keep record of the different ways of being appointed to a principal's position. Then, this variable's behavior was analyzed in the linear regression model.

Then, we used valid data from the contextual questionnaire applied to fifth-grade students in state and municipal schools assessed, as presented above. In the analysis of schools' socioeconomic characteristics, the level of formal education of parents was considered as informed in students' contextual questionnaires as a proxy or average of their Socio-Economic Level (SEL). This choice was made because we considered a close relationship between socio-economic stratum and schooling trajectory, pointed out in several other studies (Curi and Menezes-Filho, 2006; Hasenbalg and Silva, 2000; Menezes-Filho, 2007; Silva and Barbosa, 2012,

Table 2 – Factorial loads for variables related to the Principals Leadership Index (Teacher Questionnaires 2007, 2009 and 2011)

Variable	Factorial loads		
	2007	2009	2011
The principal stimulates and motivates me in my job	0.856	0.862	0.872
I fully trust the principal as a professional	0.887	0.886	0.895
The principal gets the teachers to commit to the school	0.835	0.830	0.842
The principal encourages innovative activities	0.871	0.868	0.879
The principal gives special attention to issues related to students' learning	0.860	0.853	0.869
I feel respected by the principal	0.789	0.785	0.807
I respect the principal	0.623	0.607	0.648
Variance explained	67.47%	66.88%	69,56%
KMO	0.916	0.907	0.918
Alpha by Cronbach	0.918	0.917	0.926

Source: *Prova Brasil* 2007, 2009 e 2011 (Brazil, 2008, 2010, 2012).
Elaboration of the authors.

among others). This information was grouped per school, thus defining an average SEL for each unit.

As a means of measuring learning/school performance, we chose to use the average results of fifth graders in Brazilian public schools (state and municipal) in mathematics. It is worth pointing out this curricular component was chosen because of its scholarly character, as stated by Rutter *et al.* (2008). The performance results of fifth-grade students were also aggregated by school unit, thus creating an indicator for fifth-graders average performance in mathematics, in Brazilian state and municipal schools participating in the already mentioned editions of *Prova Brasil*.

The following step was to discuss how and to what extent the PLI and the form of appointment to the role (IND_PRIN) was related to learning performance of fifth grade students, considering the educational network (state or municipal). One must not lose sight of the issue of regional differences (to be presented in the section that follows), which have historically impacted Brazil's educational and social inequalities. The relationship between these variables (PLI, IND_PRIN and student performance) was assessed by linear regression models adjusted for the different editions of *Prova Brasil*. Table 3 below summarizes the description of these variables:

WHO ARE THE PRINCIPALS OF PUBLIC (STATE AND MUNICIPAL) SCHOOLS IN BRAZIL?

In this section, we present a general profile of the principals of Brazilian public schools, based on data obtained from schools that were tested in fifth grade in *Prova Brasil*, editions of 2007, 2009 and 2011.

Table 3 – Appointment of principals by Education System in 2007, 2009 and 2011

Variable	Type of variable	Description
Dependent		
RES_ACAD	Continuous	Average mathematics proficiency test scores for fifth grade students in the <i>Prova Brasil</i> (2007, 2009, and 2011), in schools selected for the study
Independent		
SEL	Continuous	Socio-economic level (SEL) — percentage of parents who have high school or college degree.
PRI	Continuous	Principal's leadership Index (Q60, Q61, Q62, Q63, Q64, Q67, Q68)
IND_PRIN	Binary	Principals who were recommended for appointment (political, technical or other)

Source: *Prova Brasil* 2007, 2009 e 2011 (Brazil, 2008, 2010, 2012).
Elaboration of the authors.

Among the principals of this group of schools, the female population prevails in all three editions (89.6% in 2007, 88% in 2009 and 85.9% in 2011). Regarding color, principals are considered to be predominantly white (49.4% in 2007, 46.3% in 2009 and 44.3% in 2011) and mixed race (38.5% in 2007, 43.3% in 2009 and 41.5% in 2011).

In regard to academic education, a reduction has been observed in the percentage of principals without a university degree over the period (2007 = 10.6%, 2009 = 9.6%, 2011 = 9.2%). However, we also observed some discrepancies in the distribution of this variable at the state level. One example that stands out is the State of Bahia, which had the highest percentage of principals without undergraduate degrees: 40% in 2007, 27.8% in 2009 and 24% in 2011. Despite a significant reduction in this percentage between 2007 and 2009 (a probable consequence of new policies for appointing principals in that state), the percentages in Bahia are still much higher than the national average.

Regarding access to the position of principal, Mendonça (2001) observed that the appointment of principals for public schools in Brazil has traditionally followed four models: political or technical nomination, public contest, direct vote election by the community, and a mixed model, which integrates features of the other three. A descriptive analysis of the data showed a small decrease in the percentage of principals who were appointed to their position through more participatory processes (involving elections within the school community) combined or not with selection processes (based on educational background, experience and, sometimes, the elaboration of an action plan). These findings indicate that, in practice, the assignment of the position of school principal still runs counter to legal recommendations for democratic participation in school management, or at least the paradigm of democratic management present in the Federal Constitution of 1988 and in the LDB/1996 is still being interpreted in different ways in subnational systems.

In fact, less than half of the Brazilian public school principals in our sample assumed their position through public tender, election or a combination of these procedures (39.6% in 2007, 38.2% in 2009 and 36.6% in 2011). On the other hand, 42.8% (2007), 45.2% (2009) and 45.9% (2011) of the Brazilian principals responsible for the schools analyzed were nominated. An average of 48.8% of these nominations were political, according to principals. It is very important to note, however, that these percentages differ a lot between municipal or state education systems, as summarized in Table 4:

Brazilian legislation, based on the Federal Constitution of 1988, defines states and municipalities as federated entities, and therefore gives them the right to autonomously decide their legislation on educational systems and their organization, which explains such differences. Gomes (2015, p. 159) considers that the present PNE seeks to modify this definition, without, however, hurting the autonomy of the federated entities:

The legislator's decision to link PNE goal 19 to technical merit and performance criteria and to public consultation of the school community seems appropriate, without, however, establishing the forms and processes involved, which are the most appropriate subject to be considered in sub-national spheres. It is about respecting the administrative autonomy of the federated entities.

Nevertheless, we considered the high index of principals stating that they have assumed their position through the indication and the relevance of this information for the management of the school, reinforcing our decision to investigate the contrasts between the state and municipal school systems in this regard.

PRINCIPAL'S LEADERSHIP, ACCESS TO PRINCIPALSHIP AND SCHOOL OUTCOMES

We developed a linear regression model to verify the association between both PLI and the different means of access to school leadership (IND_PRIN) and the learning outcomes of the school. The dependent variable used in the model was the average proficiency of fifth grade students in a mathematics test at every school in each edition of *Prova Brasil* (RES_ACAD). The socioeconomic level (SEL) of the student's family, previously described, was used as the control variable. Hence, the effects found for the analyzed variables considered socio-economic differences between students.

The regression Equation of de Regression used as reference for the analysis followed the formula:

$$\text{RES_ACAD} = \beta_0 + \beta_1 (\text{SES}) + \beta_2 (\text{PLI}) + \beta_3 (\text{IND_PRIN}) + \epsilon$$

Tables 5, 6 and 7 below present the descriptive statistics of the variables in each of the editions of the *Prova Brasil* analyzed in this study:

As one can observe in the tables above, overall academic results improved over the three editions of *Prova Brasil*. It is worth noting, however, that the small improvement in school results for mathematics is unfortunately not observed in the final years of middle school (ninth grade), suggesting that the quality of education in Brazil continues to be a challenge for public policies (Coelho, 2008; Soares, 2007).

Table 4 – Variables used in the model

	2007		2009		2011	
	Municipality %	States %	Municipality %	State %	Municipality %	States %
Public tender or election	35.3	55.6	27.0	53.3	33	55.6
Recommendation*	57.9	29.4	50.5	20.9	57.8	26
Other	5.7	13.9	4.6	11.6	6	14.4
No response	1.1	1.1	17.9	14	3.2	4
Total	100	100	100	100.0	100	100

*By politicians, technical staff, or others

Source: *Prova Brasil* 2007, 2009 e 2011 (Brazil, 2008, 2010, 2012).

Elaboration of the authors.

As previously explained, this study assumes the concept of integrated leadership (Marks and Printy, 2003), adding the characteristics related to a pedagogical or instructional management and other characteristics related to a relational management, especially those encompassing trust-based relationships and recognition by school faculty. The index constructed (PLI) aimed to synthesize the teachers' perception of the school principal in terms of motivation, trust, teacher-principal relationship, as well as their commitment to students' learning outcomes. The negative minimum value observed for the PLI indicated the existence of a negative perception of the principal's leadership in some schools. The PLI average shows a significant drop in 2009 and a small increase in 2011. We have not yet studied this variation in depth, but we hypothesize that the growing diffusion of accountability policies in recent years in Brazil (Brooke, 2006, 2008, 2013) may be influencing teachers' perceptions of the principals' leadership and increasing

Table 5 – Descriptive statistics of the variables used in the model, 2007

Variables	Minimum	Maximum	Mean	Standard deviation
RES_ACAD (Fifth grade mathematics)	131.32	320.88	188.879	20.743
SES	0.00	1.00	0.248	0.127
PLI	-4.23	1.18	0.0386	0.845
IND_PRIN	0	1	0.520	.500

Source: *Prova Brasil 2007* (Brazil, 2008).
Elaboration of the authors.

Table 6 – Descriptive statistics of the variables used in the model, 2009

Variables	Minimum	Maximum	Mean	Standard deviation
RES_ACAD (Fifth grade mathematics)	102.24	316.44	197.299	26.858
SES	0.00	1.00	0.236	0.133
PLI	-4.48	1.14	0.023	0.892
IND_PRIN	0	1	0.550	0.498

Source: *Prova Brasil 2009* (Brazil, 2010).
Elaboration of the authors.

Table 7 – Descriptive statistics of the variables used in the model, 2011

Variables	Mínimum	Maximum	Mean	Standard deviation
RES_ACAD (Fifth grade mathematics)	130.58	314.46	202.609	27.050
SES	0.00	1.00	0.252	0.132
PLI	-4.76	1.06	0.024	0.865
IND_PRIN	0	1	0.540	0.498

Source: *Prova Brasil 2011* (Brazil, 2012).
Elaboration of the authors.

attention on the learning outcomes of the students. It seems pertinent to consider the hypothesis that such extracurricular policies interfere directly with school management, bringing new demands (Paes de Carvalho, Oliveira and Lima, 2014), both administrative and instructional, and certainly affect perceptions and relationships within the school.

In relation to access to the principal position, the predominance of recommendations was confirmed (technical, political or otherwise). The appointment of principals in Brazilian public schools (historically a local political choice, which may not consider any educational or management qualifications) is part of the tradition in Brazilian public administration. These practices seem to find fertile ground, especially at the municipal domain, often creating a space for political and partisan patronage — an issue that has been widely criticized in educational literature (Maia and Manfio, 2010; Mendonça, 2001). In the three editions of *Prova Brasil* studied, variations were observed in this aspect, being observed an increase in the use of public contests — especially in state educational systems — with proof of qualifications, as well as processes that combine these selection mechanisms with ratification by the community, either through consultation or voting. In this study, we observed in all the three editions of the *Prova Brasil* analyzed a negative correlation between the learning outcomes of a school and the fact that the principal was nominated for their position (see Tables 8, 9, 10).

Table 8 – Coefficients of the first estimated model (2007)

	State schools			Municipal schools		
	b	Sig.	D.P.	B	Sig.	D.P.
RES_ACAD (Constant)	***	0.000	0.650	***	0.000	0.403
SES	0.419	0.000	1.994	0.381	0.000	1.236
PLI	0.088	0.000	0.320	0.079	0.000	0.175
IND_PRIN	-0.129	0.000	0.580	-0.137	0.000	0.309
	R ² = 0.203			R ² = 0.192		

Source: *Prova Brasil* 2007 (Brazil, 2008).
Elaboration of the authors.

Table 9 – Coefficients of the second estimated model (2009)

	State schools			Municipal schools		
	b	Sig.	D.P.	B	Sig.	D.P.
RES_ACAD (Constant)	***	0.000	1.403	***	0.000	0.528
SES	0.419	0.000	3.101	0.393	0.000	1.600
PLI	0.112	0.000	0.455	0.109	0.000	0.222
IND_PRIN	-0.235	0.000	0.916	-0.175	0.000	0.415
	R ² = 0.273			R ² = 0.230		

Source: *Prova Brasil* 2009 (Brazil, 2010).
Elaboration of the authors.

Table 10 – Coefficients of the third estimated model (2011)

	State schools			Municipal schools		
	b	Sig.	D.P.	B	Sig.	D.P.
RES_ACAD (Constant)	***	0.000	0.933	***	0.000	0.473
SES	0.416	0.000	2.652	0.399	0.000	1.386
PLI	0.125	0.000	0.439	0.131	0.000	0.199
IND_PRIN	-0.187	0.000	0.798	-0.145	0.000	0.362
	R ² = 0.246			R ² = 0.229		

Source: *Prova Brasil* 2011 (Brazil, 2012).
 Elaboration of the authors.

The analysis of the linear regression having as a dependent variable the academic results of fifth-grade students in mathematics tests and as control variable the school’s average SEL, showed that the index created (PLI) is positively correlated with the school’s learning outcomes. From these results, we can infer that the principal leadership fosters an improved institutional climate for more effective pedagogical work, which, in turn, is conducive to a better student performance. We also highlight the negative and statistically significant association between “having principals appointed to the position” and students’ performance. As the regression results showed, the variables used in the estimated models were responsible for explaining approximately 20% of the variation in mathematics test results of fifth-grade students in each edition of *Prova Brasil* studied.

It is also interesting to note that the predictor variables had a stronger correlation in state schools than in municipal schools. One plausible hypothesis for this result is that, among 5,600 municipalities in a continental country (especially with very diverse contexts such as in Brazil), there is a greater variability in measurements at the municipal level. This difference may imply the need to add other predictors to more accurately explain local specificities, particularly in municipal networks. The relevance of future investments in research in this regard is even greater, if we consider that municipal education systems are responsible for elementary education and concentrate about 70% of the enrollment for 5th grade in public education in the country.

FINAL CONSIDERATIONS

One of the greatest challenges for public education in Brazil is keeping students in schools with good academic results. Considering the matter of equity in learning across schools, this study investigated possible associations between students’ performance and two key factors: one in-school factor (principal leadership) and one out-of-school factor (related to the process for choosing the school’s principals in different educational systems). The first one was measured by the teachers’ perception about the leadership of their school’s principal. The second one relates to the means of access to the principals’ positions in Brazilian public schools, a process defined locally by each school network. The statistical analysis was based on information provided

by the contextual questionnaires answered by principals, teachers and fifth-grade students from public schools included in three editions of *Prova Brasil* (2007, 2009 and 2011). The study aimed to identify an internal factor (the principal's leadership, as perceived by the school's faculty) and an external factor related to the policies in educational systems (namely, how principals are appointed to their position), investigating the extent to which it can affect students' outcomes.

The results indicate a positive association between average school performance of fifth-grade students in math tests and principal leadership; on the other hand, there was a negative association between the same students' performance and the fact that the principal was nominated for their position (in most cases via political recommendation). As an exploratory study, these results provide some clues about the relationships between the factors analyzed, although they did not allow us to establish causality. We hope that these clues encourage new research and thus deepen the debate on public policies related to democratic school management. This could stimulate, for example, more transparency in the principals' selection process, including public definition of criteria, thus ensuring their legitimacy and recognition by faculty. The results herein discussed indicate two important factors in school management that pose a statistically significant influence on students' outcomes, both of them related to the principals' role and functions, suggesting relevant topics for further investigation and discussion.

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