

## EXCELLENCE WITH EQUITY: THE IMPORTANCE OF SCHOOL FACTORS FOR STUDENT SUCCESS IN UNFAVOURABLE CIRCUMSTANCES

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*This study analyzes the determinants of success of a group of public schools that served students of low socioeconomic status (Excellence with Equity study). Based on Prova Brazil data, we test whether there is a difference between the prevalence of school factors in the 215 schools identified by the Excellence with Equity study compared to schools with similar characteristics in 2007 but which did not show the same performance regarding the learning of their students thereafter. Taking into account statistical significance, results show that the treatment schools have principals who have been more highly rated by teachers for their leadership attributes; better facilities and operating conditions; more cohesive management and teaching teams; better working conditions for teachers; more learning opportunities; and less school violence. It is also possible to infer that the presence of better educational and infrastructure-related conditions in treatment schools may be a result of the effective management of resource.*

### INTRODUCTION

This project is a further study based on the publication "*Excelência com Equidade: as lições das escolas brasileiras que oferecem educação de qualidade a alunos de baixo nível socioeconômico*" [*Excellence with Equity: the lessons of Brazilian schools offering quality education to students of low socioeconomic status*], prepared by the Lemann Foundation and Itaú BBA in Brazil. The goal of this study is to analyze the prevalence of school factors in the *Excellence with Equity* school (*treatment group*) compared to schools also attended by disadvantaged students, with similar quality levels and in the same city in the baseline year (*control group*). To accomplish this objective, we use: i. propensity score matching methods for the identification of an appropriate *control group*; ii. Item Response Theory model for the estimation of latent school factors; and iii. statistical tests of mean differences between matched groups.

### DATA & METHODS

In this study, we used the micro data of the Prova Brazil 2007, 2009, and 2011 (INEP). Prova Brazil is a public data set and makes information available concerning student performance and school factors through the contextual questionnaires of teachers, students, schools, and directors, and covering the whole universe of Brazilian public schools.

The theoretical framework of this study is the model for effective schools developed by Murphy *et al.* (Hallinger & Murphy, 1986; Murphy, Hallinger, & Mesa, 1985). The authors conceptualize school effectiveness related to scholastic processes, such as a safe environment, a sense of community, the professional development of school staff, the academic mission, school leadership, monitoring, and high expectations. This conceptual framework guided the choice of the factors of school effectiveness which were tested as being fundamental in explaining the observed high performance of the schools in the treatment group.

Based upon the conceptual model of Murphy *et al.* (Hallinger & Murphy, 1986; Murphy, Hallinger, & Mesa, 1985) that conceptualizes school effectiveness related to school factors, we investigated the prevalence of the following school factors in treatment and control schools: intra-school cohesion, teacher's education, teacher's experience, teacher's work conditions, absence of learning opportunities at the school, the quality of the library, the quality of the school facilities, the availability and state of equipment, the school operating conditions, the school climate, the teacher assessment of the principal's attributes, the experience of the director and the principal's educational training. These latent constructs were measured upon the basis of the information available in the Prova Brazil and compiled using the Item Response Theory (Samejima, 1969).

Based upon the questionnaires, we conducted a selection of relevant variables which are correlated with the latent trait. Technical details about the application of the methodology are discussed by Kolen and Brennan (2004). Once the measurements have been obtained, we change the scales to situate them within the limits from 0 (lowest observed rate of the construct – worse situation) to 10 (highest observed rate of the construct – better situation).

In this study, we consider that the *treated* schools should be similar to *control group* in the initial period (2007) in regards to: i. *quality of the education level*; ii. the *context of the education system*, and iii. the *socioeconomic level of the school*. We adopted two specifications for the regional context that drives our analysis: Matching 1, that matches schools based on the municipality code and Matching 2 (size of the school population). We hypothesize that if there exists a significant difference between the *treatment and control* according to the specification of the matching, there will be evidence of a "school system effect" concerning school factors.

Next, we proceeded with the propensity score matching between the schools participating in the study Excellence with Equity and similar schools and, after statistical tests to validate the balancing properties, appropriate control groups were obtained for the analysis. All matched schools were restricted to the common support of the propensity score, ensuring the existence of observations for the treatment and control groups.

After selecting the control group using the propensity score method, this group is then paired to the treatment group. Statistical tests were conducted to test for the difference in the prevalence of the school factors in the treatment and control groups after 2007.

## RESULTS

Initially, the difference was tested in the prevalence of school factors as seen in their isolated components in 2009 and 2011, followed by the two matching specifications. Table 1 presents the estimates of the differences between component variables of school efficiency factors among the treatment and control groups and the significance levels. A significance level of 0.10 was considered to be acceptable. We expected that schools in the treatment group have a higher prevalence of school efficiency factors than do the control schools, since it is expected that the sign of the difference between the treatment and control groups will be positive and statistically significant (less than 10%).

Viewed globally, the results show that schools in the treatment group have a set of school characteristics which are favorable compared to those of the control group: facilities which are in better condition (walls, roof, floor, bathrooms) and well ventilated; increased availability and improved state of some equipment, such as television and computers for use by students and teachers; a higher proportion of schools that have a librarian; little or no occurrence of problems at the school which affect its operation; a better school climate, with a lower incidence of episodes of violence or crime in the schools; more learning opportunities; higher rates of teachers that completed a undergraduate degree; principals who are more recognized by teachers regarding their leadership qualities.

Table 1: Estimates of the difference and probability of significance of the prevalence of school factors treatment and control groups by matching specification

Variable	2009				2011			
	Matching 1		Matching 2		Matching 1		Matching 2	
	Difference	p-value	Difference	p-value	Difference	p-value	Difference	p-value
Quality of the facilities								
Evaluation of the roof	-	-	-	-	-	-	0.137	0.057
Evaluation of the walls	0.128	0.05	0.112	0.076	-	-	0.141	0.063
Evaluation of the floor	0.149	0.07	0.144	0.083	0.118	0.072	0.166	0.032
Evaluation of the halls	-	-	0.112	0.072	-	-	-	-
Evaluation of the bathrooms	-	-	0.146	0.085	-	-	0.204	0.003
Evaluation of the classrooms	0.113	0.08	0.129	0.100	0.118	0.03	0.175	0.005
Evaluation of the kitchens	-	-	-	-	-	-	0.207	0.010
Evaluation of the doors	-	-	-	-	0.138	0.03	0.176	0.034
Evaluation of the windows	-	-	-	-	0.029	0.69	0.179	0.086
Evaluation of the hydraulic installations	-	-	-	-	-	-	0.167	0.040
Evaluation of the electrical installations	-	-	0.154	0.068	-	-	-	-
Classrooms are well ventilated	-	-	-	-	-	-	0.057	0.075
Availability of equipment								
Television available	-	-	-	-	-	-	0.099	0.012
Satellite dish available	-	-	-	-	0.165	0.06	-	-
VCR or DVD available	-	-	-	-	0.096	0.03	-	-
Copying Machine (Xerox) available	-	-	-	-	-0.308	0.00	-0.370	0.003
Stereo equipment available	-	-	-	-	0.131	0.01	0.155	0.002
Computer available for exclusive use by students	-	-	-	-	0.130	0.02	-	-
Computer available for exclusive use by teachers	-	-	-	-	0.146	0.01	0.151	0.029
Computer available for exclusive use by administration	-	-	-0.069	0.064	0.100	0.01	-	-
Library								
Students borrow books	-	-	-	-	0.048	0.00	0.029	0.090
Teachers borrow books	-	-	-	-	0.033	0.04	-	-
There is a librarian	0.092	0.07	0.114	0.011	-	-	-	-
Operating conditions								
Little or no insufficiency of financial resources	-	-	0.121	0.082	-	-	-	-
Little or no insufficiency of pedagogical resources	-	-	0.133	0.068	-	-	0.090	0.082
Little or no interruption of educational activities	0.112	0.04	0.132	0.040	0.085	0.07	0.113	0.034
Little or no shortages of teachers	0.152	0.01	0.116	0.050	0.153	0.02	0.163	0.010
Little or no shortages of administrative personnel	-	-	-	-	0.183	0.02	-	-
Little or no shortage of students	-	-	-	-	0.095	0.08	-	-
Little or no shortage of teachers	-	-	0.127	0.008	-	-	0.115	0.044
School environment								
No occurrence of attempts on the lives of teachers or staff within the school	-	-	-	-	-	-	0.029	0.084
No occurrence of equipment robbery	0.039	0.06	0.088	0.019	-	-	-	-
No occurrence of equipment theft	-	-	-	-	0.076	0.02	-	-
No occurrence of graffiti	0.136	0.04	0.088	0.093	0.090	0.02	0.081	0.028

No occurrence of predatory behavior	0.130	0.02	-	-	0.095	0.00	-	-
No occurrence of disreputable behavior on the part of external adjunct staff	0.175	0.01	-	-	0.095	0.06	0.147	0.001
No occurrence of disreputable behavior on the part of internal adjunct staff	0.109	0.05	0.109	0.044	0.058	0.04	0.115	0.000
Learning opportunities								
No occurrence of learning problems due to a lack of physical or pedagogical infrastructure	0.089	0.00	0.106	0.001	0.089	0.00	0.106	0.006
No occurrence of learning problems due to an environment of physical insecurity in the school	0.037	0.08	0.050	0.038	0.037	0.09	0.050	0.019
No occurrence of learning problems due to a lack of student discipline	0.071	0.09	-	-	-	-	-	-
No occurrence of learning problems due to student disinterest	-	-	0.059	0.052	-	-	0.059	0.039
No occurrence of learning problems due to excessive teacher workload	-	-	-	-	-	-	0.064	0.066
Curriculum compliance by the teacher (average per school)	-	-	0.118	0.047	0.172	0.00	0.229	0.000
Math teacher corrects homework (average per school)	0.063	0.00	0.082	0.000	0.070	0.00	0.077	0.000
Portuguese teacher corrects homework (average per school)	0.054	0.00	0.060	0.000	0.063	0.00	0.061	0.000
Teacher training								
Teachers have higher education	-	-	-	-	0.043	0.05	-	-
Evaluation of the director by the teachers								
The director motivates the teachers	0.161	0.03	0.185	0.007	0.161	0.07	0.185	0.015
The teachers trust the director professionally	0.129	0.05	0.133	0.055	-	-	0.133	0.066
The director manages to have the teachers be committed to the school	0.139	0.03	0.123	0.053	0.139	0.06	0.123	0.085
The director stimulates innovative activities	0.126	0.09	-	-	0.126	0.10	-	-
The director pays special attention to issues related to student learning	0.135	0.09	0.150	0.093	0.135	0.05	0.150	0.097
The teachers feel respected by the director	-	-	-	-	0.126	0.05	-	-

Source: Microdata of the Prova Brasil (INEP) 2007, 2009, and 2011.

Note: Matching 1 included IDEB 2007, NSE School, and Municipal Code (IBGE); Matching 2 included IDEB 2007, NSE School, and Population of the Municipality according to the census of 2007 (IBGE)

Table 2 shows the difference between the treatment and control groups with regard to school efficiency factors measured by latent constructs estimated by the IRT model. Because these are continuous variables, the values of the table cannot be interpreted here. The scales of the constructs range from 0 to 10, whereby 0 represents the worst situation of the factor and 10 the best, except for the factor of a *Lack of Learning Opportunities in the School*: for this factor, 0 represents more opportunities, while 10 represents fewer opportunities. Therefore, except for the factor of a *Lack of Learning Opportunities in the School*, it is expected that all the estimates of the differences are positive.

All together, the results in Table 2 show that schools in the treatment group have a set of favorable school efficiency characteristics compared to those of the control group: Improved *school environment* in 2009 and 2011; Improved operational conditions in 2009 and 2011; Improved quality of facilities in 2009 and 2011; More educational opportunities to learn in 2011; Improved working conditions for teachers in 2009 and 2011; More cohesive teachers in 2009 and 2011.

Table 2: Estimate of the difference and probability of significance of school factors among treatment and control groups in the second year, including specification

Construct	2009				2011			
	Matching 1		Matching 2		Matching 1		Matching 2	
	Difference	p-value	Difference	p-value	Difference	p-value	Difference	p-value
School environment	-	-	0.371	0.046	0.623	0.001	0.629	0.003
Operational conditions	0.285	0.083	0.366	0.040	0.573	0.000	0.582	0.001
Equipment	-	-	-	-	-0.651	0.001	-0.615	0.000
Facilities	-	-	0.255	0.065	0.368	0.029	0.511	0.019

Lack of learning opportunities in the school	-	-	-	-	-0.314	0.025	-0.320	0.017
Working conditions of the teachers	-	-	0.310	0.035	0.177	0.027	0.212	0.016
Intra-school cohesion	-	-	-	-	0.249	0.054	0.332	0.005

Source: Microdata of the Prova Brasil (INEP) 2007, 2009 and 2011.

Note: Matching 1 included IDEB 2007, NSE School, and Municipal Code (IBGE); Matching 2 included IDEB 2007, NSE School, and Population of the Municipality according to the census of 2007 (IBGE)

## DISCUSSION AND IMPLICATIONS FOR EDUCATIONAL POLICIES

This study focused on schools that deal with challenging circumstances: attended by students with a low socioeconomic status. We believe that this situation can be changed and result in continuous improvement in student learning. A set of 215 schools stood out by presenting a rapid improvement in their learning indicators and providing quality education to their students (Fundação Lemann & Itaú BBA, 2012). The evidence presented here is enough to suggest that these schools had in fact an environment and relationships which were more conducive to learning: directors who were more highly-rated by teachers regarding their leadership skills; better facilities and operating conditions; more cohesive management and teacher teams; better working conditions for teachers; more opportunities for learning and less school violence.

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