FEDERAL UNIVERSITY OF CEARÁ

The impact of teacher bonuses on student performance in full-time schools: The case of the Espírito Santo

O impacto da bonificação aos docentes sobre o desempenho dos alunos das escolas de tempo integral: O caso do Espírito Santo

El impacto de la bonificación para maestros en el desempeño de los estudiantes en las escuelas de tiempo completo: El caso de Espírito Santo

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ABSTRACT

The goal of the study was to analyze the effect of granting financial incentives to teachers in relation to the performance of students from full-time schools of Espírito Santo. A method of matching was used by means PSM (propensity score matching) and then a Tobit regression to analyze the exam scores of the SAEB (National Basic Education Assessment System) in 2017. The results found showed that there is a positive association and related between the BD (Bonificação por Desempenho) program and the Portuguese and mathematics grades of third-year high school students from full-time schools in Espírito Santo. The work concludes by explaining that the success of the program to the reduction in absenteeism and the decrease in teacher turnover.
Keywords: bonus; performance; SAEB; full time schools; absenteeism.

RESUMO

O objetivo deste estudo foi analisar o efeito do pagamento de incentivos financeiros aos docentes em relação ao desempenho de alunos de escolas de tempo integral do Espírito Santo. Foi utilizado o método PSM (*propensity score matching*) e em seguida, a regressão Tobit para análise das notas do exame do SAEB (Sistema Nacional de Avaliação da Educação Básica) do ano de 2017. Os resultados encontrados evidenciaram que há associação positiva e significativa entre o programa BD (Bonificação por Desempenho) e as notas de português e matemática dos alunos do terceiro ano do ensino médio das escolas capixabas de tempo integral. O trabalho conclui relacionando o êxito do programa à redução do índice de absenteísmo e diminuição da rotatividade do docente.
Palavras-chave: bonificação; desempenho; SAEB; escola de tempo integral; absenteísmo.

RESUMEN

El objetivo de este estudio fue analizar el efecto del pago de incentivos económicos a los docentes en relación al desempeño de los estudiantes de las escuelas de tiempo completo de Espírito Santo. Agotado el método PSM *(propensity score matching)* y luego regresión de Tobit para analizar los puntajes del examen SAEB (Sistema Nacional de Evaluación de la Educación Básica) en 2017. Los resultados encontrados mostraron que existe una asociación positiva entre el programa BD (Bonificação por Desempenho) y el Calificaciones de portugués y matemáticas de estudiantes de tercer año de secundaria en escuelas de tiempo completo. El artículo concluye explicando que el éxito del programa de bonificación se deba a reducción absentismo y de la rotación de profesores.
Palabras clave: bonificación; actuación; SAEB; escuela de tiempo completo;absentismo.

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1 INTRODUCTION

There is a general agreement among several authors that teacher quality is an essential factor in the student's teaching-learning process, according to Kingdon and Teal (2007), Fryer (2013), Bellés-Obrero and Lombardi (2019) and Tavares and Ponczek (2019); and that their level of aptitude is often measured by the salary they earn (Sprietsma & Waltenberg, 2005; Dolton & Marcenaro-Gutierrez, 2011; Stadler et al., 2017). In this context, incentive payment for teachers has been adopted by several countries as a way to motivate them to improve student outcomes (Balch & Springer, 2015).

The idea that giving financial incentives to teachers stimulates their performance is supported by the view that they are constantly faced with weak incentives and little responsibility, especially in developing countries (Lepine, 2016). Thus, educational performance pay programs have been implemented in high-income countries such as the United States, England, Netherlands and Israel, as well as in developing countries such as India, Pakistan, Kenya, China, Chile, Brazil, Mexico and more recently in the Peru (Belles-Obrero & Lombardi, 2019).

According to the existing literature, empirical evidence on the implementation of such policies is limited and presents divergent conclusions. Several studies have been carried out linking the effectiveness of the teacher bonus program to improvements in student performance, such as Sprietsma and Waltenberg (2005), Kingdon and Teal (2007), Dolton and Marcenaro-Gutierrez (2011), Muralidharan and Sundararaman (2011), Balch and Springer (2015), Duarte and Silveira (2015), Imberman and Lovenheim (2015), Oshiro, Scorzafave, and Dorigan (2015) and Lepine (2016). In contrast, other studies have found evidence that providing financial incentives to teachers does not affect their productivity and is not capable of impacting student learning (Fryer, 2013; Monteiro, 2015; Ree, Muralidharan, Pradhan & Rogers, 2015; Bellés -Obrero & Lombardi, 2019; Tavares & Ponczek, 2019).

In Brazil, some studies were carried out on the subject and, as in the international literature, they also presented divergent results, such as Sprietsma and Waltenberg (2005), Duarte and Silveira (2015), Oshiro et al. (2015), Lepine (2016), Carvalho (2018), Santos, Pereira and Rodrigues (2018) and Tavares and Ponczek (2019). The majority took place in São Paulo, one of the five Brazilian states that adopt compensation programs based on student performance. The other states are: Pernambuco, Rio de Janeiro, Amazonas and Espírito Santo (LEPINE, 2016). These studies sought to assess public and private standard shift schools (morning and afternoon), in which the majority assessed fifth and ninth grade students. However, to date, no study has verified this "bonus vs. performance" in full-time schools, a gap to be filled by this research.

Therefore, the objective of this study was to verify to what extent the payment of pecuniary benefits to teachers reflects in an improvement in the performance of students in Espírito Santo. For that, the present research evaluated the impact of a bonus program on the student performance of full-time schools in the state education system. This impact was assessed through the Performance Bonus (BD) program and through the SAEB exam scores obtained from the subjects of Portuguese and Mathematics, which are the most common areas to assess the general level of student learning.

In this study, we sought to expand the analyzes present in the literature by investigating the gap that is centered on the verification of possible improvement in the performance of students who are enrolled in full-time schools, whose teacher bonus program has been adopted. Thus, this research collaborates to promote discussions in the academic world about the effectiveness of the extended shift teaching model in the country.

In practice, this research supports public policy makers in decision-making on the effective application of educational resources, where we sought to bring insights into the functioning, effects and possible characteristics that make the policy of incentives to teachers efficient. According to Dolton and Marcenaro-Gutierrez (2011), investing in better quality teachers is the ideal way to improve the stock of human capital, and this, in turn, would be the common factor responsible for the economic growth of a country.

2 THEORETICAL FRAMEWORK

In the educational system, teachers are central elements of the learning mechanism in schools, where their behavior and efficiency can change, depending on the type of motivation they face in the work environment (Kingdon & Teal, 2007). In this context, there was a progressive growth of paid incentives to teachers from several countries, as a way to encourage them to strive to achieve better results for their students (Imberman & Lovenheim, 2015).

Pay-for-performance systems are generally examined within organizations. There are studies that have evaluated the causal effect of linking the manager's salary to the company's general performance or to the productivity of lower-level workers (Bellés-Obrero & Lombardi, 2019). In the educational context, more attractive payments could arouse the interest of professionals in the teaching career. This fact could increase the average quality of teachers, increasing their dedication to teaching and, at the same time, reducing absenteeism and turnover (Tavares & Ponczek, 2019).

It is generally assumed that better workers are more rewarded, so wages are an indicator of their productivity. In the literature on educational economics, a teacher's salary is often taken as a parameter of his level of qualification (Sprietsma & Waltenberg, 2005).

According to the existing literature, the first studies on teacher incentives emerged around the 1980s, the main ones being: Johnson (1986), Swanson and Koonce (1986), Jacobson (1989), Holmstrom and Paul Milgrom (1991), among others. In these pioneering researches, questions

about intrinsic (personal achievements) and extrinsic (monetary gratification) rewards to teachers were addressed. From these works, other academic researches on the same theme were carried out, which stand out: Sprietsma and Waltenberg (2005), Kingdon and Teal (2007), Muralidharan and Sundararaman (2011), Dolton and Marcenaro-Gutierrez (2011), Fryer (2013), Bellés-Obrero and Lombardi (2019).

Currently, financial incentive programs have been implemented in several territories, but with different methodologies such as: tournament with awards between schools, salary variation with predetermined intervals, group or individual financial bonuses, among others. In the next subsection, the main findings of the literature will be summarized, both in international and national works on this subject.

2.1 Faculty Financial Incentive Surveys

In the context of the relevance of the educator's profession, countries such as those mentioned in the introduction have adopted mechanisms of payment based on meritocracy. However, the implementation of such policies is limited and presents mixed conclusions.

In the context of classical studies, the work of Jacobson (1989) in a district of New York stands out, where the author examined the effects of teacher salary incentives in terms of absenteeism. The results of this research revealed that there was a progression in the time devoted to the exercise of the function of education professionals, in addition to a strong increase in their attendance after the first year of implementation of the incentive program.

In relation to the most recent studies, Imberman and Lovenheim (2015), for example, looked at a group-based incentive payment program in Texas/US and focused on a particular aspect of the project: the percentage of students in a group that a teacher instructs. The survey results not only provided consistent evidence that student performance increased after the program was implemented, but it was also observed that the effects are greater for teachers whose students are, on average, low on performance.

One of the most promising researches came from authors Muralidharan and Sundararaman (2011) who conducted the study of a bonus program in rural primary schools in the Indian state of Andhra Pradesh. Evidence showed that the program was relatively productive and that treatment school units performed better than other randomly chosen schools. Treatment school students did better not only in math and language (for which there were incentives) but also in science and social studies (for which there were no incentives), suggesting positive effects.

Ree et al. (2015) verified the implementation of a single policy in Indonesia that permanently and unconditionally doubled the salaries of public school teachers. After two and three years, the doubling of salaries did not lead to improvements in teacher effort measures and had no impact on student learning outcomes. The authors found that large unconditional wage increases may not

result in improved performance for older workers in a public sector setting where they have "permanent" employment contracts, with a low probability of being fired for little (or no) productivity.

In the case of Bellés-Obrero and Lombardi (2019), there was a study of the impact of the Bono Escuela (BE) project on the performance of students in Peru. This pay-for-performance program consisted of a kind of tournament awarding a bonus of more than a month's salary to the principal and all teachers in the schools in the top 20% within a group of comparable schools. The survey's conclusion was that the project had no impact on students' internal math and language grades. It was inferred that the program has the potential to induce the so-called free-riding, a "free ride" effect by less struggling teachers, thus decreasing its impact on students' learning.

In addition to the studies cited, which described the success and failure results of these programs, there was also research demonstrating that incentives reduced student performance, especially in larger schools (Fryer, 2013). To justify these results, the author considers four arguments: the incentives were not big enough; the incentive scheme was very complex; group incentives may not be effective; and teachers may not know how to improve student achievement.

In Brazilian literature, one of the first studies carried out in Brazil was carried out by Sprietsma and Waltenberg (2005), the authors sought to estimate the effect of teachers' salaries on student performance in the context of a developing country. The researchers' objective was not to analyze a bonus program, but a marked salary variation existing at the time, both in public and private schools nationwide. The results showed that the salaries of Portuguese and mathematics teachers showed a small but positive and significant effect on the test scores of students in private schools. However, the effects were not significant or even negative in public schools.

In a more contemporary research, the authors Duarte and Silveira (2015) evaluated the Educational Performance Bonus (BDE) project in the state of Pernambuco, implemented in 2008. It consists of a policy of monetary incentives for all professionals from schools in the state school network that completed pre-established goals for student performance on math and Portuguese tests. The results were positive and significant for the grades of students in the fifth and ninth year, suggesting that the program had a good participation in the exams of the Prova Brasil.

In São Paulo, Oshiro et al. (2015) analyzed the School Quality Program (PQE), which presents rules on remuneration for performance, implemented in 2008. Evidence was found that there were improvements in the grades of students in the fifth year of elementary school in 2009, although the ninth year showed negative effects. When verifying the long-term effects, it was observed that there was a strong decline in student performance between 2009 and 2011. According to the authors, the answer to this

difference between the fifth and ninth grade would be the lower number of schools that attend the first cycle compared to the total that teaches the second stage of elementary education.

Also in São Paulo, Lepine (2016) studied an incentive program that consisted of a stimulus scheme involving a group bonus, from which school employees receive a payment proportional to how much each school has improved in relation to its objective. The estimates obtained showed that the program had positive overall effects for both fifth and ninth grade students, although for the latter the performance gains were more modest and less robust.

Carvalho's work (2018) differs from the others mentioned because it is a qualitative approach. Through interviews obtained in public schools in the state of São Paulo, opinions of teachers on bonus payments and other issues related to female dimensions were collected. Despite dealing with the payment of bonuses per result, the article concludes that there is an overlapping presence of models of teaching work: a model related to femininity (dedication,

love of teaching) and another model corresponding to business management (competition, finance) . There was no approach to the impact of the program on the students' grades.

A more recent study that evidenced negative impacts of the discussed topic was prepared by Tavares and Ponczek (2019). The authors verified the effects of teachers' salaries on student proficiency, considering the existence of a salary variation rule based on ownership: the so-called five-year rule. The findings of this research demonstrated that the salary increase of teachers apparently does not affect their productivity and is not capable of impacting student learning in basic education.

Therefore, as can be seen in this section, both national and international surveys did not agree on the effectiveness of pay-for-performance policies. The following Table 1 presents the literature summary divided into four classifications: authors, study description, results and literature. International and national studies are listed together, sorted by year of publication.

Table 1
Main results found in researched articles

Authors	Study Description	Results	Literature
Jacobson (1989)	Effect of teacher salary incentives on absenteeism.	Positive effect.	International
Sprietsma e Waltenberg (2005)	Impact of teacher salary variation on student performance.	Positive effect on private schools. Negative effect on public schools.	National
Muralidharan e Sundararaman (2011)	Consequences of the bonus for teachers in the grades of rural school students.	Positive effect.	International
(Fryer, 2013)	Influence of group incentives on student performance improvement.	Negative effect.	International
Duarte e Silveira (2015)	Effect of bonuses to teachers on students from state public schools.	Positive effect.	National
Oshiro et al. (2015)	Effect of bonuses to teachers on students from state public schools.	Positive effect for the 5th year. Null effect for 9th year.	National
Bellés-Obrero e Lombardi (2019)	Impact of the teacher bonus program on student performance.	Negative effect.	International
Tavares e Ponczek (2019)	Influence of teacher salary variation on student performance.	Negative effect.	National

Source: Own elaboration.

The studies cited, both national and international, have a common point: the focus on standard shift school units, that is, classes taught in just one period, either morning or afternoon. In the following subsections, the concepts of the BD (Performance Bonus) program and the relationship of financial incentives to teachers in the performance of students from full-time schools will be explained, concluding the section with hypothesis H1.

2.2 Espírito Santo Performance Bonus Program (BD)

With the purpose of evaluating the impact of a bonus program on the student performance of schools in the state education system, the Espírito Santo State Bonus for Performance (BD) project was used for this purpose. The choice of this state as a field of study served as verification of the long-term success of the BD program, as Ferreira (2019, p.35) reported that the excellent performance of students enrolled in the 2013 Prova Brasil "generated a bonus for teachers in your payments".

The BD program is a remuneration system in the state of Espírito Santo implemented at the end of 2009 by Complementary Law No. 504 and Decree No. 2761-R, later amended by Decree 3949-R and Complementary Law 887. retribution of monetary incentives (annual and equivalent to 1.5 monthly salary) to active professionals of the Department of Education - SEDU, with the goal of recognizing and valuing their efforts (SEDU, 2019).

Benefit distribution depends on budget availability and is calculated based on collective and individual indices. The period of appreciation matches the full academic year, that is, the activities are analyzed from the first to the last day in the classroom (Espírito Santo, 2016).

In the question of group (collective) payment, the Unit Deserving Index (IMU) is used as a criterion. The same refers to the percentage achieved from the School Development Index (IDE), containing the performance of students in the Espírito Santo Basic Education Assessment Program (PAEBES), family income and the teaching status of students (Espírito Santo, 2011).

For the individual indicator, the percentage of the professional's contribution to the performance of the school unit is observed, through their presence in the classroom. In this indicator, the employee's attendance is also considered and, therefore, each absence will imply a 10% reduction in the bonus amount. Consequently, the professional who has ten absences in the school year will not be entitled to the bonus (Espírito Santo, 2016).

2.3 Financial Incentives and Full-Time Schools

The characteristics that full-time schools have in comparison to part-time schools are diverse, including: integration of teaching with the practice of exercises in the classroom, offering dynamic and socio-educational activities, pedagogical monitoring, among others (Kamski & Schmitz, 2018). Considering these differences, one must therefore take into account the type of teaching modality and school structure in the act of creating and implementing educational policies (Mattiello, 2019).

The systematization of full-time education models began in Brazil through the Mais Educação Program, created in 2007 by the federal government. The program aimed to provide financial resources to states, municipalities and the Federal District to expand school hours and, among other objectives, improve student performance (Parente, 2016).

In the national literature, there were no articles published in periodicals dealing with the performance of students in full-time schools, nor about units of this type with any bonus program. Only dissertation papers were detected (Aquino, 2011; Xerxenevsky, 2012; Gandra, 2017), of which statistical methodologies such as propensity score matching and diff-in-diff were adopted to verify any increase in student performance in light of the expansion of the school day.

Aquino (2011), for example, investigated whether the increase in school hours improved the grades of 8th grade students in public state schools in São Paulo. The results of this verification showed that there was a positive effect in Portuguese, but in a small proportion; for mathematics, there was no significant effect. As for the study by Xerxenevsky (2012), the influence of the Mais Educação Program on Portuguese and Mathematics grades in the 4th and 8th grades in schools in Rio Grande do Sul was analyzed negative effect for 4th grade mathematics; for the 8th grade, there was a null effect on student performance for both subjects evaluated. Finally, Gandra (2017) assessed the long-term effectiveness of the Mais Educação Program in relation to student performance. The evidence from this research proved that the analyzed program contributed negatively to the average performance of the student in the assessments of Portuguese and Mathematics.

To achieve the objective of this study, only data from the year 2017 were analyzed, as a result of the implementation of Law 13.415/2017. Among several legislative changes in the education sector, the aforementioned law proposed a reform in the policy to encourage the implementation of full-time schools, including the expansion of units that enabled the analysis of the set of treatment and control groups in this study. (BRAZIL, 2017).

Therefore, based on the prospects for improving full-time education that law 13,415/2017 describes and basing itself on the purpose of the student performance bonus, the following hypothesis was formulated:

Hypothesis 1: Payment of financial incentives to full-time school teachers positively affects student performance.

3 METHODOLOGY

This section provides a description of the data used in this study, as well as the variables and data analysis technique employed. The present work is a quantitative research and secondary data collection in cross-section, as described in detail in subsection 3.1. In the other subsections, the variables and, finally, the data analysis technique will be presented.

3.1 Database and Sample

In this research, the sample was divided into two groups: a treatment group, made up of full-time schools that joined the bonus program, and a control group, made up of full-time schools that do not participate in the program and any other similar ones. Thus, the treatment group in this research refers to the state of Espírito Santo, which has implemented the Bonus for Performance program in schools in the state education system. The control group was represented by national schools that do not adopt the policy of additional remuneration for the results of student exams.

To assess student performance, the third year of high school was selected, due to data standardization, as not all full-time units attend elementary school, as verified in the catalog of schools on the INEP portal (INEP, 2019a). The subjects of Portuguese and Mathematics were used to analyze student performance, since these are the most common subjects in proficiency exams for national assessments by the federal government, and thus, can be generalized to assess the level of student learning.

The data used refer to the students' grades in the Basic Education Assessment System (SAEB) exam, formerly known as Prova Brasil, held every two years nationwide. The grades in this system have their own scale ranging from 0 to 425 in Portuguese and from 0 to 475 points in mathematics, with the objective of verifying the level of competence of the student for each school year. The choice of SAEB allows schools from other units of the federation to be used as a control group. The information was obtained through access to databases and microdata of the INEP portal (INEP, 2019b), such as: catalog of schools, grades for subjects in Portuguese and Mathematics, in addition to obtaining the answers to questionnaires applied to students, teachers and characteristics of the school.

Data filtering began by locating schools as rural or urban, with the latter remaining to eliminate possible biases. Then, by administrative dependence, keeping information

from the state units where, in the case of the treatment group, the bonus program is in effect. The classification and division between regular and full-time schools were carried out using the INEP School Catalog (INEP, 2019a). As for the series, the third year of high school was selected. Other relevant selections were on: taking the exam, completing the questionnaire, proficiency scores in Portuguese and mathematics. Finally, with reference to the questionnaires, only the responses of interest to the variables in Table 2 of subsection 3.3 were selected.

3.2 Data Analysis Technique
3.2.1 Data Treatment

First, considering the existence of extreme values in the samples (outliers) with regard to the students' grades, the data winsorization process was carried out. This tool consists of minimizing outliers with a fixed percentage adopted by the author for a predetermined cutoff point (Duarte, Girão & Paulo, 2017).

To verify the usefulness of this procedure, box-plots were used in the student data. Once the measurement technique was performed, the need to apply the method at 1% was observed. In a new check, the Stata software did not show the presence of outliers and, therefore, it is possible to proceed with the other steps in order to avoid further distortions in the samples.

3.2.2 Pairing Method

The evaluation of the impact of the Performance Bonus program on students' school efficiency is summed up in verifying what this same average performance would be like if the school had not joined the program. As it is impossible to verify this condition simultaneously, it is necessary to create a control group to represent this scenario. Thus, in this context, there is the treatment group made up of schools in Espírito Santo, and the control group, made up of schools that do not participate in the program and any other similar ones.

In this sense, for this first methodological approach, the impact of the bonus program will be achieved through a matching technique called propensity score matching (PSM). This technique consists of circumventing a problem of selection bias (since the choice of the present study is not random) and takes into account the degree of similarity between the information of the control and treatment groups. PSM is used to solve the dimensionality problem arising from the number of variables selected in the pairing. Thus, a synthetic indicator is obtained for all the adopted criteria, facilitating the matching and construction of the counterfactual.

The PSM takes into account the observable characteristics of the variables described in Table 2 of subsection 3.3, in addition to the students' Portuguese and mathematics proficiencies. In this way, the PSM assigns weights or probabilities to the units in the control group that are similar to the units in the treatment group, making it possible to compare the two groups using a regression model. This technique has limitations regarding the analysis of unobservable characteristics; however, this is not the case for work variables.

3.2.3 Econometric Model

Although the BD program was implemented in November 2009, a long-term results analysis was carried out, as a short-term verification may not be faithfully representative due to precocity and initial difficulties in project management (Gandra, 2017). In addition, it was restricted to 2017 due to the enactment of Law 13,415/2017, which proposed a reform in the policy to encourage the implementation of full-time schools, including expansion of units. To estimate the impact of the bonus policy on student performance, it was based on a Tobit statistical regression model. The justification for using this technique lies in the fact that the values of the dependent variable are limited at their ends (both lower and upper). The model used is detailed below:

$$Grade_i = \beta_0 + \beta_1 \text{BD} + \beta_2 \sum_i + \varphi_i + \varepsilon_i \qquad (1)$$

Where: $Grade_i$ = represents the average proficiency of the student at school i in mathematics or Portuguese; β_0 = constant; BD = indicator variable equal to 1 if a school participates in the Performance Bonus program and 0 if the school is part of the control group; $\sum_i$ = vector of basic observable characteristics of the student from school i; φ_i = series of dummy variables relevant to the student (characteristics vectors of teachers and school i); ε_i = standard error.

In the proposed model, the coefficient of interest is β_1 which identifies the average difference in the test scores of students associated with the implementation (or not) of the Performance Bonus between the schools in the treatment and control groups. The value of this parameter was estimated after considering the entire group of student variables ($\sum_i$) and the set of schools/teachers (φ_i) that can also interfere with student performance.

3.3 Database and Sample

The variables used are described and summarized in Table 2. They are variables traditionally addressed in studies of economics of education and that were adapted from the study by Oshiro et al. (2015).

Regarding the variables related to the students, the following were considered: mother's education, frequency of reading books, whether the student attended nursery school, whether he has a job and lives with both parents or just one of them. In addition to these control variables, the dependent variables used were Portuguese and Mathematics proficiency scores. The variable of interest refers to the participation or not of the school in the analyzed bonus program.

As for the variables of professionals related to teaching, the following were evaluated: the salary they receive and the length of experience in the school unit.

Finally, on the school variable, the total number of students per grade assessed in each teaching unit was described.

Table 2
Tobit Model Variables

Variables and description	Type	Proxy	Awaited sign
Mother's Education: whether or not the student's mother completed the 8th grade/9th grade.	Control	1=yes	(+)
Reading books: if the student reads always/almost always or never/almost never.	Control	0=no	(+)
Maternal: whether the student did it or not.	Control	1=always/almost always; 0=never/almost never	(+)
Work: whether the student works outside the home or not.	Control	1=yes	(-)
Lives with parents: whether the student lives with both parents or one of them.	Control	0=no	(+)
Teacher salary: whether the teacher earns up to R$2,500 or not.	Control	1=yes	(+)
Length of service: if the teacher teaches at the school for up to 5 years or more than 5 years.	Control	0=no	(-)
Number of students: total 3rd year students per school.	Control	1=lives with both; 0=lives with one of them	(-)
Portuguese proficiency: average grade in the Portuguese subject (SAEB scale).	Dependent	Valor numérico	(+)
Mathematical proficiency: average grade in the math subject (SAEB scale).	Dependent		(+)
Performance Bonus (BD): indicates whether or not the school participates in a bonus program.	Independant and of interest	Numerical value	(+)

Source: Own elaboration, with variables from the study by Oshiro et al. (2015). Data obtained from the INEP portal (2017).

4 ANALYSIS AND DISCUSSION OF RESULTS

This study sought to verify the impact of the payment of financial incentives to teachers in relation to the performance of students from full-time schools. The results found in this work are presented below through analyzes carried out in the Stata software.

4.1 Sample Characteristics

Table 3 describes the number of observations for the year 2017, classified by group for each step of selecting useful data for the research. Useful data is understood to mean those selected and of interest to the study for the appropriate statistical tests using the Stata software. Until the conclusion of this research, data referring to the 2019 SAEB were not available on the INEP portal, thus restricting data analysis to the aforementioned period only.

Table 3
Number of observations per group, referring to the year 2017.

Treatment Group		Control Group		Total
Description	Number of observations	Description	Number of observations	
Full data	24,661	Full data	1,431,664	1,456,325
Post selection	878	post selection	2,367	3,245
Post PSM*	178	Post PSM*	463	641

Source: Survey data.
Note: Full data refer to complete information extracted from the INEP portal.
* PSM stands for Propensity Score Matching.

Table 4 presents the descriptive analysis of the variables used in the hypothesis of this study for the year 2017, referring to third-year high school students in full-time schools. The means shown were obtained after the propensity score matching matching process.

Table 4
Means of variables used in the Tobit Regression Model - 2017

	Variables	Tratament	Control
Students	Lives with parents (%)	57.27	51.84
	Mother's education up to 9th grade (%)	65.07	50.32
	Reading books - always/almost always (%)	75.92	79.18
	Work outside the home (%)	13.88	27.11
	Did the maternal (%)	85.68	81.56
Teachers	Salary up to R$ 2,500.00 (%)	26.68	22.56
	Teaches at school between 1 and 5 years (%)	87.85	84.38
	Has taught at school for over 5 years (%)	12.15	15.62
Nº.	Average of 3rd year students per school	91.00	62.70
Grades	Portuguese average (SAEB scale)	285.29	267.16
	Mathematical Average (SAEB scale)	291.59	260.82

Source: Research data.
Note: Number of observations: 641

Regarding the variables of the students, the treatment group has largely higher averages, such as the variable "they did the maternal", where the percentage of 85.68% against 81.56% of the control group was shown. In contrast, the control group had a higher index than the opposite group in the variable "reading books" with a percentage of 79.18% against 75.92% of the treatment group. It is inferred, therefore, that more students from the full-time school in Espírito Santo completed kindergarten compared to students from other states who study in the same category

schools; the latter, however, have a higher frequency of reading books when compared to Espirito Santo students.

Regarding the variables of teachers, it is detailed that more teachers from full-time Espírito Santo schools receive a salary of up to R$ 2,500.00 when compared to teachers from other regions of Brazil. Over a five-year service period, teachers from full-time schools in other Brazilian states have more experience than education professionals in Espírito Santo.

As for the school information and the average scores of Portuguese and mathematics proficiencies, the treatment group had higher rates than the control group. On average, 91 students in the treatment group are enrolled in the third year of high school in each full-time school in the sample, while in the control group, this number is approximately 63 students. In relation to proficiencies: the average grade in Portuguese was 285.29 for students in the group with bonus and 267.16 for the group without bonus; in mathematics, the mean score of treated students was 291.59 and that of control group students was 260.82. It is noteworthy that although there are differences between the groups tested, the PSM reduced this bias.

4.2 Tobit Regression Model Results

Table 5 shows the results of model 1 by means of Tobit regression, having as dependent variables the average scores of Portuguese and Mathematical proficiencies. This model aims to verify the hypothesis of this study, which states that "the payment of financial incentives to full-time school teachers positively affects student performance".

Table 5

Tobit Regression - 2017 High School Proficiencies

Variable	Portuguese		Mathmatics	
	Coeficient	P-value	Coeficient	P-value
Performance Bonus (BD)	18.858	0.000	21.469	0.000
Lives with the parents	6.968	0.057	8.505	0.033
Mother's education	2.225	0.558	1.168	0.778
Book reading	21.382	0.000	3.505	0.471
Have work	-12.242	0.016	-9.914	0.074
Maternal completed	1.230	0.791	1.902	0.707
Teacher salary	1.113	0.808	3.061	0.541
Length of service 1-5 Years (teacher)	-6.681	0.226	-4.924	0.413
Number of students per school	-0.010	0.842	-0.013	0.799
Constant	252.032	0.000	266.262	0.000

Source: Research data.
Note: Number of observations: 641

After estimating model 1, it is observed that the coefficient of the variable of interest Bonus for Performance – BD was positive and significant at 1% in both subjects (P-value 0.000). Thus, the hypothesis was supported, that is, there is an association that the payment of financial incentives to teachers in full-time schools positively affects student performance.

By the coefficients shown in Table 4, it is associated that third-year high school students enrolled in full-time schools that have performance bonus programs had an increase of 18.86 points in Portuguese and 21.47 points in mathematics in the year of 2017. As mentioned above, the analysis of the hypothesis was restricted to the year 2017 due to the enactment of Law 13,415/2017, which proposed a reform in the policy to promote the implementation of full-time schools, including expansion of units.

In addition, when verifying the results found for some variables related to the student context, such as when the student lives with both parents, there is a positive association in the grades of the two subjects, with a significance of 10% for Portuguese and 5% for mathematics. In other words, it is associated that students from full-time schools with a bonus program and who live with their parents performed better in the subjects assessed than students from schools of the same type, but without a bonus program. Regarding the variable "reading books", there is a positive and significant association (1%) regarding the Portuguese subject, while in mathematics, the coefficient was not significant. Therefore, it can be associated that the frequency of reading books of the student in the treatment group improved their performance in Portuguese, where they use literature tools that reinforce their text interpretation skills, which generally do not apply in mathematics (justifying the null effect).

4.3 Discussion of Results

Table 6 below presents a general summary of the results found in model 1. In sequence, the results related to the objective of this research are compared to the studies presented in the theoretical framework. Finally, other information on the remaining variables is explored and analyzed at the end of the section.

Table 6

Summary of expected results and results found

Variable	Awaited result	Result found	
		Portuguese (2017)	Mathmatics (2017)
Performance Bonus (BD)	(+)	(+)***	(+)***
Lives with the parents	(+)	(+)*	(+)**
Mother's education	(+)	Non Significant	Non Significant
Book reading	(+)	(+)***	Non Significant
Have work	(-)	(-)**	(-)*
Maternal completed	(+)	Non Significant	Non Significant
Teacher salary	(+)	Non Significant	Non Significant
Service time prof. (1-5 years)	(-)	Non Significant	Non Significant
Number of students	(-)	Non Significant	Non Significant

Source: Research data.
Note:* significant at the 10% level; ** 5% level; *** level 1%

Observing Table 6, the expected signs for the analyzed coefficients should be positive. The result found

confirmed the hypothesis of this study for the grades of the subjects of Portuguese and Mathematics in 2017, that is, it can be associated that the payment of financial incentives to full-time school teachers positively affects student performance.

The present study has, as a limitation, the impossibility of applying the Granger causality test, as only 2017 data are available and the aforementioned test must be applied in a time series. The results shown here can only be associated with the "bonus" cause and "performance improvement" effect and, therefore, it cannot be said that one influenced the other.

Similar results were found in the studies by Aquino (2011) and Xerxenevsky (2012), but partially. The convergences are found in the results of the Portuguese subject, in which both studies mentioned showed positive results in full-time schools. In mathematics, the two studies mentioned revealed that there were negative effects.

However, these authors did not assess full-time schools on the condition of having implemented (or not) the teacher bonus program. Aquino (2011), for example, investigated whether the increase in school hours improved the grades of 8th grade students in public state schools in São Paulo, in 2007 and 2008. Xerxenevsky (2012) analyzed the influence of the Mais Program Education in Portuguese and Mathematics grades in 4th and 8th grades in full-time schools in Rio Grande do Sul in 2009.

Therefore, this study brings unprecedented results in the literature, as it sought to investigate whether financial incentives for full-time school teachers positively affect student performance, which was confirmed. The possible explanation for this success is due to the category of individual deserving of the bonus, given that in full-time schools there is a certain decrease in teacher turnover and, according to Alcure (2019), this fact has a positive impact on student performance.

Among the other variables presented in Table 6, the results of students who live with both parents stand out, where positive and significant effects associated with students enrolled in full-time schools with a bonus program were demonstrated. The probable cause of this effect may be due to the fact that there is a greater demand from both for the improvement of the student's performance and, in addition, considering the family background, there may also be some stimulus for the student to impress them with good grades. However, further research would be needed to confirm these assumptions.

Another interesting variable that should be briefly analyzed would be regarding the student who has a job: negative results were expected, as the fact that the student works would reduce his or her dedication to study, which could even affect their school performance. As shown in Table 6, the results were negative and significant in both subjects, confirming the assumption verified, that is, the student who alternates his daily journey between work and study at a full-time school suffers a drop in his academic performance.

Finally, as for the other variables verified here, a more in-depth analysis would be needed to understand the lack of significant effects. For example, the fact that it is not possible to state that professional experience, teacher remuneration, number of students, and pre-school level completed are associated with student performance.

5 FINAL CONSIDERATIONS

In this work, an investigation of the impact of the payment of financial incentives to full-time state school teachers on student performance was carried out, using the state of Espírito Santo as a field of study. The system evaluated in this state refers to the Performance Bonus (BD) program and one of its objectives is to encourage the pursuit of progressive improvements in student performance and in the management of school and administrative units.

Through statistical tools such as propensity score matching and Tobit regression, it was possible to conclude that there is an association between the BD program and the improvement in the performance of high school students in full-time schools in Espírito Santo. The possible explanation for the success of the BD in this type can be attributed to a tendency towards a decrease in teacher turnover and absenteeism, thus inducing satisfactory results in the students' grades, with each professional's absence being reduced by 10% of the bonus amount.

In terms of theoretical contribution, this research contributes to a little comprehensive literature at national level on the theme of bonuses to teachers to improve student performance. In addition, the results of this study fill the gap in the literature regarding the impact of bonuses to teachers on the performance of students in full-time schools, in which scientific evidence has shown that there is a positive association between them.

As for the practical contribution, with the positive results found, public administrators in the educational area can assess possible expansions and/or transformations of common state school units into full-time schools. Such action would aim at raising the quality of teaching and, consequently, improving student learning.

The limitation of this study lies in the scarcity of data from other periods for analysis, since only 2017 data was used, as, until the conclusion of this research, the SAEB microdata for the year 2019 were not available on the INEP portal. Therefore, as a suggestion for future work, an evaluation covering other future periods is recommended, when evaluative data are available and thus make it possible to verify causality by means of the Granger test. Furthermore, it can be verified whether the inclusion of other student variables affects the impact of the program, given the vast amount of information in the microdata available on the INEP portal.

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