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# **The Impact of Structured Teaching Methods on the Quality of Education<sup>\*</sup>**

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## **Abstract**

This paper estimates the impact of the use of structured methods on the quality of education of the students in primary public school in Brazil. Structure methods encompass a range of pedagogical and managerial instruments applied to the education system. In recent years, several municipalities in the State of São Paulo have contracted out private educational providers to implement these structured methods in their schooling system. Their pedagogical proposal involves structuring curriculum contents, elaboration and use of teachers and students textbooks, and training and supervision of the teachers and instructors. Using a difference in differences estimation strategy, we find that the fourth and eighth grader students in the municipalities with structured methods performed better in Portuguese and Math than students in municipalities not exposed to the methods. We find no differences in approval rates. However, a robustness check is not able to discard the possibility that unobserved municipal characteristics may affect the results.

Keywords: quality of education, structured methods, Brazil.

JEL Codes: I21, I28.

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## I. Introduction

The quality of education in Brazil is low by several international comparisons. For instance, Brazil ranked 53th in Math proficiency among all 57 participant countries in the 2006 PISA Exam.<sup>1</sup> In the attempt to overcome this disadvantage several policies have been adopted in the last fifteen years. Among them, the decentralization of educational system was pervasive. The states transferred the control of the primary school system to the municipalities<sup>2</sup>. In some states the municipalities have autonomy to choose the pedagogical material and part of the curriculum contents under the federal regulation standards. This autonomy includes the possibility of contracting out educational services from private organizations. Particularly to our interest, some agreements are such that private institutions are contracted out to develop and provide textbooks for the students, pedagogical materials for the teachers that systematize classes, homework materials and answer keys, etc. They also coach the teachers on the use of these materials. In the state of São Paulo, in the last ten years around one third of the municipalities have hired private institutions that provided what became to be known as *structured teaching methods* to the public system.

The purpose of this paper is to estimate the impact of structured teaching methods on the proficiency of students in municipal school system in the State of São Paulo. The evaluation of this effect is relevant in itself for policy making purpose. This is the first attempt to gauge the impact on proficiency of this institutional innovation. Moreover, this study has a wider interest by contributing to the literature of economics of education in at least two specific topics: (i) the debate of private vs. public school management; and (ii) the discussion of the relevance of inputs in the school production function.

The novelty of this Brazilian experience is the development of a private market for structured teaching methods that are demanded by the public sector. Although there is no competition between municipal public schools, there is competition between private institutions to develop and provide structured methods to the municipal public school system. The use of private system in the public schools is not new. There is the experience of charter schools in the U.S. that became popular among some policy makers because they seem to share the benefits of private competition without sacrificing the government control and supervision. Charter schools encompass public and private elements. On one hand, they are allowed independent development and decision-making. On the other hand, they are public financed and state accountable for performance. Similar to charter schools, the schools in municipalities that use the structured teaching methods in Brazil are publicly funded and supervised but privately managed regarding pedagogical and curricular decisions. Differently from charter school, they are broader in the sense that they cover all public schools under the municipality administration. Due to it, there is no competition between “public” and “charter” schools within municipality. However, in another sense they are more restrictive since the private decisions are circumvented to pedagogical and

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<sup>1</sup> See PISA (2006).

<sup>2</sup> For more details about the decentralization of the Educational System in Brazil, see Madeira (2008) and Leme et al (2009).

curricular choices, including teacher coaching. They do not include human resource allocation decisions such as hiring/firing teachers and principals or even assigning them to schools. These decisions are under the municipality public authority.

There is a recent debate on the impact of charter schools on student performance in the U.S. The results are mixed. Bettinger (2005) finds no differences in the math and reading test score gains among 4<sup>th</sup> graders between charter and neighboring public schools in Michigan. Booker et al. (2007) find that students experience low test scores growth in the first year in charter schools but it is followed by a catch up in the subsequent two-three years compared to their expected performance in the traditional public schools in Texas. However, Hoxby and Muraka (2009), taking advantage of the random selection of charter school students in New York City, find positive effect of charter schools on math and reading performances of third to eighth graders. Moreover, there is some evidence that charter schools enhance competition among public schools. Brooker et al. (2008) find a positive and significant impact of charter school district penetration on achievements of traditional public school students in Texas. Hanushek et al. (2007) find that the relation between the probability of exiting school and its quality is more acute on charter schools than on traditional public schools in Texas.

This paper also relates to the literature of the effectiveness of school inputs. The international evidence on the impact of school inputs on students' outcomes, particularly on provision of pedagogical material, like textbooks and teachers in training services is ambiguous. Early studies, surveyed by Lockheed and Hanushek (1987), show that textbooks provision was, on average, the most cost effective program compared to teachers training, interactive radio, technical schools, peer tutoring and cooperative learning in some developing countries. The World Bank (2002) reports studies in the same direction: in Philippines the provision of multilevel material combined with parents and teachers partnership had a positive impact in reducing drop-out rates and improving test scores. It also showed to be more cost effective than the sole provision of textbooks. In Nicaragua a textbook provision program with monitoring of their use in classroom had a positive effect on student scores but it was less effective than radio instructional program. A more recent study in Kenya reported by Glewwe, Kremer, Moulin (2007) shows that the provision of textbooks had a positive impact only on the performance of the top students. The impact of teachers in-service training on students' performance is also ambiguous. Angrist and Lavy (2002) show that an in-service training in Jerusalem improved test scores of elementary public schools students and was more cost effective than reducing class size or lengthening the school day. On the other hand, Jacob and Lefgren (2002) find no impact of marginal increases in in-service teachers training in the performance of students in Chicago public school system. These results altogether seem to point that combined policies are more effective than isolated ones and this is the central feature of the structured teaching methods analyzed in this study. The curriculum organization, the provision of pedagogical material and teachers training are joint components of the structured method programs.

Using a longitudinal dataset of municipalities, our results show that (i) municipalities that adopted structured methods experience higher average proficiency gains in Math and Portuguese for 4<sup>th</sup> and 8<sup>th</sup> graders than those that did not adopt such methods; and (ii) the worst-performing municipalities in proficiency exams – with the exception of 4<sup>th</sup> grade

Math – are those with the greatest gains from adopting structured methods. However, robustness tests suggest that one cannot rule out the possibility that unobserved municipal characteristics associated with proficiency changes over time may affect the results.

The paper is organized as follows: section two discusses structured teaching methods that several São Paulo State municipalities have adopted in agreements with private teaching systems. Section three describes the dataset and the sample used in the analysis. Section four presents a descriptive analysis of the participating and non-participating municipalities and their observed characteristics associated to the adoption of structured methods. Section five describes the methodology used to identify the impact of these teaching methods on student proficiency. Section six discusses the main results and a robustness check. Finally, the last section concludes the study.

## **II. Private Teaching Systems and Structured Methods**

In this section we will describe the main features of the private teaching system and compare their pedagogical mechanisms with the ones usually present on regular public schools that do not contract out the private institutions.

In the late 1990s, with the strong incentives for decentralization and educational autonomy given to the municipalities, agreements between private educational institutions and municipal public school systems started to be signed in some states of Brazil, mainly in São Paulo. The pedagogic proposition of these private teaching systems involves structuring curriculum contents and learning activities by means of learning materials intended for students and instructors. Teaching systems also offer teachers instruction and pedagogic advice, in addition to access to an education portal along with the materials. It is worth noting that differences between agreements may lead to differences not only in the materials and training the various teaching systems provide, but also between different municipalities served by the same system. The amounts charged represent about 10% of the cost per student/year in the public sector.

Teaching systems propose to offer an integral set of learning materials with content for every subject and grade, prepared by internal teams under centralized coordination. The contents are divided into textbooks covering regular periods (usually of two months) and organized by grade and by subject. Therefore, the textbooks include content by subject and provide a class plan, since one textbook must be completed and another begun every two months. Furthermore, teaching systems also offer instructors support materials. In general, these materials are intended to clarify the class plan implied in student textbooks by offering instructors not only a suggested teaching sequence, but also methodological strategies for each topic and supplemental activities to be undertaken with students.

The private teaching systems also offer instructor training and advice services. In general, these services involve meetings every two or six months with all the instructors in the network, divided by areas and grades. At these meetings, instructors from the teaching systems address different methodological strategies to convey the contents of learning materials. Some teaching systems carry out bimonthly visits to classes to monitor instructors and address doubts they may have. Others offer a permanent consultant in each

city to support instructors and track the entire teaching process. Systems with virtual graduate or specialization programs offer scholarship grants to instructors and headmaster of the municipalities with which they maintain agreements.

Other mechanism system offers consist in interactive portals intended to add depth to textbook contents, with supplemental activities, texts, documents and education-related articles, test-question banks, areas where schools can exchange experiences and where instructors can ask questions and have them answered. Some systems also offer online content for students.

It is important to say that each teaching system may have particular features and the class load and type of training and support offered in each municipality may vary depending on the agreement between each specific municipality and the teaching system.

Contrasting with schools that adopted the private systems, a regular public school in São Paulo is free to choose its pedagogical methodology in general. The principal and the teachers decide on the syllabus content (under the federal regulation standards), textbooks and supplemental materials, tests and exams, the sequence of the curriculum contents, etc. Note that it is even possible that two different classes in the same grade and school may have different syllabus, textbooks, etc.

### **III. Data**

In this section, we describe the data sources and the data collection process. Since there is no unique source which contains all pieces of information needed, the data collection process involved different procedures.

In order to obtain information of the extent and range of the system, primary data had to be collected and constructed from some different sources: the survey on several educational programs made by the São Paulo State Audit Court – TSE SP, survey with its affiliated by the Union São Paulo State Municipal Education Officials, direct contact with some teaching systems and direct contact with the municipalities. Our database has information on standing agreement between each municipality and the teaching system; period and scope (Kindergarten, Grade School, High School, and Adult Education) for each municipality.

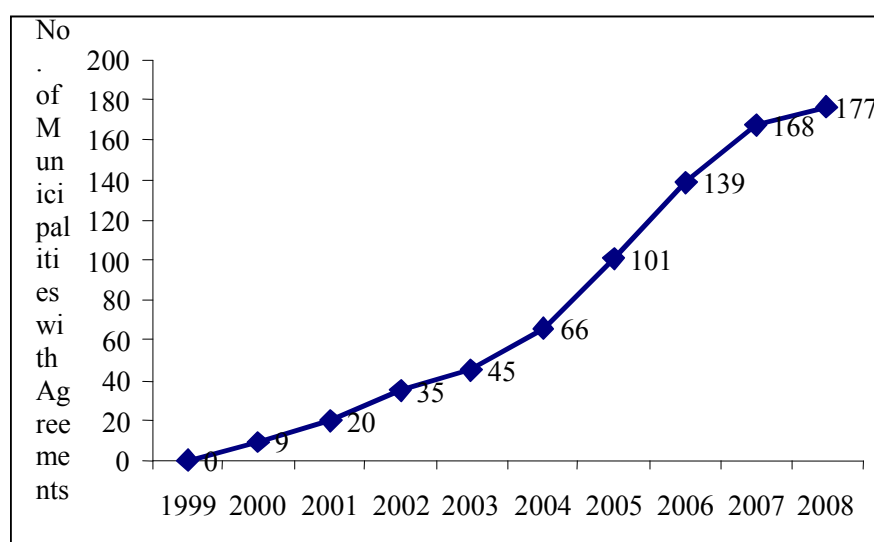
For information about the student's proficiency, we used the Prova Brasil exam. Prova Brasil is the nationwide voluntary proficiency test applied to public school students in the 4<sup>th</sup> and 8<sup>th</sup> grades in 2005 and 2007. It encompasses tests in Math and Portuguese.

We also use data from the Brazilian Census of 2000 for information on the municipalities' demographics and economics characteristics.

### **IV Descriptive Analysis**

Primary public education in Brazil is divided in two systems: one subordinated to the state educational authority and the other to the municipality educational authority. Therefore municipalities have schools belonging to one of these systems or to both. According to our survey, 79 out of 645 municipalities in São Paulo State had schools belonging to the state system only, 396 to the municipal system, and 170 to both systems. Out of the 566 municipalities with schools in the municipal system, 189 contracted out some kind of private structured method between 1999 and 2008. Over this period, 13 municipalities terminated their agreements, and one of these resumed it after one year. Therefore, in 2008, 177 municipalities (around 30 percent) had some kind of agreement in place, covering approximately 440 thousand students in the State's municipal system, equal to 14 percent of those enrolled in municipal systems and 8 percent of all public school (state and municipal) enrollments. Figure 1 shows how the figures evolved over the years:

**Figure 1 Teaching systems evolution in São Paulo municipalities 1998-2008)**



The annual flow of municipalities adopting structured methods can be seen in Table 1, next. As can be seen, the years 2005-2007 show a concentration of municipalities adopting methods, and 2008 shows a concentration of terminations.

**Table 1: Annual Flow of Municipalities with Structured Method Agreements**

All Municipalities			
	Entry	Termination	Total
1999	3	0	3
2000	6	0	6
2001	11	0	11
2002	15	0	15
2003	11	1	10
2004	21	0	21
2005	36	1	35



2006	40	2	38
2007	31 <sup>3</sup>	2	29
2008	16	7	9
Total	190	13	177

On the other hand, most of these municipalities (94%) have agreements in force for 1st-4th grades, as this is the education level with the highest municipalization rate statewide. Even so, 75 percent of these adopt structure methods for Kindergarten and 48 percent do so for grades 5 through 8.

Since we use a difference in difference empirical strategy, we first restricted our sample to municipalities with structured methods signed between 2006 and 2007 and the municipalities without structured methods by 2007. Table 1 shows that 40 and 31 municipalities contracted out private institutions in 2006 and 2007. As our measure of proficiency is the Math and Portuguese scores in Prova Brasil, we further restricted our sample to the municipalities that participated in the test in both years, reducing the number of municipalities in the treatment group to 59 and to 332 in the control group.

In order to investigate if the decision to participate in Prova Brasil is systematically affected by some observable characteristic of the municipalities we computed the probability of participation through a probit regression<sup>4</sup>. As we can see in Table 2, the only variable significant at 5% is the absence of State schools in the municipality. The average schooling of the population has a positive impact but is only significant at 10%.

**Table 2: Probit Model - Participation in Prova Brasil 2005**

Variables	dy/dx	dy/dx
Population (1000 hab.)	0,0000 (0,0002)	-0,00011 (0,00021)
% Population 7 to 14 years old	-0,5212 (0,5490)	0,00155 (0,90405)
Population Average Schooling	0,0644* (0,0341)	0,07194* (0,04533)
Population Per capita Income	-0,0006 (0,0003)	-0,00056 (0,00043)
% of Poor in Population	-0,0192 (0,2163)	-0,09944 (0,31388)
Only School Municipal System	0,1300** (0,0420)	0,00002** (0,00003)
School Age Per capita Education Expenditure		-0,00007 (0,00003)
Per capita Municipal Revenue		0,16846*** (0,06209)
Y predicted	85,63	85,15
Pseudo R <sup>2</sup>	0,0315	0,072

<sup>3</sup> These 31 municipalities include the municipality of “Registro”, which had had an agreement in place in 2001 and 2005 and resumed it in 2007

<sup>4</sup> At the municipality level we have few variables to use in the analysis.

If we include the municipality's per capita revenue and expenditures in education by the population in school age we restrict our sample to 449 municipalities but we also observe that per capita revenue of the municipality has a significant, although very small, negative impact in the probability of participating in the exam.

In terms of the characteristics of the municipalities that signed structured methods agreements in 2006 and 2007 and the municipalities without structured methods by 2007 and restricting our analysis only to the municipalities which participated in Prova Brasil 2005, Table 2 shows that the two groups are very similar in terms of average schooling, percentage of poor in the population and percentage of population in school age. The largest differences are the smaller size of the population, the higher education expenditure and the lower presence of state managed schools in the municipalities that adopted structured methods.

**Table 3 : Municipality Characteristics**

	Without Structured Methods in 2007			Structured Methods in 2006 and 2007		
	Mean	SD	N	Mean	SD	N
Total Population (1000 hab)	53,37	115,38	332	28,42	38,31	59
% Population Poor	0,21	9,43	331	0,20	8,57	58
Years of Schooling	5,37	0,92	331	5,32	0,77	58
Per capita Income	278,28	85,73	331	282,25	106,38	58
% Population 7 to 14 years old	0,14	0,03	332	0,14	0,03	59
Per capita Revenue	1663,,28	690,00	263	1764,59	821,07	45
School Age per capita Education Expenditure	2203,50	1142,22	266	2656,16	1747,14	43
School Municipal System Only	0.684	0.466	332	0.814	0.393	59

Source: Population, Years of Schooling, Per Capita Income: Censo Demográfico 2000-IBGE;  
% Poor – IPEADATA; Revenue and Education Expenditure: Fundação SEADE

The analysis of the joint impact of these variable, controlling for the results of Prova Brasil 2005 and approval rates 2005, on the probability of the municipality to adopt structured methods, using a probit model, shows that the only variable significant at 10% is the absence of state managed schools, when we include educational expenditures and per capita revenue of the municipalities.

**Table 4: Probit Model - Structured Method (2006-2007)**

	dy/dx	DP
Approval rate 4 <sup>th</sup> grade	-0,00262 (0,00317)	-0,00433 (0,00342)
Prova Brasil 05 Math	-0,00416 (0,00271)	-0,00456 (0,00304)
Prova Brasil 2005 Portuguese	0,001749	0,002273

	(0,00313)	(0,00345)
Population	-0,00054	-0,00028
	(0,00038)	(0,00037)
% 7 to 14 years old Population	-0,55271	0,727242
	(0,65191)	(100.714)
Average Years of Schooling	-0,02094	-0,03769
	(0,04358)	(0,04814)
Average Per capita Income	0,000334	0,000426
	(0,00041)	(0,00047)
% Poor Population	-0,23701	-0,5033
	(0,28066)	(0,34432)
School Municipal System Only	0,06095	0,075361*
	(0,0413)	(0,04665)
School Age per capita Education Expenditure		0,00003
		(0,00002)
Per capita Revenue		-0,00005
		(0,00004)
Y predicted	13,64	12,08
Pseudo R <sup>2</sup>	0,0416	0,0739
N	389	302
* p< 10%; **p< 5%; ***p< 1%.; Standard deviations in parentheses.		

When we compare the students' proficiency of municipalities with structured methods in 2006 and 2007 with the municipalities without structured methods by 2007, we observe that the results are lower for the first group, 2,29 point in math and 1,28 points in Portuguese in 2005, and higher, 2,42 in math and 2,07 in Portuguese in 2007.

**Table 5: Performance of Municipalities 4<sup>th</sup> Grade**

Municipalities Without Structured Methods in 2007				Municipalities With Structured Methods in 2006 and 2007		
2005		Prova Brasil 2005		2005		Prova Brasil 2005
Approval Rate		Math	Reading	Approval Rate	Math	Reading
Average	91,43	195,15	185,93	90,84	192,86	184,65
SD	5,35	14,13	12,44	5,61	10,59	9,25
N	332	332	332	59	59	59
2007		Prova Brasil 2007		2007		Prova Brasil 2007
Approval Rate		Math	Reading	Approval Rate	Math	Reading
Average	92,76	207,83	186,50	92,80	210,25	188,57
SD	4,88	19,14	14,30	4,76	19,20	13,08
N	332	332	332	59	59	59

## V. Methodology: The Difference-in-Differences Estimator

The ideal strategy of estimating the causal effect of the adoption of structured methods on the quality of education would be to observe municipalities with and without the use of methods at a given point in time. This, however, is impossible. Therefore, we must resort to creating comparison groups (control groups) as similar as possible to the municipalities with structured methods in place (treatment group) to build counterfactuals. The key assumption to identify the causal impact of the methods is that the control groups behave as the treatment group in the absence of the treatment. To control for unobserved characteristics that differently affects the level of proficiency on each groups, we adopt the difference-in-differences estimator with fixed municipality effect. Intuitively, this estimator is the difference between proficiency gains over time of municipalities with structured methods and the proficiency gains of municipalities without such agreements over the same period. This difference can only be understood as the true impact of methods adoption under the assumption that, had the treatment group not adopted structured methods, the gain in proficiency would be the same as in municipalities in the control group.

The relevant variables for analysis are average student approval rates between the first and fourth grades and the average proficiency scores in Mathematics and Portuguese attained by 4th and 8th graders measured by the Prova Brasil. In this study, we estimate the impact of methods on schools adopting them in 2006 and 2007.

Impact estimation is based on the following fixed-effect regression using 2005 and 2007 data:

$$y_{it} = \alpha + \beta d_{it} + \delta T_t + \lambda_i + u_{it} \quad (1)$$

where  $y_{it}$  is one of the variable of interest (approval rate, Math proficiency or Portuguese proficiency) for municipality  $i$  in year  $t$  (2005 and 2007);  $d_{it}$  is a dummy assumes value 1 if municipality  $i$  had a structured method in place in year  $t$ , the coefficient  $\beta$  captures the additional gain the treatment group showed relative to the mean of control municipalities (the difference-in-differences estimator). The dummy  $T_t$  equals 1 if  $t$  is 2007 and zero if  $t$  is 2005, the coefficient  $\delta$  captures the average change in results from 2005 to 2007 for control-group municipalities.  $\lambda_i$  is the fixed effect, that is, a variable that captures municipality  $i$ 's unobserved fixed characteristics;  $u_{it}$  is the random term. The regression was estimated with municipalities that had never had contracted out the structure methods prior to 2006. The relevant parameter is the  $\beta$ , which measures the change in approval rates or proficiency scores induced by the adoption of the methods.

## VI. Results

### VI.1. The Average Impact of Structured Methods

Table 6 shows the average and standard deviation of the approval rate, Math and Portuguese proficiency in 2005 and 2007 for students in the 4th grade. It can be noticed that the gains in math and Portuguese in the treatment group were higher than the control one.

The treatment group presents lower levels of proficiency in 2005 and depicts higher levels after the implementation of the structured methods in 2007. Differently, no gains are seen in the approval rates for both control and treatment groups in the period.

**Table 6: Average 4th grader performance**

<b>Municipalities without Structured Methods</b>				<b>Municipalities with Structured Methods in 2006-2007</b>		
	<b>2005</b>	<b>Prova Brasil Exam 2005</b>		<b>2005</b>	<b>Prova Brasil 2005</b>	
	Approval (%)	Math	Portuguese	Approval (%)	Math	Portuguese
Mean	91.43	195.15	185.93	90.84	192.86	184.65
SD	5.35	14.13	12.44	5.61	10.59	9.25
N	332	332	332	59	59	59
	<b>2007</b>	<b>Prova Brasil 2007</b>		<b>2007</b>	<b>Prova Brasil 2007</b>	
	Pass	Math	Portuguese	Pass	Math	Portuguese
Mean	92.76	207.46	186.25	92.2	210.14	188.43
SD	4.93	19.14	14.34	4.81	18.14	12.26
N	391	391	391	70	70	70

The regression was estimated using all municipalities in the treatment group that have adopted structured methods in 2006 and 2007 in any grade. Table 7 shows the regression results. The estimation was run for the approval rates of the students in 1st-4th grades and 5th-8th grades and for the scores of Prova Brasil exam for the 4th and 8<sup>th</sup>. The results reinforce the figures shown in Table 6. It indicates that the impact on approval rates, though positive, is not statistically significant. They also show a positive impact of 4.7 and 3.4 points in 4th Math and Portuguese Prova Brasil exams scores respectively. For 8th graders the impact on Prova Brasil exam Math and Portuguese scores is also positive at 6.3 and 4.9 points, respectively. These results are notable. One way of measuring the relative importance of the impact is to express these gains in terms of the standard deviation of Prova Brasil proficiency scores. In 2005, the nationwide standard deviation of Portuguese and Math scores were of approximately 40 points in each case, for both 4th and 8th graders. Therefore, the impact of adopting structured method agreements corresponds to about 10 percent of the standard deviation. For example, the impact on 4th grade math scores is  $4.7/40 = 0.1175$ .

**Table 7: Municipal Fixed-Effect Regression: Expanded Sample**

	4th Grade			8th Grade		
	Approval Rate (1st-4th)	Math Proficiency	Portuguese Proficiency	Approval Rate (5th-8th)	Math Proficiency	Portuguese Proficiency
Structured method	0.626	4.712**	3.353**	2.077	6.261**	4.921*
	(0.655)	(2.284)	(1.624)	(1.596)	(2.928)	(2.660)
2007	1.342***	12.679***	0.569	1.481**	3.058**	6.955***
	(0.255)	(0.887)	(0.631)	(0.670)	(1.230)	(1.118)
Constant	91.336***	194.802***	185.738***	86.408***	246.217***	227.933***
	(0.169)	(0.591)	(0.420)	(0.456)	(0.836)	(0.760)
Observations	782	782	782	278	272	272

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.  
Standard deviations in parentheses.

To check the sensitivity of the results to sample-selection bias, we replicate the procedure with a restricted sample including only municipalities with agreements in place for each of the analyzed grades. The treatment group for the 4th grade analysis included only municipalities with methods in place for the 4th grade, and likewise for the 8th grade analysis. The total number of municipalities in the restricted sample is can be seen in Table 8.

**Table 8: Number of Municipalities, Restricted Sample**

	4th Grade		8th Grade	
	Total	With Prova Brasil	Total	With Prova Brasil
Treatment	65	54	30	26
Control	392	332	332	100

The results for the restricted sample increases the estimated impact of methods to 5.3 points in the 4th grade Prova Brasil exam (Math) and keeps the impact on Portuguese scores at 3.4 points. The impact on average 1st-4th grade approval rates remains statistically no different from zero. For the 8th grade, results indicate 8.58 and 5.5 higher scores in math and Portuguese respectively. Approval rates are 2.9 percentage points higher and statistically significant at 10 percent. Table 9 depicts the results. Comparing with extended sample, we find higher impacts of the structured methods in all but one quality of education indicators. These results are expected since in the restricted sample the method was adopted in the examined grade. Although it is possible that externalities of having structured methods adopted in different grades affects the quality of education of students in a given grade, the direct impact of the methods are more effective.

**Table 9: Municipal Fixed-Effect Regression: Restricted Sample**

	4th Grade			8th Grade		
	Pass Rate (1st-4th)	Math Proficiency	Portuguese Proficiency	Pass Rate (5th-8th)	Math Proficiency	Portuguese Proficiency
Structured method	0.582 (0.682)	5.301** (2.377)	3.383** (1.692)	2.973* (1.733)	8.584** (3.368)	5.488* (3.088)
2007	1.342*** (0.255)	12.679*** (0.889)	0.569 (0.633)	1.481** (0.631)	3.058** (1.227)	6.955*** (1.125)
Constant	91.350*** (0.171)	194.860*** (0.596)	185.781*** (0.424)	86.492*** (0.440)	246.146*** (0.855)	227.945*** (0.784)
Observations	772	772	772	252	252	252

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Standard deviations in parentheses.

## VI.2. The Heterogeneous Effect of the Starting Point

This section extends the analysis of the impact of structured methods on student proficiency to determine whether the impact varies for municipalities with different initial levels of proficiency. The question is whether structured methods have a greater impact on municipalities with higher or lower initial Prova Brasil exam scores. To test whether the impact of structured methods differs for various proficiency levels, we include in the analysis the interaction of 2005 Prova Brasil scores with the treatment group:

The estimated regression is:

$$y_{it} = \alpha + \beta d_{it} + \phi d_{it} PB_{i05} + \delta T_t + \lambda_i + u_{it} \quad (3)$$

This estimation provides the impact, conditioned on 2005 Prova Brasil exam scores, of structured methods on students proficiency. Again, the analysis was applied to both samples: (i) the expanded one, where treated municipalities are the ones with methods on any grades; and (ii) the restricted one, where treated municipalities are the ones with methods in place for the analyzed grades only.

For the expanded sample, Table 10 shows that the interaction is not statistically significant for 4th grade Math Prova Brasil scores, but is for Portuguese Prova Brasil scores with a negative impact. This means that impact is greater for less proficient municipalities. The same result occurs for Math and Portuguese 8th grade scores.

**Table 10: Estimation of Structured Methods' Impact Interacted with 2005 Proficiency**

**Municipal Fixed Effect Regression: Expanded Sample**

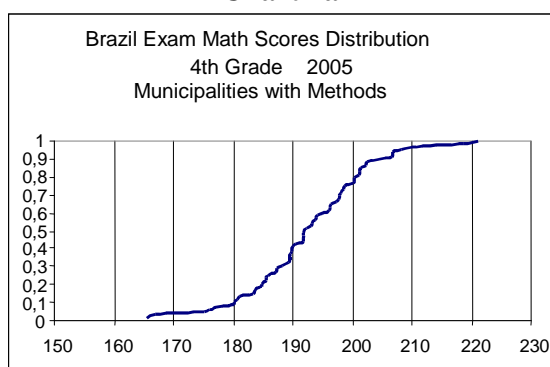
	4th Grade		8th Grade	
	Math Proficiency	Portuguese Proficiency	Math Proficiency	Portuguese Proficiency
Structured method	3.386 (38.795)	68.541** (30.024)	155.476*** (48.202)	82.830* (44.994)
Structured method x BE 2005	0.007 (0.201)	-0.353** (0.162)	-0.611*** (0.197)	-0.344* (0.198)
2007	12.679*** (0.888)	0.569 (0.628)	3.058** (1.187)	6.955*** (1.108)
Constant	194.802*** (0.579)	185.738*** (0.409)	247.365*** (0.759)	229.302*** (0.709)
No.	782	782	239	239

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

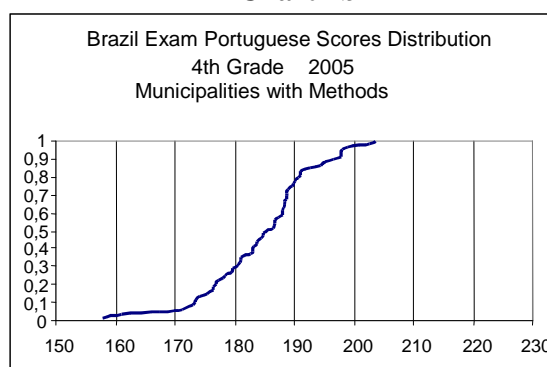
Standard deviations in parentheses.

We find that the break-even score – that is, the Prova Brasil exam score for which the marginal effect is zero – is 194.2 points (4th Grade, Portuguese). Chart 2.b shows that 86 percent of municipalities with structured methods score below this threshold. For 8th Grade Math, the score is 254.46 and covers 81 percent of municipalities, as seen in Chart 2c. Finally, for 8th Grade Portuguese, the score is 240.75 points and, again, as Chart 2d shows, 81 percent of municipalities with structured methods score below this level.

**Chart 2a**



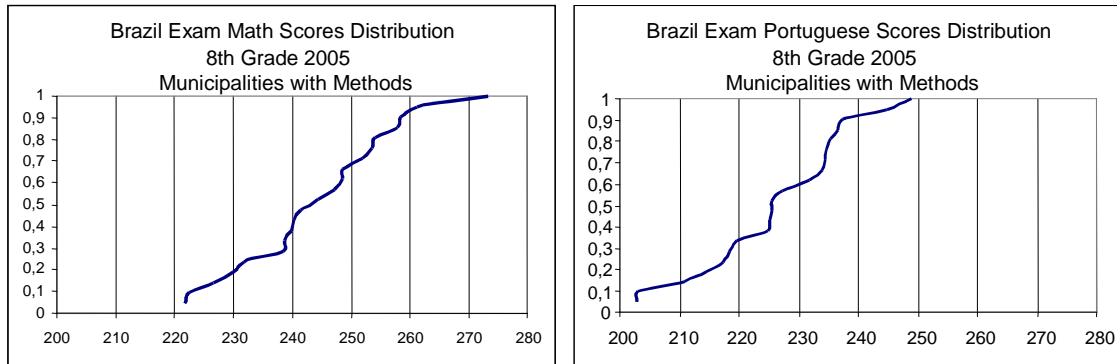
**Chart 2b**



**Chart 2c**

**Chart 2d**





Restricting the sample does not change the results qualitatively, as it can be seen in Table 11 below.

**Table 11: Estimation of Structured Methods' Effect Interacted with 2005 Proficiency - Municipal Fixed Effect Regression: Restricted Sample**

	4th Grade		8th Grade	
	Math Proficiency	Portuguese Proficiency	Math Proficiency	Portuguese Proficiency
Structured method	4.131 (40.512)	70.228** (31.138)	149.877*** (56.690)	56.923 (55.078)
Structured method x BE 2005	0.006 (0.209)	-0.362** (0.168)	-0.578** (0.231)	-0.227 (0.242)
2007	12.679*** (0.890)	0.569 (0.630)	3.058** (1.199)	6.955*** (1.126)
Constant	194.860*** (0.584)	185.781*** (0.413)	247.564*** (0.787)	229.559*** (0.739)
Observations	772	772	227	227

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$   
Standard deviations in parentheses.

### VI.3. The Effect of Accumulated Exposure to Structured Methods

This section investigates the impact of exposure years to structured methods on student proficiency. We attempt to determine the existence of cumulative effects of student exposure to structured methods over time. To this end, the control group becomes the set of all municipalities without methods by 2007, and we build two alternative treatment groups.

The first one contains municipalities whose contracts started in 2005. For these, 4th graders had only been exposed to structured methods for one year at the time of the 2005 Prova Brasil exam. The exposure increases to 3 years at the time of the 2007 Prova Brasil exam. We label these groups 3 years vs. 1 year. The second group is made up of municipalities that adopted methods in 2004 and whose 4th graders had therefore had two years' exposure at 2005 Prova Brasil exam and 4 years' at the 2007 Prova Brasil exam. This group is labeled 4 years vs. 2 years. Table 12 shows the number of municipalities in each group, obtained only from the expanded sample and 4th graders.

**Table 12 Number of municipalities**

	<b>Total</b>	<b>com BE</b>
3 vs. 1	36	29
4 vs. 2	21	19
Control	169	130

The effect was estimated with the difference-in-differences method and controlling for municipal fixed effect. The treatment group's different results in 2007 and 2005 are due to two factors: duration of the exposure to the method and the time effect itself. Assuming that the time effect is the same for the treatment and control groups, our estimator identified the exposure effect. The estimation with the first group – 3 years vs. 1 year – identifies the effect of exposure from the 2nd to the 4th grade relative to exposure in the 4th grade only. The estimation done with the second treatment group – 4 years vs. 2 years – indicates the effect of 1st-4th grade exposure relative to 3rd-4th grade exposure.

The results can be seen in Table 13, next, and are qualitatively similar. The gain in Math scores is 4.6 points for the first group, 3 vs. 1, and 5.5 points for the second one, 4 vs. 2. Results for Portuguese are 1.61 for group 3 vs. 1 and 2.25 for 4 vs. 2; the results, however, are not statistically different from zero.

**Table 13: Estimation of the Effect of Accumulated Exposure to Structured Methods - Municipal Fixed Effect Regression: 4th Grade**

	<b>3 years vs. 1 year</b>		<b>4 years vs. 2 year</b>	
	<b>Math Proficiency</b>	<b>Portuguese Proficiency</b>	<b>Math Proficiency</b>	<b>Portuguese Proficiency</b>
Structured method	4.595** (1.905)	1.615 (1.372)	5.515*** (2.163)	2.248 (1.527)
Constant	12.679*** (0.540)	0.569 (0.389)	12.679*** (0.503)	0.569 (0.355)
Observations	1.083	1.083	1.053	1.053

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Standard deviations in parentheses.

Taken together, the evidence indicates that exposure over time generates gains in Math scores. Note that this exercise is with respect only to differences between different exposures to the method between the 1st and 4th grades.

## VI. 4 Spillover Effects

The adoption of structured methods, by the schools of the municipal educational system raises the question of spillover effects. These effects could be on the schools that belong to other educational systems, private or state managed, brought about by some kind of competition between them. The effects could be also on the other grades of the schools of municipal system in the case of partial adoption of the structured methods, as a result of some demonstrative effect.

### VI.4.1 Impact for the State System

To test if the adoption of structured methods stimulated some kind of competition in the other educational systems we compared the results with the schools of the state system. We cannot test for private schools since they don't participate in Prova Brasil. We restricted the analysis to municipalities with both local and state schools, and compare the Prova Brasil scores achieved by schools in the state system at municipalities adopting structured methods in 2006-2007 with the scores in the state system of municipalities without structured methods by that time. Because state system schools are not directly exposed to the structured methods, comparison of their results with those of the municipal systems – which are directly exposed to methods – helps interpret the results. Therefore, if the estimator for the variable that captures the adoption of structured methods is positive and significant for schools in both systems the results will favor the hypothesis of spillover effects. If the estimator is significant for the municipal system only, and not for the schools in the state system, it is an evidence of no spillover effects of structured methods.<sup>5</sup>

As Table 14 shows, proficiency gains for state schools in municipalities that adopted structured methods do not differ from those of state schools in non-structured method municipalities. More specifically, the estimated changes are negative, even if not statistically different from zero. This result suggests that there are no spillover effects.

**Table 14: Robustness Test with State Schools as Treatment – Municipal Fixed Effect Regression: 4th Grade**

<u>State Schools</u>	<u>Municipal Schools</u>
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<sup>5</sup> This test could also be interpreted as a robustness test for the impact of unobservable municipality's general and specific characteristics, preferences, social norms etc that may be associated with proficiency changes and the adoption of structured methods. Assuming that these general characteristics are mainly responsible for proficiency changes in the treatment group, they should also affect changes in the state schools found in the treatment group's municipalities.

	Math Proficiency	Portuguese Proficiency	Math Proficiency	Portuguese Proficiency
Structured method	-0.214 (3.071)	-1.504 (2.813)	4.322 (2.635)	3.324* (1.879)
2007	6.301*** (0.869)	-6.081*** (0.796)	13.069*** (1.642)	0.598 (1.171)
Constant	190.525*** (0.557)	185.155*** (0.510)	193.472*** (0.916)	185.722*** (0.653)
Observations	275	275	349	349

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Standard deviation in parentheses.

However, we also compared the results for municipal school only. The results are not statistically significant for Math and significant for Portuguese only at 10 percent. This result suggests that the no effect result found may be due to the smaller sample size. Thus, strictly speaking, the results are inconclusive, although it may suggest that there are no spillover effects.

#### VI.4.2 Impact for 8th Graders in Municipalities with Structured Methods

Like the previous one, this exercise attempts to find evidence of spillover effects resulting from the adoption of structured methods but inside the municipal schools. In this case, we compare the proficiency of 8th graders in municipalities that adopted methods up to the 4th grade with the proficiency of 8th graders in municipalities with no methods. The hypothesis is that no student in either group is exposed directly to structured methods, but one group is exposed only indirectly to them. Therefore, the second test restricts the treatment group to municipalities adopting structured methods in 2006 and 2007, with the exclusion of those with methods for the 5th to 8th grades. The control group is made up of municipalities with no structured methods by 2007. The difference-in-differences is estimated for 8th grade Math and Portuguese Prova Brasil exam scores and compared with 4th grade results. Therefore, a positive and significant for both 4<sup>th</sup> and 8<sup>th</sup> grades estimator would support the hypothesis of spillover effects of structured methods inside the municipal system.<sup>6</sup>

**Table 15: Robustness Test Using the 8th Grade as Treatment**  
**Municipal Fixed Effect Regression: municipalities with structured methods for grades 1-4**

	8th Grade	4th Grade
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<sup>6</sup> This test can also be interpreted as a robustness test for unobserved characteristics of municipalities and municipal education systems associated with proficiency changes and the adoption of structured methods

	<b>Math Proficiency</b>	<b>Portuguese Proficiency</b>	<b>Math Proficiency</b>	<b>Portuguese Proficiency</b>
Structured method	-1.522	2.111	3.998	3.114
	(5.073)	(4.911)	(3.077)	(2.232)
2007	5.032***	8.346***	13.683***	0.972
	(1.058)	(1.024)	(0.831)	(0.603)
Constant	247.816***	228.950***	195.641***	186.706***
	(0.873)	(0.845)	(0.614)	(0.445)
Observations	350	350	987	987

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Standard deviations in parentheses.

As Table 15 shows, the effects on 8th Grade Prova Brasil exam scores are not statistically different from zero. Results are not statistically significant for the 4th Grade either, although the estimated scores are similar to those seen in the general estimation. Again, the absence of significance may be due to the sample's small size, thus the results are inconclusive.

#### **VI.5. Robustness Test : Results for Municipalities Adopting Methods in 2008**

The robustness test attempts to investigate whether a selection bias exists in the adoption of structured methods. To do this test, we use a control group made up of municipalities that adopted methods in 2008 and that, as a result, had not been exposed at the time of the 2005 and 2007 Prova Brasil exams. Again, the control group is made up of municipalities that did not have methods in place by 2008. The results shown in Table 16 indicate that these municipalities showed greater performance gains in 4th Grade Math and Portuguese scores than the control group. Also, this group's score gain was far superior to that shown by the group made up of municipalities that did in fact adopt methods in 2006-2007. In other words, municipalities that decided to enter into agreements with private teaching systems in 2008 show the greatest proficiency gains in 2005 and 2007. This suggests a strong selection bias, at least for this group.

**Table 16: Robustness Test Using 2008 Adopters as Treatment Group**

**Municipal Fixed Effect Regression: Municipalities with Structured Method only in 2008**

	<b>4th Grade</b>	
	<b>Math Proficiency</b>	<b>Portuguese Proficiency</b>
Structured method	9.314**	8.503***

	(4.561)	(3.194)
2007	12.314***	0.236
	(0.903)	(0.632)
Constant	194.938***	185.787***
	(0.639)	(0.448)
Observations	723	723

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
Standard deviation in  
parentheses.

## VI. Conclusion

This study attempts to assess the impact of the adoption of structured methods on the students' proficiency and approval rates on São Paulo State municipal schools. The evidence suggests that compared to municipalities that did not adopt structured methods, the affected municipalities present: higher proficiency in 2007; higher proficiency gains from 2005 to 2007; and no effect on approval rates. Furthermore, we find that the worst-performing municipalities in proficiency exams – with the exception of 4th grade Math – are those with the greatest gains from adopting structured methods. However, a robustness test suggests that we are not able to discard that unobserved municipal characteristics associated with proficiency changes over time may affect the results.

These results are in line with most of the empirical literature related to charter schools that find no conclusive evidence on their impact on proficiency. We do not find either evidence of positive spillover and competition effects of these methods. Within the same municipalities, 8<sup>th</sup> graders students not directly affected by the adoption of structured methods in 4<sup>th</sup> grade classes, do not present a significant gain in proficiency compared to students in the same grade of municipalities that did not adopt structured methods in any class. State schools in municipalities that adopted the methods did not benefit either.

As for the discussion about the relevance of inputs for the education production function our results are also in line with main conclusions of the literature. Assuming that our results capture a causal effect of the structured method on proficiency, they suggest that combine material, teachers' training and parents and teachers is effective in rising students' proficiency. On the other hand, our results contradict part of the literature which finds positive impacts of inputs only in top students. We find that for the majority of proficiency measures analyzed, the effects are more pervasive on bottom ranked schools.

## References

Angrist, J. D. Lavy, (2001) V. Does Teacher Training Affect Pupil Learning? Evidence from Matched Comparisons in Jerusalem Public Schools. *Journal of Labor Economics* 19(2): 343-369.

Baker, J. (2002) Evaluating the impact of Development Projects on Poverty: A Handbook for Practitioners. The World Bank.

Bettinger, Eric P., (2005). "The effect of charter schools on charter students and public schools," *Economics of Education Review*, Elsevier, vol. 24(2), pages 133-147, April.

Booker, Kevin & Gilpatric, Scott M. & Gronberg, Timothy & Jansen, Dennis, (2007). "The impact of charter school attendance on student performance," *Journal of Public Economics*, Elsevier, vol. 91(5-6), pages 849-876, June.

\_\_\_\_\_, (2008). "The effect of charter schools on traditional public school students in Texas: Are children who stay behind left behind?," *Journal of Urban Economics*, Elsevier, vol. 64(1), pages 123-145, July.

Glewwe, P. Kremer M, Moulin S. (2007) Many Children Left Behind? Textbooks and Test Scores in Kenya. NBER Working Paper Series WP 13300.

Hanushek E. A (2003) The Failure of Input-Based Schooling Policies. *The Economic Journal*, Vol 113, No , Vol 113, No 485, pp F64-F96.

Hanushek, Eric A. & Kain, John F. & Rivkin, Steven G. & Branch, Gregory F., (2007). "Charter school quality and parental decision making with school choice," *Journal of Public Economics*, Elsevier, vol. 91(5-6), pages 823-848, June.

Hoxby, Caroline M. and Murarka, Sonali, Charter Schools in New York City: Who Enrolls and How They Affect Their Students' Achievement (2009). NBER Working Paper Series, Vol. w14852, pp

Jacob, B. A. Lefgren, L. The impact of Teacher Training on Student Achievement: Quasi-Experimental Evidence from School Reform Efforts in Chicago NBER Working Paper Series, WP 8916. 21

Leme, Carolina M., Ricardo Paredes, André Portela Souza, A Municipalização do Ensino Fundamental e seu Impacto sobre a Proficiência” (2009) in *Educação Básica do Brasil*, org. Fernando Veloso et. al. Elsevier, pg. 261-280

Lockheed, M. Hanushek, E.A. (1987) Improving the Efficiency of Education in Developing Countries: Review of the Evidence. Discussion Paper Education and Training Series, The World Bank.

Madeira, R. (2007) The Effects of Decentralization on Schooling: Evidence From the Sao Paulo State's Education Reform (132), mimeo

PISA (2006). PISA 2006: Science Competencies for Tomorrow's World. OCDE.



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