ELSEVIER

The Quarterly Review of Economics and Finance
48 (2008) 377–388

The QUARTERLY REVIEW of ECONOMICS and FINANCE

www.elsevier.com/locate/qref

Education regulation as an instrument of income distribution: The case of Ceara

Marcos Costa Holanda [a,*], Cláudio André Gondim Nogueira [b], Francis Carlo Petterini [c]

[a] *Economic Research and Strategy Institute of Ceara (IPECE), CAEN/UFC, Brazil*
[b] *Economic Research and Strategy Institute of Ceara (IPECE), University of Fortaleza (UNIFOR), Brazil*
[c] *Pontifícia Universidade Católica do Rio de Janeiro (PUC-RJ), Brazil*

Received 13 December 2006; received in revised form 13 December 2006; accepted 13 December 2006
Available online 30 March 2007

Abstract

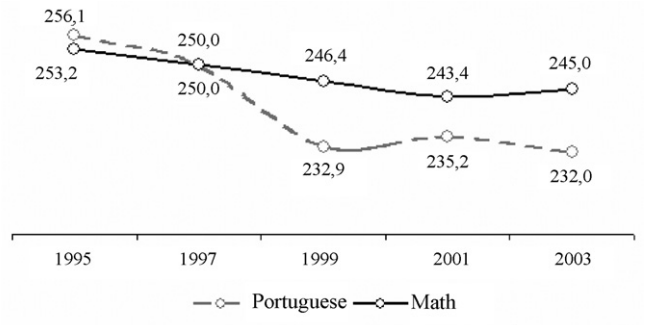
The concern regarding the quality of public educational systems has become increasingly important in recent years, which is justified due to the role that education has as an instrument to promote economic development and income distribution. Since there are imperfect credit markets and other limiting aspects, the market is not able to provide education in the amounts that society desires and, therefore, the government has to intervene directly to provide the service to those who are not able to afford private education. The problem is that there is a clear disparity in terms of quality between public and private education. The private system is supposedly able to regulate itself through competition, while public education needs to be regulated by the State in order to assure minimum quality levels. In the context of the State of Ceara (Brazil), two public educational regulatory systems are compared: a public voucher system and a system based on teacher incentives. In the voucher system, competition would provide incentives to public schools to increase their levels of efficiency, but it may originate some "centers of excellence", penalizing the least efficient schools, and weak incentives to teachers may undermine its expected results. The system based on teacher incentives, on the other hand, could be considered as a form of "positive regulation" in the sense that there will be no sanctions to the worst schools. The idea is to reward, through pecuniary benefits, teachers and principals of those schools considered the best in terms of existing levels and/or in terms of improvement in the quality of the education provided. The main argument is that a system, such as the latter may induce a healthy competition among public schools that would end up improving teaching quality and achievement.
© 2007 Board of Trustees of the University of Illinois. All rights reserved.

JEL classification: I2; I28

Keywords: Education; Regulation; Income distribution

* Corresponding author.
E-mail addresses: holanda@ipece.ce.gov.br (M.C. Holanda), claudioandre@unifor.br (C.A.G. Nogueira), petterini@yahoo.com.br (F.C. Petterini).

1062-9769/$ – see front matter © 2007 Board of Trustees of the University of Illinois. All rights reserved.
doi:10.1016/j.qref.2006.12.020



Source: SAEB INEP/MEC Report. Average grades of the 2nd cycle.

Graph 1. Average grade in SAEB—Portuguese and Math.

1. Introduction

The concern regarding the quality of public educational systems is becoming increasingly important in recent years. In general, a common but yet concerning result is being observed: *the quality of public education is not improving over the years* (e.g., see Carneiro & Heckman, 2003).

In Brazil, the *Sistema Nacional de Avaliação da Educação Básica*[1] (SAEB), created in 1995, evaluates primary and secondary students every 2 years. And, in Ceara, the *Sistema Permanente de Avaliação da Educação Básica*[2] (SPAECE), created in 1992, conducts annual evaluations only in public schools. They both measure the students' performances based on standardized tests in Math and Portuguese. Grades are contained in the interval between 0 and 500.

As an illustration of what is being happening in recent years in Brazil, Graph 1, presents the Brazilian average grade in SAEB during the period 1995–2003. As the graph illustrates, quality has been declining during the period in consideration.

Many factors may explain why the quality in public education has not been improving. In Brazil, educators have listed several factors, such as the poor quality of teachers, the lack of parent participation in schools, the need to enter the job market early, the negative influence of the media, drug related problems and so on.

Empirical works that have tested these hypotheses in Brazil are still scarce. The problem is that these evaluation systems mentioned before did not include a survey regarding students' academic and family backgrounds, till recently. As an example, only last year SPAECE started to apply questionnaires to the students with questions about their family backgrounds and their situation in school.

The importance of this discussion for a state, such as Ceara, one of the poorest in Brazil, is that education is one of the most important instruments to promote economic development and income distribution.[3] Relevant transformations can only occur in society if the public educational system is able to give a good response in terms of quality so that students that are provenient from poorer families are able to compete with those that come from richer families and are able to afford private schools. But, many limiting factors can prevent that public schools spontaneously

[1] Basic Education National Evaluation System.
[2] Basic Education Permanent Evaluation System.
[3] See, for example, the seminal work in Brazil written by Langoni (1974).

achieve high-quality levels. Therefore, there is the need for government regulation in order to guarantee minimum quality standards in public schools.

Thus, the main objective of this paper is to analyze, in the context of the State of Ceara, two public educational regulatory systems: a public voucher system and a system based on teacher incentives. In each case, the pros and cons will be discussed in detail and, as a conclusion, the system that was actually proposed to Ceara will be described.

Besides this introduction, this paper is composed of three additional sections. In section II, the analysis about alternative educational regulatory systems will be made. In section III, the case of Ceara will be described in detail. Section IV concludes.

2. Alternative educational regulatory systems

The literature suggests many alternatives that a regulator may use in order to improve quality in schools. In this section, some of these alternatives will be analyzed giving special emphasis on those that are most attractive considering Ceara's reality.

Most of the alternatives found in the literature focus basically on two policy instruments: the creation of a voucher system and the creation of incentive schemes to teachers and/or principals. Those works about voucher systems (that are the most common in the literature) indicate that their main virtue would be to provide incentives to schools in order to increase efficiency. Competition among schools would force them to compete with one another in order to attract a better pool of students and to improve the quality of education (e.g., see Hoxby, 2001, 2002, 2003; Lieberman, 1986; Millimet & Collier, 2004). Those works about incentive schemes, on the other hand, focus their analysis on ways to improve schools' managerial capacity and/or to enhance the level of effort of teachers and/or principals (e.g., see Jacob & Lefgren, 2005; Glewwe, Ilias, & Kremer, 2003).

In all cases, it is important to acknowledge that every alternative has its pros and cons, i.e., there is no system that can be considered perfect in every situation. Alternatives should be analyzed according to the specific environment where they ought to be implemented. That is exactly why two alternatives will be considered in Ceara's context: a public voucher system and a teacher incentive scheme based on school performance in standardized tests.

2.1. A public voucher system

Considering Ceara's context, certain types of voucher systems proposed in the literature would be difficult to implement, especially those that include private schools, because of the following arguments:

[1] In poor regions or states, due to a tight budget constraint, the value of the voucher may not be large enough to cover the costs of attending a private school (see Lieberman, 1986);
[2] Private schools may not have capacity to include all the students provenient from public schools (see Lieberman, 1986);
[3] If private schools are included, transfer of funds to those schools would mean less resources to their public counterparts and
[4] This type of voucher system, which includes private schools, is more suitable to regions or countries where there are flexible labor markets and relationships.

The conjunction of these factors indicates that in Ceara's case it would be more realistic to consider a system where only public schools compete with one another.[4]

Thus, in order to implement a public voucher system the regulator must take into consideration a series of factors, such as the following:

[1] Students should be free to choose the public school which best suits his/her interests, subject to the school's capacity constraint, and they should be selected on a "first come, first serve" basis.
[2] Each school should receive exactly the same amount of money "v" per student enrolled and autonomously will decide how to allocate its resources (even though, wages are determined exogenously).
[3] Assuming that the only source of revenues for the schools is the vouchers, they will have to earn revenues that should be greater or equal to its costs. Therefore, each school will be able to determine the maximum number of students that it can enroll (that occurs when they break even).
[4] The value of "v" should then be determined so that learning is maximized, subject to the constraint that every student in the district who wants to study in a public school is served, and to the government's budget constraint, that in poor regions is usually very tight.

Considering these aspects and the school's average peer and teacher quality as well as its managerial capacity as given, the value of the voucher should be set at the highest level possible since it will determine the quality of the school's physical infrastructure, one of the most important determinants of learning.

The appealing feature of this result is that if v is high enough, more vacancies could be offered at better quality schools (that, on average, have higher per pupil costs), and a surplus would be generated at lower quality schools, and those resources could be used to improve their infrastructure, their teaching methods, and the quality of their teaching staff. Then, in this scenario, one could expect considerable positive impacts on learning.

At this point, a few critical remarks are necessary:

[1] Learning targets should be realistic given the existing budget constraint. Furthermore, the regulator must acknowledge that learning may be affected by a series of random effects associated with pupils' family backgrounds, pupils' commitment, and efforts (e.g., see Gradstein, Justman, & Meier, 2005).
[2] There could be decreasing returns on spending (keeping peer and teacher quality and managerial capacity unchanged) (see Carneiro and Heckman, 2003).
[3] Since students are free to move from one public school to the other (as long as vacancies are available), then peer quality may change after the system is implemented.[5]
[4] In a voucher system, competition would force schools to boost efficiency. But, Peterson and Shattuck (2004) point out that there is a lot of inertia built into the process, and the change

[4] This is not only the case of Ceara, though. Hoxby (2002, p. 17), for example, acknowledges that "*this traditional form of choice is by far the most pervasive and important form of choice in American elementary and secondary schooling today*".

[5] Hoxby (2001), for example, found empirical evidence that such a phenomenon did not occur on voucher systems implemented in Milwaukee, Michigan and Arizona. Nevertheless, she aquiesces that such phenomenon is a theoretical possibility and may occur in certain contexts.

is very gradual. Furthermore, this system may end up punishing the least efficient schools, especially those that were already in disadvantage when it was first implemented.

[5] Teachers will face weak incentives to increase their levels of effort and, consequently, the quality of their teaching because, in the public voucher system described before, their wages are exogenously determined by the government and, therefore, an increase in their quality could not be compensated directly.[6]

Thus, one can realize that the voucher system providing incentives to increase competition among schools may force them to compete in order to attract a better pool of students and to improve the quality of education. At the same time, one must acknowledge that this system may originate some "centers of excellence" and weak incentives to teachers may undermine its expected results.

2.2. *Teacher incentives and the quality of public education*

Another body of work that proposed alternatives to improve learning in public schools is the one that suggests the use of incentive schemes. These incentive schemes are usually designed to increase teacher effort.

The basic idea is that the government regulator would like to hire teachers in order to provide good quality education to students in public schools. The problem is that the regulator will be expecting that the teachers will give a certain level of effort and commitment while performing their tasks. Since direct monitoring and the gathering of information are usually very costly, then teachers could have their own agenda, i.e., they may provide students with a low level of effort.

Therefore, if teacher quality/effort is in fact one of the determinants of learning, then the principal would be facing an *agency problem* (e.g., see Kreps, 2004; Mas-Colell, Whinston, & Green, 1995; Pindyck & Rubinfeld, 1997). In this case, the problem emerges because teachers (the agents) may pursue their own goals, even at the expense of obtaining lower learning levels, and that is exactly the opposite of what the regulator (the principal) desires.

Thus, the regulator can design reward systems to teachers so that they can come as close as possible to meet his own goals. Kreps (2004) indicates that a variety of motivators or incentives can work on individuals or groups of individuals, such as intrinsic motivators (such as pride in a job well done); the desire to acquire and maintain a general reputation for good behavior because such reputation provides future benefits; the desire not to be fired; the prospect of a promotion or desirable assignments; and direct financial incentives based on measures of performance.

The most important factor that should be taken into consideration in the solution of this problem is that the regulator wants to determine a high-enough incentive in order to achieve the targeted level of effort, but just enough so this is true and no more (see Kreps, 2004).

In problems where the agent is in reality a group of individuals, such as in this case, the same principles are still valid, but the principal should be aware that an additional problem may occur: the *free-rider* problem. More specifically, the regulator must acknowledge that since every teacher accounts for just a small part of the learning process, then they will have less motivation to give a higher level of effort and then free-ride on others' efforts. Despite this, group incentive schemes may still be used in the present context since learning may not be measured by anything other than group output and tying compensation to the level of output of the group may promote helping

[6] A similar argument is given by Kremer, Moulin, and Namunyu (2003) and Hoxby (2002).

efforts within the group (see Kreps, 2004; Mas-Colell, Whinston, & Green, 1995; Pindyck & Rubinfeld, 1997).

As an example of this type of incentive scheme, Jacob and Lefgren (2005) propose that subjective principal assessments can be used in order to determine teacher compensations that will ultimately affect their performances and consequently learning. The most compelling argument of their analysis is that, according to the data,[7] principals are most qualified to evaluate teachers according to their overall performance and this could be used as a good predictor of student achievement. This may be so, but as the authors recognize, principals are more likely to identify those teachers that produce the largest and smallest achievement gains in their schools. Furthermore, one must consider that this kind of assessment can be affected by personal biases.[8]

Another example of such mechanism is given by Glewwe et al. (2003). These authors discuss Kenya's case where teacher incentive programs based on students' test scores were used in order to strengthen weak incentives. As the data analyzed seem to indicate, Kenya's experience cannot be considered successful, since students in treatment schools scored higher than their counterparts only during the life of the program. In fact, there is little evidence of increasing long-run learning, teacher attendance did not improve, homework assignment did not increase, and pedagogy did not change. The fundamental explanation for such results lies on the hypothesis that teachers change their levels of effort during the duration of the program to prepare the students to the test.

Levitt and Dubner (2005) explain that the American government established standardized tests as a mandatory part of the *No Child Left Behind* Act, sanctioned by President Bush in 2002. By that time, 20 American States already adopted such instrument. In Chicago, for example, these tests were incorporated in 1996 both in primary and secondary schools. This mechanism was created aiming to stimulate students to study harder, since only students with merit were supposed to pass the tests. On the other hand, in this context, worse students and teachers would have strong incentives to cheat. In the specific case of teachers, this would happen because they could be reprehended (or lose a promotion) in case of a bad performance of their students. In fact, data from Chicago analyzed by these authors indicate that some teachers indeed cheated on the exams by changing some answers of the students who took the test. Teachers from the worst classes in terms of performance were exactly the ones with a greater disposition to cheat.

Therefore, given these indications provenient from past experiences, if a regulator ought to implement a mechanism based on incentives, a few very important points should be considered:

[1] Since these are incentives usually given to groups of individuals, the mechanism should account for the free-rider problem.
[2] The incentive scheme should have a long-run perspective, so that structural changes may occur during the process. In this case, other policy instruments may be introduced during the process so it can become more robust.
[3] If incentives are measured through the grades of standardized tests, then it would be preferable if teachers did not have direct contact with those tests, which should be elaborated and ministered by non-stakeholders.

[7] The data analyzed is provenient from a mid-size district located in the western United States. The district requested to remain anonymous.

[8] As an example, the authors in question present evidence that principals tend to discriminate against male and untenured faculty.

Thus, considering the information discussed in this section, which type of mechanism is more suitable according to Ceara's reality? An answer to this question will be discussed below.

3. The case of ceara

In Ceara's context, the implementation of a voucher system as the one proposed before would mean a relevant change on the existing educational structure and, considering the possible set backs mentioned before, this option may end up being riskier than others. Furthermore, this type of mechanism is based on the application of sanctions to those schools that are considered inefficient.

Incentive schemes, on the other hand, can be considered as a form of "positive regulation" in the sense that they aim to reward only those schools or teachers that present the best performances or the highest quality levels.

In the case of incentive schemes, the objective is basically to affect teacher effort. However, broader incentive schemes can also affect managerial capacity, especially when school principals' efforts are also targeted.

Hence, as an attempt to deal with the problem of overall unsatisfactory results in standardized tests, the Government of Ceara introduced, in 2005, an award to compensate some of its public schools for their good performances, according to the State Law no. 13,665 of September 20, 2005. This mechanism consists of the payment of an additional monthly wage to the teachers and principals of the schools which were relatively better than the others on annual standardized tests. Hence, it is expected that this pecuniary incentive would progressively enhance teacher dedication, improving future results of teaching quality.

The mechanism of the award does not suppose that low grades on the standardized tests are solely due to low teacher dedication, but acquiesces that pecuniary incentives to teachers may generate *spillover effects* as they seek to improve their qualification and teaching skills. Furthermore, it may generate a healthy competition among public schools that can end up developing internal mechanisms in order to improve teaching quality and achievement.

During the conception of the award some specific questions where addressed. These can be summarized by the following arguments: (i) an award based only on higher grades would be simplistic and unfair because it would not take into consideration the initial differences on the distribution of infrastructure and peer and teacher quality in schools; (ii) some teachers may become *free-riders* and, therefore, receive the award even though their levels of effort remained unchanged; and (iii) the number of schools awarded should be large enough in order to stimulate the participation of the largest number of schools possible and, at the same time, it should be compatible with the government's budget.

The first topic discussed above emerged from the fact that, in Ceara, schools located at the State capital are usually better equipped (in terms of libraries, computer labs, sport facilities, internet access, etc.) and their teachers are better qualified than in other regions of the State. Hence, if these differences were not acknowledged, other schools would be almost automatically excluded from the competition.

Additionally, public schools have different profiles according to the place in which they are located and to the clients that they serve. In other words, there are schools specialized only in primary education, others only in secondary education, and those specialized in both. In the latter case, there could be important economies of scale that can also be taken into consideration.

Furthermore, an award based solely on who gets the higher grades would not take into consideration the effort that a school at the lower end of the distribution had to make in order to

improve its performance on the standardized tests and to enhance overall student achievement. On the other side, it would be acknowledging those experiences that seem to be working properly. Thus, one can notice that there are a series of pros and cons that must be considered when such a system is being analyzed.

In order to properly address all the issues mentioned above, the type of award chosen was divided into two categories and three subcategories. The two main categories were defined as: "schools that achieved the highest grades in SPAECE of the year" and "schools with the best performances of the year". And, the subcategories were defined according to the school's teaching specialization: "primary education only", "secondary education only", and "both primary and secondary education". The first award is intended to schools that define the quality standards in education that should be pursued by the others, while the second award is intended to give incentives for good performances so that schools can achieve the defined standards. In other words, the first award recompenses the best schools, while the second recompenses those schools with the best improvements.

After defining the categories eligible for the award, the next step was to define how to measure grades and performance. In this context, the option chosen was to built indices, one for each category, and then classify schools according to their performances.

In order to classify the winners according to the highest grades, it was taken into consideration that there are two tests (Portuguese and Math) and different types of schools. Therefore, the classification index was built, as expression (1) details. It measures the average order of each school in the category that it is part of (the closer to 1 the better the school is).

$$\mathrm{IN}_i = \frac{n_{\mathrm{F},i}}{n_i}\frac{\mathrm{ONP}_{\mathrm{F},i} + \mathrm{ONM}_{\mathrm{F},i}}{2} + \frac{n_{\mathrm{M},i}}{n_i}\frac{\mathrm{ONP}_{\mathrm{M},i} + \mathrm{ONM}_{\mathrm{M},i}}{2} \tag{1}$$

where IN_i is the grade classification index of the ith school; $n_{\mathrm{F},i}$ the number of students in primary education; n_i the number of students of the ith school; $\mathrm{ONP}_{\mathrm{F},i}$ the classification order of the ith school in the Portuguese test for primary education; $\mathrm{ONM}_{\mathrm{F},i}$ the classification order of the ith school in the Math test for primary education; $n_{\mathrm{M},i}$ the number of students in secondary education; $\mathrm{ONP}_{\mathrm{M},i}$ the classification order of the ith school in the Portuguese test for secondary education; and $\mathrm{ONM}_{\mathrm{M},i}$ is the classification order of the ith school in the Math test for secondary education.

Now, in order to classify the winners according to the best performances, it was taken into consideration the school order according to three indicators: the approval rate, the abandon rate, and SPAECE grades. Hence, a performance index was built, as expression (2) details, which will represent the average performance order of the school in its category (the closer to 1 the better the school is). This index is actually a weighted average of the three indices that will be detailed ahead.

$$\mathrm{IP}_i = 0.15\mathrm{OAp}_i + 0.15\mathrm{OAb}_i + 0.70\mathrm{ONP}_i \tag{2}$$

where IP_i is the performance classification index of the ith school; OAp_i the order in the approval rate performance of the ith school in relation to the other schools; OAb_i the order in the abandon rate performance of the ith school in relation to the other schools; and ONP_i is the order in the SPAECE grades performance of the ith school in relation to the other schools.

The weights used in (2) are basically *ad hoc*, but were defined acknowledging that schools may manipulate their approval and abandon rates in order to improve their performances. On the other hand, since SPAECE tests are strictly out of the schools' control, its index would receive a greater weight in relation to the others.

The index in (2) that measures the schools' performance according to their approval rates is detailed in expression (3). More specifically, it consists of the determination of the relative orders of the average change in the schools' approval rate in primary and secondary education in relation to the previous year.

$$\mathrm{OAp}_i = \mathrm{Order}\left[\frac{\Delta\mathrm{Ap}_{\mathrm{F},i} + \Delta\mathrm{Ap}_{\mathrm{M},i}}{2}\right] \tag{3}$$

where OAp_i is the order in the approval rate performance of the ith school in relation to the other schools; $\Delta\mathrm{Ap}_{\mathrm{F},i}$ the change in the approval rate in primary education of the ith school in relation to the previous year; and $\Delta\mathrm{Ap}_{\mathrm{M},i}$ is the change in the approval rate in secondary education of the ith school in relation to the previous year.

The index in (2) that measures the schools' performances according to their abandon rates is detailed in expression (4). More specifically, it consists of determining the relative order of the average change in the abandon rate in primary and secondary education in relation to the previous year.[9]

$$\mathrm{OAb}_i = \mathrm{Order}\left[-\frac{\Delta\mathrm{Ab}_{\mathrm{F},i} + \Delta\mathrm{Ab}_{\mathrm{M},i}}{2}\right] \tag{4}$$

where OAb_i is the order in the abandon rate performance of the ith school in relation to the other schools; $\Delta\mathrm{Ab}_{\mathrm{F},i}$ the change in the abandon rate in primary education of the ith school in relation to the previous year; and $\Delta\mathrm{Ab}_{\mathrm{M},i}$ is the change in the abandon rate in secondary education of the ith school in relation to the previous year.

And, the index in (2) that measures the schools' performances according to their SPAECE grades is detailed in expression (5), below.

$$\mathrm{ONP}_i = \mathrm{Order}\left[\frac{n_{\mathrm{F},i}}{n_i}\Delta\left(\frac{\mathrm{NP}_{\mathrm{F},i}}{\sigma_{\mathrm{NPF},i}} + \frac{\mathrm{NM}_{\mathrm{F},i}}{\sigma_{\mathrm{NMF},i}}\right) + \frac{n_{\mathrm{M},i}}{n_i}\Delta\left(\frac{\mathrm{NP}_{\mathrm{M},i}}{\sigma_{\mathrm{NPM},i}} + \frac{\mathrm{NM}_{\mathrm{M},i}}{\sigma_{\mathrm{NMM},i}}\right)\right] \tag{5}$$

where ONP_i is the order in the SPAECE grade performance of the ith school in relation to other schools; $n_{\mathrm{F},i}$ the number of students in primary education; n_i the number of students of the ith school; $\mathrm{NP}_{\mathrm{F},i}$ the average grade of the ith school in the Portuguese test for primary education; $\sigma_{\mathrm{NPF},i}$ the standard deviation of the grades of the students of the ith school in the Portuguese test for primary education; $\mathrm{NM}_{\mathrm{F},i}$ the average grade of the ith school in the Math test for primary education; $\sigma_{\mathrm{NMF},i}$ the standard deviation of the grades of the students of the ith school in the Math test for primary education; $n_{\mathrm{M},i}$ the number of students in primary education; $\mathrm{NP}_{\mathrm{M},i}$ the average grade of the ith school in the Portuguese test for secondary education; $\sigma_{\mathrm{NPM},i}$ the standard deviation of the grades of the students of the ith school in the Portuguese test for secondary education; $\mathrm{NM}_{\mathrm{M},i}$ the average grade of the ith school in the Portuguese test for secondary education; and $\sigma_{\mathrm{NMM},i}$ is the standard deviation of the grades of the students of the ith school in the Portuguese test for secondary education.

In expression (5), the average grade of the school is divided by the standard deviation of their students' grades. The intuition behind this procedure is that schools with very asymmetric distribution of grades due to just a few students with natural abilities (despite teacher quality) or to just a few committed teachers, should be penalized. Therefore, there will be incentives for good teachers to monitor others and detect free-riders.

[9] The multiplication by −1 is due to the fact that the smaller the abandon rate is the better is the school's performance.

Regarding the third issue regarding the award mentioned before, it was defined that 50 schools should receive the award.[10] This represents approximately 7.5% of the 666 public schools managed by the State government.[11] In the category "schools that achieved the highest grades in SPAECE of the year" the best three schools according to teaching specialization (just primary, just secondary, and both primary and secondary education), totalizing nine schools. And, in the category "schools with the best performances of the year" seven schools with only primary education, 13 schools with only secondary education, and 21 schools with both primary and secondary education. The number of schools awarded was proportional to the relative number of schools of each type.

A very important analysis that can be done at this point is to investigate why these specific schools were awarded. Preliminary results indicate that certain factors indeed affect performance, such as average qualification of teachers, the number of pupils per classroom, school participation in social projects, the amount of classes with laboratory assignments, etc.

The following maps illustrate the geographical distribution of the winning schools both in terms of overall quality and performance levels.

On the map that indicates the best schools in terms of SPAECE grades, one can notice that the schools are concentrated in Fortaleza (the State capital) and the cities that have or are close to universities. This could indicate that good grades on the exams are due to better qualification of teachers (Fig. 1).

The second map illustrates the distribution of schools awarded according to their performances. The results show a great dispersion of schools supporting the idea that the award can be an instrument of better income distribution. On the other hand, considering that some schools awarded were located in poor municipalities and have poor infrastructure, then the results show that good teachers can make a difference under adverse conditions.

Thus, the implementation of the award represents a new regulation and public management paradigm in Ceara. The proposed system is simple because the basic instrument to regulate the quality of education is through the concession of pecuniary incentives, free of bureaucracy or complex rules.

In this sense, an imitation effect toward the best practices is expected because when a group of schools is awarded in a certain year, the others will try to learn their practices so they could imitate them. But, there will always be schools that will be able to innovate in order to stay ahead of the others. And, parents will try to assess why the school of their children has not been awarded. Then, one should expect that these factors would end up inducing schools to increase their level of efficiency and teachers to give higher levels of effort that ultimately would lead to better quality of the education provided.

In this context, rational teachers will perceive that chances to improve the quality of student grades are better for those schools in the lower part of the grade scale and will be tempted to ask for transfers. Hence, this system may end up stimulating teacher mobility as they try to transfer to other schools in order to increase their chances of being awarded. This contrasts with the voucher system discussed before, where the overall level of efficiency of schools is supposed to increase due to the mobility of students across schools.

Thus, the future existence and regularity of the award proposed could ensure, in the long-run, some kind of convergence in terms of school quality among the public schools maintained by the State's government. In other words, it is expected that the incentives provided by the award

[10] Money rewards for teachers of awarded schools were estimated in approximately US$ 1,000,000.

[11] There was not only a single case where the same school should be awarded in both categories, but there is a rule that prevents a school to be awarded twice anyway.

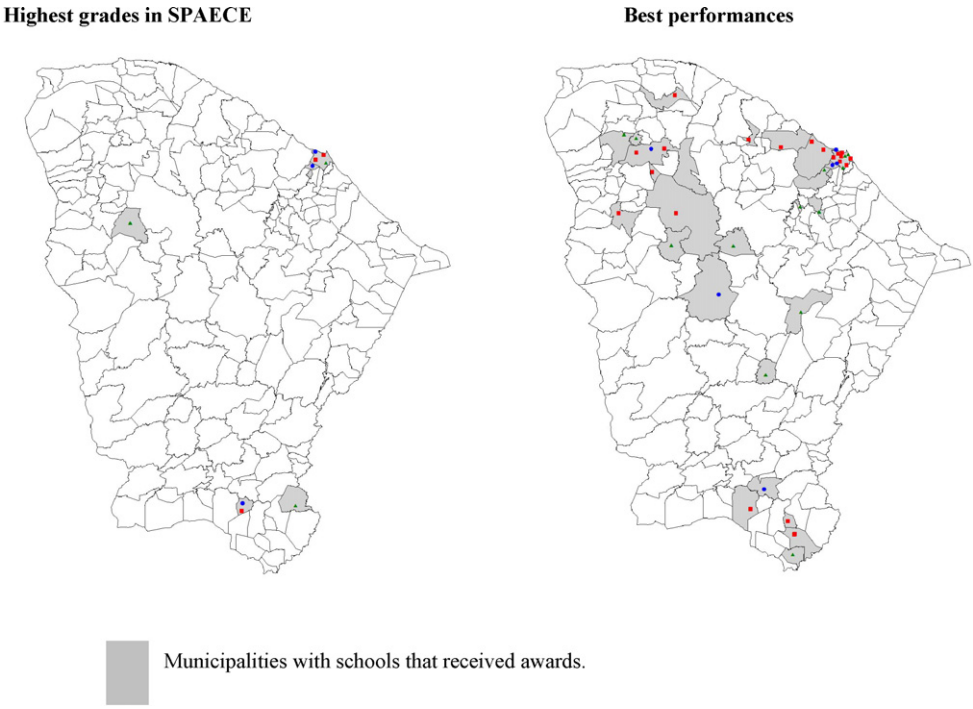


Fig. 1. Map of the schools awarded in each category—2004.

would lead the public school system to achieve satisfying levels of quality, in a relatively cheap and effective way.

4. Concluding remarks

As it has been discussed in this paper, some countries have been experiencing decreasing quality levels in public education. On the other hand, quality of private education does not present the same trend. The explanation for this comes from the endogenous regulation that exists in private markets due to competition, i.e., when a private school lacks quality it will end up losing an expressive share of its market or, in an extreme case, will have to close its doors.

This phenomenon is a serious concern to society, basically because those with very few educational opportunities are exactly the ones that are the clients of the public school system. Hence, due to the low quality of public education a vicious cycle is built: people who have lower levels income usually have less formal schooling and since they cannot afford it, they will not be able to acquire high-quality education. And, it goes on and on.

At the moment that a significant part of the population enters this vicious cycle, lower levels of schooling, and consequently of human capital, ends up negatively affecting the development process. In other words, a problem of inequality due to the absence of regulation will have impacts on social welfare.

In this context, since the public system lacks this endogenous regulation imposed by competition, then it is necessary that the government puts a regulatory system in place. Two types of systems, widely discussed in the specialized literature have been analyzed: (i) a voucher system

and (ii) a teacher incentive mechanism. In the case of Ceara, in particular, the latter system is supposedly more appropriate and easier to implement.

The final message of the paper is that regulation of the quality of education affects the distribution of income. And, if this instrument is well designed, adequate to the specific conditions of the place where it is supposed to be implemented, and if it has continuity, then it can indeed become a very powerful public policy tool over time.

References

Carneiro, P., & Heckman, J. J. (2003). Human capital policy. In J. J. Heckman & Krueger (Eds.), *Inequality in America: What role for human capital policy?* (pp. 77–239). MIT Press.

Glewwe, P., Ilias, N., & Kremer, M. (2003). *Teacher incentives*, Working Paper 9671. The National Bureau of Economic Research.

Gradstein, M., Justman, M., & Meier, V. (2005). *The political economy of education: Implications for growth and inequality*. Cambridge: The MIT Press.

Hoxby, C. M. (2001). *How school choice affects the achievement of public school students*. Available at: http://post.economics.harvard.edu/faculty/hoxby/papers/choice_sep01.pdf.

Hoxby, C. M. (2002). *School choice and school productivity*, Working Paper 8873. The National Bureau of Economic Research.

Hoxby, C. M. (2003). Introduction to the economic analysis of school choice. In C. M. Hoxby (Ed.), *The economic analysis of school choice*. University of Chicago Press.

Jacob, B. A., & Lefgren, L. (2005). *Principals as agents: Sujective performance measurement in education*, Working Paper 11463. The National Bureau of Economic Research.

Kremer, M., Moulin, S., & Namunyu, R. (2003). *Descentralization: A cautionary tale*.

Kreps, D. M. (2004). *Microeconomics for managers*. W.W. Norton & Company.

Langoni, C. (1974). *As causas do crescimento econômico no Brasil*. Hucitec.

Levitt, S. D., & Dubner, S. J. (2005). *Freakonomics: O lado oculto e inesperado de tudo que nos afeta*. Elsevier.

Lieberman, M. (1986). Market solutions to the education crisis. *Policy Analysis*, *75*. Available at: http://www.cato.org/pub_display.php?pub_id=941&full=1.

Mas-Colell, A., Whinston, M. D., & Green, J. R. (1995). *Microeconomic theory*. Oxford University Press.

Millimet, D. L., Collier, T. (2004). *Efficiency in public schools: Does competition matter*? AEA Annual Meeting. Available at: http://www.aeaweb.org/annual_mtg_papers/2005/0108_1015_1505.pdf.

Peterson, P., Shattuck, H. L. (2004). A discussion on school vouchers and the performance gap. *The Southern Journal of Teaching & Education*. Available at: http://www.sjteonline.com/winter2004ppeterson.htm.

Pindyck, R. S., & Rubinfeld, D. L. (1997). *Microeconomics* (4th ed.). Prentice-Hall.