The Brazilian Education Quality Index (Ideb): Measurement and Incentives Upgrades

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Abstract

The increasing availability of social statistics in Latin America opens new possibilities in terms of accountability and incentive mechanisms for policy makers. This paper addresses these issues within the institutional context of the Brazilian educational system. We build a theoretical model based on the principal-agent framework to analyze the role of the recently launched Basic Education Development Index (Ideb) as a numeraire in the provision of incentives at the sub-national level. The first objective is to study what are the best designs of conditional budgetary transfers to public managers from the federal to the municipal level that could help to increase the quality of educational services, by comparing different outcomes from alternative models of educational transfers. Furthermore, we analyze the local government's decision about how to allocate its education budget as seeking to accomplish the different objectives contemplated by the index, which involves the interaction between its two components, proficiency and the passing rate. The second aim of the paper is to discuss policy issues concerning the implementation of the synthetic education index in the light of this model. We will demonstrate that an educational target system has the potential to improve the allocation of resources for education through conditional transfers to municipalities and schools. We also argue that there is room for improving the Ideb's methodology itself. We discuss the desirable properties of an ideal education index, including the weights attributed to qualitative proficiency scores vis-à-vis quantitative school flows in the index and the incorporation of out-of-school children. With respect to the utilization of the education target index, we argue in favor of an *ex-post* relative learning evaluation system for different municipalities (schools) based on the value-added across different grades - something that resembles a Difference-in-Difference evaluation system - and has its advantages, such as an incentive to an increased diversity in the admission choices available to schools and its robustness to aggregate shocks. Finally, this suggests the desirability of building an integrated system of evaluation, applying the same criteria to exams at different grades.

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1. Introduction

The aim of this paper is twofold. First we build a theoretical model based on the theory of incentives to analyze the role of the Basic Education Development Index (Ideb), the center of the new Education Plan just launched in Brazil, in providing incentives to public managers. Then we discuss policy issues concerning both measurement and evaluation issues related to the implementation of the synthetic index within the framework of a target system.

In March 2007 the Brazilian federal government announced an Education Development Plan (PDE), a set of proposals aiming to improve the quality of education in the country. The plan's main innovation was the creation of a synthetic indicator of education quality, the Basic Education Development Index (*Ideb*), based on the academic passing rate and the results of Prova Brasil (and Saeb) for each municipality in the country. The federal government will determine targets for the evolution of the *Ideb* and then condition part of its education-related transfers to the accomplishment of these targets. The thousand municipalities with lowest *Ideb* will receive extra resources and the others, only technical support.

The creation of a target system in education is a historical reference in Brazil, not only in the field of education but also in the national social policy scenario as a whole, and provides a unique opportunity for the country to recover its educational delay. Although, despite all its virtues, there is still room for improvement concerning methodological issues and the design of incentive mechanisms related to the *Ideb*. This paper will then focus on methodological and policy issues concerning the implementation of the synthetic index within the framework of a target system.

By improving the education quality indicator, which will provide the basis at the same time for the education debate and public transfers, we hope to improve the quality of education itself. By guaranteeing resources to areas with fastest improvement rates, we move closer to fulfilling the promise of high quality education for all.

On the next sections included in the introduction we will described the *Ideb* and its methodology and then analyze the rationale behind the implementation of social targets. In section 2 we build a model in two stages and derive some conclusions from it. In section 3 we first analyze the dimension of how to build an ideal index, discussing issues such as the index's weights and the incorporation of out-of-school children. In section 4 we then discuss dimension of the role of *Ideb* within a target system and consider evaluation issues. Then we conclude.

1.1 The Ideb

The *Ideb* is analytically expressed by the following formula

$$Ideb = Q\ F$$

in which Q is a proficiency measure, that can be the students' performance in the Prova Brasil or in the Saeb, and F is a measure related to the school flow, corresponding to the students' passing rate.

The table that follows shows the initial *Ideb* values for each educational sector and their respective targets for 2021.

IDEB 2005 e Projections for Brazil

	First Years of Primary Schools (first half)		Final Years of Primary Schools (second half)		Secondary Schools	
	2005	2021	2005	2021	2005	2021
TOTAL	3,8	6,0	3,5	5,5	3,4	5,2
Region						
Urban	4,0	6,2	-	-	-	-
Rural	2,7	4,9	-	-	-	-
Administrative Level						
Public	3,6	5,8	3,2	5,2	3,1	4,9
Federal	6,4	7,8	6,3	7,6	5,6	7,0
State	3,9	6,1	3,3	5,3	3,0	4,9
Municipal	3,4	5,7	3,1	5,1	2,9	4,8
Private	5,9	7,5	5,8	7,3	5,6	7,0

source: Saeb 2005 e Censo Escolar 2005 e 2006 - INEP/MEC

Ideb ranges on a scale from 0 to 10 and the initial level included in the Educational Development Plan (PDE) for Brazil as a whole was 3.8 in 2005. A target of 6.0 was set for 2021, just before the celebration of the 200th anniversary of the Brazilian independence. This strategy aims to bring the educational results of the whole country in 2021 to the same level observed today in Brazilian private schools.

The methodology behind the Ideb is as follows. On one hand, from (i) the average passing rate of a specific schooling level - in this case the first half of primary school - it is calculated (ii) the average time T needed to complete one school year. (iii) Its inverse gives P, the average passing rate, which corresponds to the probability that a student passes on to the following school year. On the other hand, (i) one calculates the standard grade in both Math and Portuguese tests taken in Saeb (or in Prova Brasil), and (ii) from their average, one obtains N. From the simple multiplication of P times N we reach the value of the index.

The table below illustrates the Ideb methodology, showing how it was calculated for the different Brazilian States in 2005, the last year when it was calculated, since it was the last edition of Prova Brazil.

state	Passing Rate - Secondary School				T=average time (years) for conclusion of 1 school year	SAEB - 3ª grade of Secondary Public Schools				P = 1/T	N = Standard Grade Average	IDEB = N x P
	1ª grade	2ª grade	3ª grade	4ª grade		Math	Portuguese	Standard Grade in Math	Standard Grade in Portuguese			
Acre	67,0	74,5	80,1	90,3	1,3	249,9	245,2	3,9	3,8	0,77	3,9	3,0
Alagoas	60,5	70,5	79,3	95,2	1,3	251,2	235,7	3,9	3,6	0,74	3,7	2,8
Amazonas	60,4	69,7	72,2	-	1,5	237,6	227,6	3,6	3,3	0,67	3,4	2,3
Amapá	63,7	70,6	73,2	-	1,5	253,2	244,5	4,0	3,8	0,69	3,9	2,7
Bahia	57,5	69,9	77,7	91,3	1,4	255,9	237,5	4,1	3,6	0,72	3,8	2,8
Ceará	62,3	73,1	79,8	87,9	1,3	254,7	248,9	4,0	3,9	0,75	4,0	3,0
Distrito Federal	57,0	67,8	72,2	-	1,5	282,8	265,7	4,8	4,5	0,65	4,6	3,0
Espiríto Santo	63,9	73,3	80,1	-	1,4	269,1	257,6	4,4	4,2	0,72	4,3	3,1
Goiás	67,0	76,4	82,7	71,7	1,4	252,9	242,3	4,0	3,8	0,74	3,9	2,9
Maranhão	64,4	72,5	82,7	92,1	1,3	232,0	224,2	3,4	3,2	0,77	3,3	2,5
Minas Gerais	64,6	74,1	78,7	95,4	1,3	280,3	261,1	4,8	4,3	0,77	4,5	3,5
M. G. do Sul	54,0	67,3	74,5	-	1,6	270,5	263,8	4,5	4,4	0,64	4,4	2,8
Mato Grosso	58,7	65,3	71,6	-	1,5	254,5	249,6	4,0	4,0	0,65	4,0	2,6
Pará	63,0	73,2	80,8	86,0	1,3	242,0	236,9	3,7	3,6	0,75	3,6	2,7
Paraíba	62,5	70,9	80,9	92,8	1,3	242,4	229,7	3,7	3,4	0,75	3,5	2,7
Pernambuco	61,2	71,5	74,6	90,1	1,4	244,3	241,1	3,7	3,7	0,73	3,7	2,7
Piauí	58,0	70,7	79,6	57,6	1,5	244,9	238,4	3,8	3,6	0,65	3,7	2,4
Paraná	62,1	70,5	72,2	91,5	1,4	274,2	259,7	4,6	4,3	0,73	4,4	3,2
Rio de Janeiro	58,9	69,1	79,4	92,1	1,4	253,9	244,1	4,0	3,8	0,73	3,9	2,8
R. G. do Norte	61,4	70,6	79,0	85,4	1,4	244,9	232,7	3,8	3,5	0,73	3,6	2,6
Rondônia	62,5	73,1	78,6	75,0	1,4	265,4	252,9	4,3	4,1	0,72	4,2	3,0
Roraima	70,9	79,7	82,7	-	1,3	265,8	254,9	4,3	4,1	0,77	4,2	3,3
R. G. do Sul	51,0	66,7	79,0	89,3	1,5	300,0	276,8	5,3	4,8	0,68	5,0	3,5
Santa Catarina	71,7	81,0	85,5	80,1	1,3	274,0	257,7	4,6	4,2	0,79	4,4	3,5
Sergipe	57,7	70,2	76,8	91,7	1,4	259,3	250,4	4,2	4,0	0,72	4,1	2,9
São Paulo	70,7	77,3	83,2	86,8	1,3	262,2	253,9	4,2	4,1	0,79	4,2	3,3
Tocantins	69,7	77,8	83,2	90,9	1,3	244,6	234,1	3,8	3,5	0,80	3,6	2,9

source: INEP/MEC

As we can see, the passing rates are very low in Brazil, ranging from 64% to 80% across states in the secondary level and reaching values as low as 50% in certain grades. Proficiency scores, in turn, are also very reduced, ranging from 3.3 to 5 within a range that goes up to 10. Since generally the minimum average conventionally to pass to next grade in Brazil is 5, we could see that all states would fail if they were students.

1.2 Rationale for Educational Targets

The management of the Brazilian educational policy has become more complex and challenging. The decentralization of education promoted by the 1988 Constitution allied to the growing involvement of other actors (such as private firms and NGOs) creates a widespread diversity of simultaneous actions. The question that interests us here is: how should we increase the returns experienced by the society from this myriad of educational actions? It is up to the federal government to set goals to the different levels of public activity (multilateral entities, several levels of the state, and the civil society) to act simultaneously towards the same goal. These goals involve the coordination of diffused efforts through the settlement of targets and the design of mechanisms providing the incentives to achieve them. The proposal is that specific locations - in particular, those at the sub-national level - commit to the educational targets as they have been specified. In practice, this would involve that states and municipalities challenge their respective populace to reach the proposed auspicious targets. The recent Brazilian experience with inflationary targets and electrical energy rationing targets reinforces the importance of setting tangible objectives.

Aside from the coordinating and mobilizing characteristics of the educational target social targets, conditioning the financial aspect to the observed social outcomes is an interesting practice to be incorporated into the system. The same spirit of conditional cash transfers such as Bolsa-Escola and now Bolsa Familia, that reward poor families whose children attend school, can be applied to the annual re-allocation of the educational budget at numerous administrative levels. The process of rewarding, with additional resources, those units progressing swiftly, may be applied towards lower levels of the government: from the federal to the state realm, from the state to their respective municipalities and from

the latter to their respective administrative regions and schools. The MEC and IBGE provide increasing levels of information, which constitutes the stepping-stone for these various geographical levels. Besides, the selection of a system capable of international comparisons allows us to place each country within an international standard.

There is no doubt that the core of social action should focus on the poorest and least educated segments, by rewarding those moving towards the emancipation of their needs. The main comparative advantage of being poor – in this case poorly educated - is the larger relative capacity of prospering. Future success should also be rewarded, instead of compensating for past failures.

The educational target's main problem may occur particularly in the short term, given the presence of shocks. The result obtained by the social actor depends on factors beyond his reach, as the outcome does not depend solely on his efforts or skills. Therefore, we argue for the importance of using relative evaluation schemes. In addition, the system of incentives should be announced a priori and the relative performance should be evaluated a posteriori. The advantage of the system, if well designed, is to attract better social actors and induce them to follow the best practices.

2. The model

The main idea of this section is to build a theoretical model based on the literature of mechanism design and theory of incentives, in order to address issues related to the incentives provided by the index based on a target system. In other words, here we discuss what to do (and not to do) with an overall quality of education index to boost the quality of education itself through incentive mechanisms. We will develop a theoretical model in an agent-principal framework and then discuss related topics following the construction of the model and its results.

Here there are two dimensions involved. The first one concerns the role of Ideb in influencing decisions about public expenditures on education. The second issue concerns the local government's decision about how to allocate its educational expenditures towards seeking the different objectives contemplated in the index.

Therefore, we will solve the agent's problem in two stages, each stage corresponding to each of the dimensions described above.

2.1 First Stage - The role of the Ideb in a Target-Based System

In the first stage we would have the local manager maximizing a political function involving the allocation of public resources between different secretaries, from where we derive its optimal investment in education.

In our model we assume that the government transfers funds to local governments, who are the ones in charge of implementing the educational policies. The federal

government thus may be regarded as the principal, whereas the agents are the municipal governments, hereafter referred to as municipalities. We will concentrate on static models with complete information, when the principal knows the agent type.

The utility functions for the federal government, U_F, and for the municipality, U_M, are respectively given by:

$$U_F = g(G_F, (f(E))$$

$$U_M = m(G_M, E)$$

where E corresponds to the municipality's expenditures on education, G_M to its expenditures with others secretaries - the available budget after the educational expenditures are carried out - and G_F is the budget available to the federal government for spending in everything else, after resources have been transferred to the municipalities for education expenses. As we can see, the municipalities' utility depends on how much they spend on education and on its other secretaries; and the federal government's utility depends on a function of the amount spent by the municipalities on education - that can be interpreted as the education quality- as well as on its expenditures towards other purposes.

Under a target-based system, the federal government faces a problem about how to offer a contract to the agent under which there is a transfer (T) conditioned to the achievement of a pre-determined educational target (E). Hence, his objective is to define a contract $\{E,T\}$ so that a target and a transfer are established. Firstly, it has to ensure that, upon accepting the contract, the agent will obtain at least the same utility it would have in autarchy.

If we choose a Cobb-Douglas functional form for both federal government and the municipality's utility function, we will have the following problem to be solved by the federal government:

$$\underset{\{T.E\}}{Max}\ (G_F)^m(f(E))^n$$
$$s.a$$
$$G_F \le Y_F - T$$
$$G_M + E \le Y_M + T$$
$$U_M = (G_M)^a.(E)^b \ge U_A$$

where, besides the variables already described, Y_F is the government's total budget, T is the part of this budget that may be transferred to the municipalities for education purposes and Y_M is the municipalities' revenue. Looking at the restrictions, we have that $G_F = Y_F - T$ is the government's budget restriction; $G_M + E \le Y_M + T$ the municipality's budget restriction; and the last one is the well-known Restriction of Participation (RP), where U_A is the outside option of the municipality (autarchy).

Inserting the budget restriction, the principal's problem corresponds to

$$\underset{\{T.E\}}{Max}\ (Y_F - T)^m(f(E))^n$$
$$s.a$$
$$U_M = (Y_M + T - E)^a.(E)^b \ge U_A$$

The Restriction of Participation will be binding, since in equilibrium the principal will give the minimum necessary for the agent to participate in the contract. Thus, we have that $(Y_M + T - E)^a.(E)^b = U_A$, what gives $T = U_A^{\frac{1}{a}} E^{-\frac{b}{a}} + E - Y_M$.

The problem can then be restated as

$$\underset{\{E\}}{Max}\,(Y_F - U_A^{\frac{1}{a}} E^{-\frac{b}{a}} + E - Y_M)^m (f(E))^n$$

whose first order conditions implies that

$$[1 + \frac{m}{n}\frac{1}{\varepsilon_E}]E_{TS} - [\frac{na - mb}{na} U_A^{\frac{1}{a}}]E_{TS}^{-\frac{b}{a}} = Y_M + Y_F$$

where ε_E, defined by $\varepsilon_E = \frac{\partial f(E)}{\partial E}\frac{E}{f(E)}$, is the quality of the education elasticity with respect to the resources invested on them, that is, to the municipality's expenditures on education.

The equation above gives an implicit solution for E^*_{TS}, the municipality's optimal investment in education under a target-based system.

If we make the assumption that the municipalities and the federal government give the same weight to education, that is, if we suppose that $a = m$ e $b = n$, we find as a result a close solution, which is

$$E_{TS}^{\ *} = (\frac{n\varepsilon_E}{m + n\varepsilon_E})[Y_M + Y_F] = (\frac{b\varepsilon_E}{a + b\varepsilon_E})[Y_M + Y_F]$$

If, in addition, we assume that the educational quality depends linearly on the resources invested in it by the municipalities, such as that $f(E) = kE$, the municipality's optimal investment in education becomes $E_{TS}^{\ *} = (\frac{n}{m+n})[Y_M + Y_F] = (\frac{b}{a+b})[Y_M + Y_F]$.

These two assumptions, in spite of being rather strong, are made for the sake of tractability and allows for comparisons between the performance of a target-based system vis-à-vis other possible systems of education finance.

In order to assess the consequences of adopting a target-based system, we have to compare it with other alternatives. We will analyze the outcomes under the following regimes: (i) Autarchy, the basic situation in which the federal government does not carry out any transfer to the municipality; (ii) Unconditional Transfer, in which the federal government chooses to invest in determined places, transferring a fixed fund of T for the municipality to invest in the education area, without establishing any condition in what refers to the accomplishment of results by the municipality; and a regime we will call (iii) Perverse Incentive, where we assume that the government decides to transfer more resources to the municipalities where the education is worst, so that the lower the educational level, the greater is the per capita transfer carried out by the government to the municipality.

In Autarchy, for example, the municipality's problem is:

$$Max\ (G_M)^a.(E)^b$$
$$s.a:\ G_M + E \leq Y_M$$

From the first order conditions, supposing interior solution, we find as a solution

$$E_A^* = \frac{b}{a+b} Y_M$$

As we can see, the educational expenditures are a fraction of the total revenue, and depend on the relative weight given by the municipalities to education on their objective function. We see clearly that the investment in education is larger within a target system than it would be without any system of federal transfers. But this can also be explained by an income effect, since in autarchy the municipality has less funds to invest. Let's examine now financial arrangements that involve transfer from the federal government.

Under an Unconditional Transfer regime, in turn, the problem of the municipality is given by:

$$Max\ (G_M)^a.(E)^b$$
$$s.a:\ G_M + E \leq Y_M + T$$

From the first order conditions, supposing interior solution, we find as a solution

$$E^{TI*} = (\frac{b}{a+b})[Y_M + T]$$

The result is analogous to the one in autarchy, since the educational expenditures are a fraction of the total revenue - fraction that once again depends on the relative weight given by the municipalities to education on their objective function - but here includes the federal transfers as well. Since $Y_F \geq T$, it becomes clear that public investment in education will be larger under a financial regime involving conditional transfers than when based on unconditional transfers, unless the federal government transfers all its revenue to the municipalities, a quite unrealistic scenario.

A system with a Perverse Incentive would be one in which the federal government decides to transfer more resources to the places with the lowest level of educational quality, without any conditionality. In such case, the municipality's problem becomes

$$Max\ (G_M)^a.(E)^b$$
$$s.a:\ G_M + E \leq Y_M + T$$
$$T = K - f(E)$$

which means that the transfers depend on the difference between the municipality's quality of education and a baseline value K previously determined.

The first order conditions, supposing interior solution imply that

$$(\frac{a\varepsilon_E + b}{b}) f(E^{PI}) + (\frac{a+b}{b}) E^{PI} = Y_M + K$$

which defines the optimal value E^{PI*} implicitly. If we assume, as in the case of educational target system, that the educational quality depends linearly on the resources invested on it by the municipalities, assuming the form $f(E) = kE$, the municipality's optimal investment in education then becomes

$$E^{PI*} = (\frac{b}{a+b}) \frac{1}{1+k} [Y_M + K]$$

Since $K \leq T \leq Y_F$ e $k > 0$, we see that this system as well generates less investment in public education than a target-based one, and even less than in the unconditional case. As long as the transfers depend on the difference between an ideal and a real value, the incentive is in the direction of keeping the educational quality as low as possible. Thus, we see that is best to reward future achievements than to compensate for past failures.

Summarizing, the main conclusion stemmed from this stage is that a target-based system, by conditioning the federal government transfers to the educational performance, provides an incentive that leads the local governments to invest more resources in education than other alternative transfer systems. In autarchy as well as in an unconditional transfer regime, the municipalities invest on education a fixed fraction of its total revenue that depends on the relative weight given by the municipalities to education on their objective function. In the Perverse Incentive regime, it spends even less than that, which may explains why we call this system in such way. With a target-based system in turn, the

municipality will direct towards education a part of its revenue which is even more than proportional to the importance it gives to education, due to the right incentive it generates.

2.2 Second Stage - Within the Ideb

The second stage involves the local government's decision about how to allocate its education budget as seeking to accomplish the different objectives contemplated by the index. The local government maximizes a function that represents the net benefit it derives from education, which in turn depends mainly on the Ideb - at least that is the idea behind this target-based system. His problem is then how much of the budget he will invest in each of the two components of the index, and can be formally stated as follows.

$$\begin{aligned} &\textit{Max Ideb} \\ &s.a: C_Q(Q) + C_F(F) \leq E^* = \overline{E} \end{aligned}$$

where Q represents the variation in proficiency and F the variation in the passing rate. The functions $C_Q(Q)$ e $C_F(F)$ correspond to the costs associated with an improvement in the proficiency and passing rates, respectively. By solving it, we find the optimal allocation of local resources between the two components of the index, namely Q^* and F^*. In order to solve this problem, we have to choose specific functional formulas both for the objective function and for the budget restriction.

With respect to the objective function, we choose to model the educational index in a Cobb Douglas fashion for different reasons. Firstly, it is the functional form of the Ideb, in its simplest form, with both coefficients equal to one. Besides, the use of an index in a

Cobb Douglas fashion has some advantages. One of them is that its exponents somehow express the degree of substitutability or complementarity between the index components, an issue that will also be analyzed. Another advantage is that it allows us to break down the growth rate of the education index into the growth rates of each of these components in an additive fashion, as follows.

$$\text{Ideb} = (Q)^{\alpha}.(F)^{\beta} \rightarrow \ln \text{Ideb} = \alpha \ln(Q) \ + \beta \ln(F) \ \rightarrow \gamma(\text{Ideb}) = \alpha\gamma(Q) + \beta\gamma(F)$$

The option of choosing weights different than a unity in the index, differing form the original one, is extensively explained in section 3.1.

With respect to the budget restriction, we have to analyze how an improvement in proficiency and in the passing rate can be achieved, as well as the interaction between them. If proficiency and the passing rate were independent, the problem the local government would have to solve would be as simple as the following.

$$\begin{aligned} &Max\ (Q)^{\alpha}.(F)^{\beta}. \\ &s.a:\ p_q Q \ + p_f F \leq \overline{E} \end{aligned}$$

whose first order conditions, assuming interior solutions, would give us

$$Q^{*} = (\frac{\alpha}{\alpha+\beta})\frac{\overline{E}}{p_q} \ \text{ and } \ F^{*} = (\frac{\beta}{\alpha+\beta})\frac{\overline{E}}{p_\beta}$$

which would the optimal values for proficiency and the passing rate that would lead to the largest evolution of the Ideb as possible. However, proficiency and the passing rate interact, as the following analysis suggests.

Increasing the student's average proficiency has costs, which are related to the investment in the improvement of educational inputs, among which the most important are those related to labor - hiring more teachers and others involved in the educational process ,

increasing their salaries or creating monetary rewarding mechanisms - and to schools' infra-structure. Hence, it concerns a direct monetary cost. We will then define p_q, which can be understood as the price of each unity of additional quality.

The costs of increasing the passing rate, in turn, depend on the way it will be achieved. There are two main possibilities to attain an improvement in the passing rates. The first one concerns the adoption of artificial promotion mechanisms, that is, making it easier for the students to pass on to the next school year. This alternative involves a cost related to a reduction in quality, and no additional monetary costs. The second one concerns the improvement of the passing rate by increasing the students' human capital, through an enhancement in the quality of the education. This alternative, in turn, involves a direct monetary cost, analogous to the first one just described. We will model the two cases separately.

Model "passing by changing the passing regime"

Formally, in the first case, the municipality's problem could be stated as

$$\begin{aligned} &Max\ (Q)^{\alpha}.(F)^{\beta}. \\ &s.a:\ p_q q \leq \overline{E} \\ &Q = q - h(F) \end{aligned}$$

where the variation in the student's average proficiency is divided into two components, in which q represents the dimension of proficiency the local government can increase by investing in more education inputs, and $h(F)$ is a term that captures the effect of a potential reduction in proficiency due to an exogenous increase in the passing rate, which can be a

consequence, for example, of a loosening in the passing criteria or to a law that determines automatic progression.

Hence, the problem can be restated as

$$\underset{\{F\}}{Max}\ (q - h(F))^{\alpha}.(F)^{\beta}.$$
$$s.a:\ p_q q \leq \overline{E}$$

It is straightforward to see that the municipality will expend the entire budget in quality-related actions, choosing thereby $q = \frac{\overline{E}}{p_q}$, and the problem thus becomes choosing the optimal passing rate. For this the government will take into account that increasing the passing rate has a twofold consequence: on one hand it increases the index through the passing rate component itself, but on the other hand it decreases the index through reducing the proficiency component. Formally, the local government's problem becomes

$$\underset{\{F\}}{Max}\ (\frac{\overline{E}}{p_q} - h(F))^{\alpha}.(F)^{\beta}.$$

The first order conditions for this problem, considering interior solution, give

$$F.h'(F) + \frac{\beta}{\alpha} h(F) = (\frac{\beta}{\alpha}) \frac{\overline{E}}{p_q}$$

which defines F^*, the optimal passing rate chosen by the local government, implicitly.

Let´s define $\varepsilon_F^Q = \frac{\partial h(F)}{\partial F} \frac{F}{h(F)} = \frac{\partial Q}{\partial F} \frac{F}{Q}$ as the quality of education elasticity with respect to the passing rate, corresponding intuitively to the rate according to which an exogenous increase in the passing rate impacts negatively proficiency.

The equation above then becomes

$$h(F^*) = \left(\frac{\beta}{\alpha\varepsilon_F^Q + \beta}\right)\frac{\overline{E}}{p_q}$$

which defines the optimal value of the approval rate chosen by the local government. To find a close value for F^* is just a matter of defining a closed functional form for $h(F^*)$.

By using the fact that $Q = q - h(F)$ and that $q = \frac{\overline{E}}{p_q}$, we find the optimal value for the proficiency, which is $Q^* = \left(\frac{\alpha\varepsilon_F^Q}{\alpha\varepsilon_F^Q + \beta}\right)\frac{\overline{E}}{p_q}$.

If we assume a linear form for the function *h* such as $h(F) = \psi F$ - just for the sake of comparability with the following models – we find

$$F^* = \left(\frac{\beta}{\alpha + \beta}\right)\left(\frac{1}{\psi}\right)\frac{\overline{E}}{p_q} \quad \text{and} \quad Q^* = \left(\frac{\alpha}{\alpha + \beta}\right)\frac{\overline{E}}{p_q}$$

From these results, we can infer that

(i) Both the optimal proficiency and passing rate improvements are positively related to the total investment in education ($\overline{E}$) and negatively related to the cost of improving proficiency (p_q), due to an income effect and a price effect, respectively.

(ii) The larger the weight given to the approval rate vis-à-vis to the students´ proficiency in the index ($\frac{\beta}{\alpha}$), the larger it will be the improvement in the passing rate aimed by the municipality, and the smaller the increase in students' average proficiency, and vice-versa.

(iii) The quality of education elasticity with respect to the passing rate (ε_F^Q) is positively related to the variation in proficiency and negatively related to the variation in the passing rate. The larger the cost in terms of quality induced by an increase in the passing rate, the more the municipality will substitute into proficiency and out of the passing rate.

Model "passing by learning"

If, in turn, the second strategy is adopted, the one of improving the passing rate by means of investing in school quality, the agent's problem will be rather different. It can be stated as

$$\begin{aligned} &\underset{\{Q,F\}}{Max}\ (Q)^{\alpha}(F)^{\beta} \\ &s.a:\ p_q Q \le \overline{E} \\ &F = F(Q) \end{aligned}$$

where the last restriction express the fact that in this case the increase in the passing rate will depend on the increase in the quality of education.

Since the way through which improvements in both proficiency and the passing rate will be achieved are by means of investments seeking an improvement in the quality of education, we can work as if the local manager had only one interest variable he will choose. Therefore, he will use the entire budget to increase the quality of education, which can be proxied by student's proficiency. Formally speaking, we can use only the budget restriction to find the optimal Q^* he will attain. Thus we will have $Q^* = \frac{\overline{E}}{p_q}$.

Finding the optimal F^* is then only a matter of inserting Q^* into $F(Q)$.

To illustrate the point, let's suppose that the impact of a variation in proficiency in the passing rates assumes a linear functional form, so that $F(Q) = \eta Q$. In this case we will have a closed solution to Q^* and F^*, which are

$$Q^* = \frac{\overline{E}}{p_q} \text{ and } F^* = \eta \frac{\overline{E}}{p_q}$$

As we can see from these results

(i) Both the optimal proficiency and passing rate improvements are positively related to the total investment in education ($\overline{E}$) and negatively related to the costs of improving the quality of education provided (p_q), the first expressing a pure income effect and the second that the income effect out weights the substitution effect.

(ii) The optimal passing rate improvement is positive related to the sensibility of the passing rate to variations in the quality of education (η), whose intuition is straightforward.

(iii) The resulting proficiency and passing rate improvements are not related to the index's weights.

General Model

We have just considered two polar cases. In the first one the local governments increase the passing rates only by means of softening the passing criteria, that is, more students are progressing through the schooling levels because it was made easier for them to progress. In the other case, the increase in the passing rates is only achieved through an improvement in school quality, which means that more students are progressing because they are learning more. However, the local governments may use both strategies at the same time. That is the reason why our next exercise will be to model both strategies in an integrated framework, in which part of the improvements in the passing rates can be achieved through a change in the passing regime and part through an improvement on the quality of education.

The local government's problem, in this case, can be formally stated as

$$\underset{\{Q,F\}}{Max}\ (Q)^{\alpha}.(F)^{\beta}$$
$$s.a.$$
$$Q = q - h(F_1)$$
$$F = F_1 + F_2$$
$$F_2 = F_2(Q)$$
$$p_q.q \leq E$$

The first restriction is the same as the one used before, and express the fact that the variation in the student's average proficiency can be divided into two components, in which q represents the increase in quality achieved by investing in more education inputs, and $h(F)$ is a term that captures the effect of a potential reduction in quality due to an exogenous increase in the passing rate. The second one refers to the two ways through

which improvements in the passing rate can be achieved: F_1 is the part attained artificially through a slackening in the passing criteria and F_2 the one attained through an improvement in quality. That is precisely what the third restriction expresses. The last one is the local government' s budget restriction.

First of all, we have the local government spending all its budget in quality related expenditures, which gives us $q = \frac{E}{p_q}$.

Then, inserting the restrictions inside the objective function, it becomes

$$\underset{\{F_1\}}{Max}\ (q - h(F_1))^{\alpha}.(F_1 + F_2(q - h(F_1)))^{\beta}$$

As we can see, it depends only on F_1, which will be the local manager's only variable of choice. Solving this problem, supposing interior conditions, we find

$$(\frac{\alpha}{\beta})\frac{F_1 + F_2(q - h(F_1))}{q - h(F_1)} = \frac{1 - F_2'(q - h(F_1))h'(F_1)}{h'(F_1)}$$

which defines F_1^* implicitly.

Let's explicitly functional forms for the functions described above, such as $F_2(Q) = \eta Q$ and $h(F_1) = \psi F_1$, where η and ψ are constants that explicit the assumption that the passing rate and the function *h* are increasing functions of the students' proficiency and the exogenous change in the passing rate, respectively, and therefore satisfy $\psi > 0$ and $\eta > 0$, and we assume the functions to be linear for the sake of simplicity.

This allows us to find a close solution for F_1^*, which is

$$F_1^* = \frac{(\frac{\beta}{\alpha+\beta} - \eta\psi)}{(1-\eta\psi)\psi}(\frac{\overline{E}}{p_q})$$

and then we can proceed to find all the variables of interest.

Knowing $q^* = \frac{\overline{E}}{p_q}$ and F_1^* we find Q^*, which is $Q^* = [(\frac{\alpha}{\alpha+\beta})(\frac{1}{1-\eta\psi})]\frac{\overline{E}}{p_q}$

Q_1^* determines F^*_2, given by $F_2^* = [(\frac{\alpha}{\alpha+\beta})(\frac{\eta}{1-\eta\psi})]\frac{\overline{E}}{p_q}$

And finally, by summing up F_1^* and F^*_2 we have F_1^*, which is $F^* = [(\frac{\beta}{\alpha+\beta})(\frac{1}{\psi})]\frac{\overline{E}}{p_q}$

As we can see infer from these results

(i) Both the optimal proficiency and passing rate improvements are positively related to the total investment in education ($\overline{E}$) and negatively related to the costs of improving the quality of education provided (p_q), as it was expected. The first expresses a pure income effect and the second that the income effect outweights the substitution effect.

(ii) The larger the weight given to the passing rate vis-à-vis to the students´ proficiency in the index ($\frac{\beta}{\alpha}$), the larger it will be the improvement in the passing rate aimed by the municipality, and the smaller the increase in students' proficiency, and vice-versa.

(iii) The optimal passing rate improvement is positive related to the sensibility of the passing rate to variations in the quality of education, whose intuition is straightforward.

(iv) The passing rate is negatively related to the quality of education's sensibility with respect to the passing rate (ψ), whereas chosen variation of proficiency is positively related to it. The larger the cost in terms of quality induced by an increase in the passing rate, the more the municipality will substitute into proficiency and out of the passing rate.

(iii) The more the passing rate responds (η) to an increase in proficiency, the larger the proficiency chosen by the municipality.

In this general model, in which the local government can freely choose the best way to improve the index, it happens as follows. The entire budget towards educational expenses will be spent in educational inputs aiming to improve the students' average proficiency. Then the local government will choose the passing regime, that is, the amount he will allow the passing criteria to be slackened in order to improve the passing rate, which involves also a choice over the amount of reduction in quality the manager will allow to happen as a consequence of it. This choice, thereby, together with the amount spent seeking to improve proficiency, will determine the total variation in students' average proficiency. This variation in students' average proficiency, in turn, will determine the second component leading to an improving in the passing rates. Summing up these two components, we will have the total variation in the average passing rate.

The next table summarizes the results stemming from the three models above.

	Proficiency	**Passing Rate**
Model "passing by changing the passing regime"	$Q^* = (\frac{\alpha}{\alpha+\beta})\frac{\overline{E}}{p_q}$	$F^* = [(\frac{\beta}{\alpha+\beta})(\frac{1}{\psi})]\frac{\overline{E}}{p_q}$
Model "passing by learning"	$Q^* = \frac{\overline{E}}{p_q}$	$F^* = \eta\frac{\overline{E}}{p_q}$
General Model	$Q^* = [(\frac{\alpha}{\alpha+\beta})(\frac{1}{1-\eta\psi})]\frac{E}{p_q}$	$F^* = [(\frac{\beta}{\alpha+\beta})(\frac{1}{\psi})]\frac{E}{p_q}$

The case described in the first model actually will not be found in reality, since it implicitly assumes that students' proficiency does not impact the passing rate. The case described in the model "passing by learning", instead, can be considered as a particular case in which there is no possibility of improving the passing by changing the passing regime, that is, by artificially slackening the passing criteria. Comparing then this model with the general model is analogous to comparing an equilibrium with commitment to a discretionary one, as in Person and Tabelini (1996), where commitment in the present case would mean a situation in which the municipalities would not be allowed of changing the passing criteria in order to improve the passing rate.

From the comparison of these two alternatives, we have the following conditions:

If $\frac{\beta}{\alpha+\beta} \leq \eta\psi$ then $Q^*_{*gm} \geq Q^*_{pbl}$ and $F^*_{*gm} \leq F^*_{pbl}$

If $\frac{\beta}{\alpha+\beta} > \eta\psi$ then $Q^*_{*gm} < Q^*_{pbl}$ and $F^*_{*gm} > F^*_{pbl}$

It means that, depending on the parameters, either a higher variation on proficiency and a lower variation on the passing rate will be achieved through a passing by learning model (equilibrium with a rule) than under a general model (equilibrium with discretion) and vice-versa.

3. Pursuing an ideal Educational Index

3.1 Index's Weighting

One of the virtues of the Ideb as an indicator is its simplicity; and its advantage is combining two central dimensions to the question of educational quality in a synthetic index. Nevertheless, the equal weight of its two components is an arbitrary choice. Why should they have the same weight?

In order to address this question, we will discuss the incentive it seeks to provide. On one hand, the larger the weight of the flux component vis-à-vis the weight of the proficiency component, the larger the incentive for the local administrator to accelerate artificially the promotion of the students - in a radical and compulsory manner - without the reformulations that are necessary to the implementation of such regime, which could lead to high costs in terms of quality of education. On the other hand, the larger the weight of the proficiency component vis-à-vis the flow component, the larger the incentive for local managers not to resist evasion, or even to increase retention or to motivate the worst students to evade, so that only the best students are submitted to standardized tests, improving thereby measured proficiency.

Perhaps it is not a coincidence that some policymakers have recently adopted or at least tried to adopt automatic promotion regimes soon after the plan was launched. This could be interpreted as the first signal about the Ideb´s capacity of changing policymaker's actions.

We should therefore seek to avoid these kinds of unbalanced behaviors. Mathematically speaking, we have to avoid that the local government choose corner solutions when trying to increase the index.

In relation to the Ideb´s weighting system, the next table shows the aggregate value of Ideb for the different Brazilian weights with different values assigned to the proficiency and the passing rates.

state	soma de 1/p	T=average time (years) for conclusion of 1 school year	P = 1/T	N = Standard Grade Average	IDEB = N x P	IDEB = $N^{0,8} \times P^{1,2}$	IDEB = $N^{1,2} \times P^{0,8}$
Acre	5,2	1,3	0,77	3,9	3,0	2,16	4,12
Alagoas	5,4	1,3	0,74	3,7	2,8	2,01	3,85
Amazonas	4,5	1,5	0,67	3,4	2,3	1,66	3,19
Amapá	4,4	1,5	0,69	3,9	2,7	1,90	3,81
Bahia	5,6	1,4	0,72	3,8	2,8	1,98	3,86
Ceará	5,4	1,3	0,75	4,0	3,0	2,13	4,17
Distrito Federal	4,6	1,5	0,65	4,6	3,0	2,04	4,47
Espiríto Santo	4,2	1,4	0,72	4,3	3,1	2,17	4,45
Goiás	5,4	1,4	0,74	3,9	2,9	2,06	3,99
Maranhão	5,2	1,3	0,77	3,3	2,5	1,89	3,39
Minas Gerais	5,2	1,3	0,77	4,5	3,5	2,44	4,96
M. G. do Sul	4,7	1,6	0,64	4,4	2,8	1,93	4,19
Mato Grosso	4,6	1,5	0,65	4,0	2,6	1,80	3,73
Pará	5,4	1,3	0,75	3,6	2,7	1,98	3,73
Paraíba	5,3	1,3	0,75	3,5	2,7	1,95	3,62
Pernambuco	5,5	1,4	0,73	3,7	2,7	1,96	3,77
Piauí	6,1	1,5	0,65	3,7	2,4	1,71	3,41
Paraná	5,5	1,4	0,73	4,4	3,2	2,24	4,62
Rio de Janeiro	5,5	1,4	0,73	3,9	2,8	2,04	3,99
R. G. do Norte	5,5	1,4	0,73	3,6	2,6	1,91	3,63
Rondônia	5,6	1,4	0,72	4,2	3,0	2,12	4,30
Roraima	3,9	1,3	0,77	4,2	3,3	2,34	4,61
R. G. do Sul	5,8	1,5	0,68	5,0	3,5	2,32	5,15
Santa Catarina	5,0	1,3	0,79	4,4	3,5	2,47	4,91
Sergipe	5,6	1,4	0,72	4,1	2,9	2,08	4,16
São Paulo	5,1	1,3	0,79	4,2	3,3	2,36	4,60
Tocantins	5,0	1,3	0,80	3,6	2,9	2,13	3,91

Formally we suggest an index in the form

$$Ideb = Q^{\alpha} F^{\beta}$$

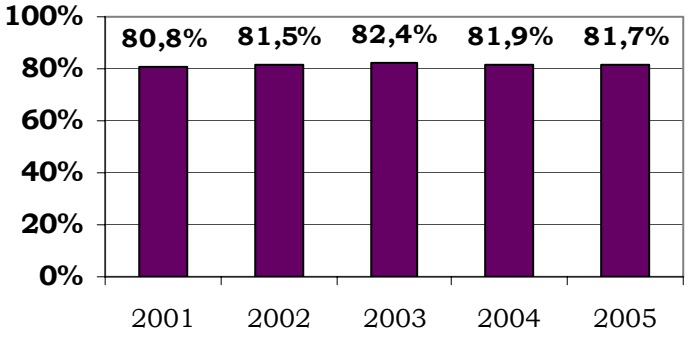
and suggest that it is very important to try to analyze and to estimate which would be an optimal weighting rationale for the index, that is, which should be the coefficients $\hat{\alpha}$ e $\hat{\beta}$. We will deepen this discussion in an extension of this paper.

3.2 Incorporating out-of-school children in the Index

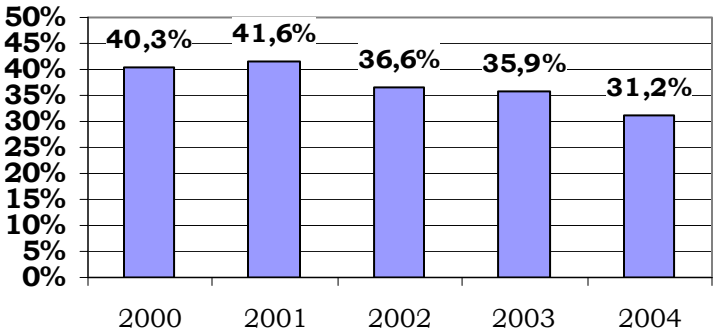
Another relevant issue of the index is the incorporation of out-of-school children, with the double aim of (a) making the local managers responsible for non-enrolled school age children, while also (b) focusing on the process of enrollment expansion according to the evolution of the index.

We observe that only 2.7% of children aged between 7 and 14 years old are not enrolled. Nevertheless, 18.3% of children aged between 15 to 17 years old are not at school. From this, we can infer that the majority of those students who are out of school had evaded, as opposed to children who have never been to school. Besides, the data shows that the expected conclusion rate of basic education was only 31.2% in 2004, even smaller than the 2004 rate of 40.3%.

Enrollement Rate from 15 to 17 years old



Average Expected Rate of conclusion of Basic Education



source: Censo Escolar/INEP

This is a problem that has to be tackled. Otherwise, there may be an incentive for mayors to leave a good deal of marginalized young people out of the school system in order to preserve the municipality's Ideb. The index, as it is built, provides only an incentive for increasing the performance of students who are in school, concerning both their proficiency and their probability of progressing on to the next school year. It does not provide incentives for children to be brought back into school. Actually, it provides an incentive

for preventing children from failing and abandoning or evading school, but giving up on them as soon as they abandon school. It provides an incentive not to bring those students back to school, since their re-inclusion would potentially worsen the Ideb, for those who abandon school have on average a lower proficiency rate and a higher probability of not being approved.

The importance of incorporating this dimension into the Ideb notwithstanding, we also have to analyze the best way of comparing the feasible possibilities using both theoretical and practical criteria.

One solution (I) would be to include children out of school in the computation of Q, using some counter-factual imputation methodology for this sake. This would consist in setting values for those students´ proficiency based on their personal characteristics, thereby seeking to control for a possible selectivity bias, which may lead to reward of municipalities with many children out of schools through proficiency. This could be done using a methodology that tackles issues concerning selectivity problems and composition-effect related to the schooling average quality, such as the ones presented in Franco et all (2003), Neri e Carvalho (2002) and Reynaldo e Natenzon (2003).

The index then would take the following form

$$Ideb = \hat{Q}\ F$$

where $\hat{Q}$ refers to Q corrected by this composition effect bias.

An alternative proposition (II) would be to include this dimension in the index in a multiplicative fashion. We could have, for example, enrollment rate in a specific school range as a third multiplicative factor. This would lead us to the following form:

$$Ideb = Q^{\alpha} F^{\beta} M^{\gamma}$$

whose advantages are the decomposition property allowed by the multiplicative form. We would use then the weight γ to determine the optimal weighting of this variable within the index.

An additional proposal (III) would be to include in the index some factor that rewards public managers for each student brought back to school, through a sort of bonus within the index. It could work, for instance, by adding an addictive factor to be summoned upon the index. In this manner we would have

$$Ideb = Q^{\alpha} F^{\beta} + z, \quad z \in [0, k]$$

One caveat would be the possibility of the mayor to make up for the enrollment rate, something like what happened in the Fundef context. The Fundef was a funding program that provided a similar incentive of transferring funds to the municipalities according to the number of children enrolled in school. In some cases, it turned out that some municipalities had more students in the school census than in the demographic census! A solution would be then to define a limit on k by municipality, which would be very simple to achieve with the available databases. But we believe those would be second-order effects.

An important feature that incorporating this dimension should have is that the enrollment to be considered should be the enrollment rate within a specific range of age, to avoid older people to be brought back to school in order to increase the enrollment.

3.3 Incorporation of Students' Transferences by the Index

In what refers to the utilization of the Ideb at the school level, allowing for comparisons among them, another suggestion would be to incorporate the fact that there are many students who are transferred across schools and also educational systems. This will soon become feasible when student-specific information becomes available through the School Census.

The main idea is to avoid that schools adopt a harder criteria of passing before the test is carried out, in order to improve their performance in the index, excluding less prepared students from the test.

Another aim would to avoid that schools entice the best students in the year of the proficiency test in order to achieve a better index. For instance, s student who studied the first two years of high school in one school and only the last one in a different school should have his added value divided in pro-rata terms according to the time of permanence in each school, so that the credit would be assigned to the school that in fact has taught and stimulated the student.

4 Application of the indicator to a target-based system

In this section we will discuss the use of the Ideb within a target-based system framework, analyzing the best way through which the evolution of the index should be assessed.

4.1 Value-Added

Schools should be evaluated for their capacity of adding value to the knowledge of the students, since this is their essential function. Therefore, we argue that it is best that the evaluation of the municipalities and schools through the Ideb to be based on the value added by the schools to the students rather than on level.

This methodology has several advantages. Aside from tackling the issue of comparison between students from different backgrounds, this system also benefits students from disadvantaged backgrounds - since being less educated presents one advantage: that of being able to learn more.

Second, if the system is based on added value, private and public resources will tend to migrate to places that offer higher returns. This will create a positive incentive for schools to improve the quality of their services, which would attract the best students, which in turn would improve even further the school quality, thus creating a virtuous cycle.

Besides, an additional advantage of adopting such a system is that it also provides an incentive for schools to mix students with privileged and disadvantaged backgrounds, which will not take place if the target is based on level, instead of on added value. This strategy can play a very important role in an unequal and diverse country like Brazil.

4.2 Differences-in-Differences

It is clearly better that it is best that the targets be based on the value-added than on level. But, in a context of uncertainty, we have to go one step further. Evaluating the evolution of the index within each municipally and each school should be carried out using a standard methodology for evaluating social programs, namely the differences-in-differences. The idea is to compare the municipalities - and their schools - by the difference in the value added to the students through formal education by each of them.

A characteristic of contracts based on a simple value-added evaluation is that there is a very large probability that, even if the municipality take all the necessary procedures to reach the target, it fails in doing so due to unexpected negative shocks. Contracts based only on the variation, or value-added, are usually pro-cyclical, reducing the government transfers when they are more necessary, and increasing them when they are less necessary.

Many factors can affect the final outcome aimed in a target system, such as natural disasters, epidemics and weather related shocks, as well as positive factors, such as social programs carried out by NGOs or international organizations, or any other aggregate shock one can think of. Most of these shocks, as we can see, are exogenous, that is, are not under direct control of the public managers.

One way of tackling this issue is through the utilization of contracts based on comparison of performance across municipalities. This contract system involves conditioning transfers to the municipality performance vis-à-vis other municipalities. A transfer from the federal government, thereby, will depend only on the difference between the outcome resulted from the amount the public manager invested on education and the outcome obtained by other municipalities.

In Neri and Xerez (2007) it is shown that, when the social results do not depend only on the investment realized by the municipalities, but also on random factors, such as exogenous shocks, mechanisms based on performance comparison are the one capable of reaching the best results. Contracts based on the differences between the value-added across municipalities avoid the pro-cyclical characters of pure value-added base contracts. In such a system, a local government investing an optimal amount in education and doing it in a efficient way will receive an optimal transfer regardless of the shocks.

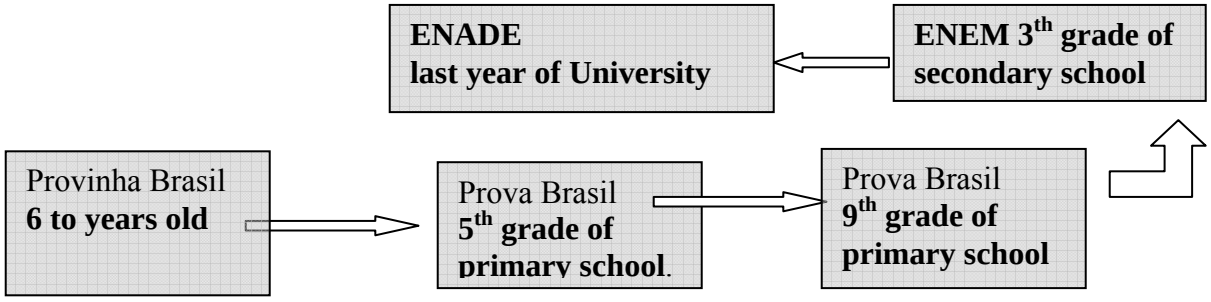
This robustness feature to aggregate shocks provided by this system based on relative measures of performance is especially important with respect to educational targets, since they consist, by their even nature, of long-term targets.

Another advantage of this type of contract is also to reduce the problem of political favoritism when certain social groups receive greater, or smaller, attention from specific governments. With the establishment of social targets it becomes possible to generate proper incentives so that social spending is distributed more equitably between groups within the same school.

4.3 Integrated Evaluation System

Another point concerning policy issues is that it is crucial to have a uniform and integrated system of evaluation for the success of this kind of target system. We already have a Provinha Brasil, that evaluates the proficiency of 6 to 8 year-old children; the Prova Brasil, applied at the end of the first half of primary school (5th grade) and at the end of primary school (9th grade); the ENEM or the SAEB for the high school (3rd year of high school); and, the ENADE at the end of the first and in the final year of university. Nevertheless, these different proficiency exams are not uniform, some corresponding to the universe of children, some to a sample and some are even voluntary. We then discuss ways of integrating them and building a whole system of proficiency evaluation that will allow us to follow every student over his entire schooling trajectory, and the value added of each school level to his performance.

Learning Evaluation System
Added Value Between Exams (D in D)



4.4 Transferences based on Social Credit

In many occasions, the best remedy against low educational attainment is not charity, but credit instead. In the system proposed, there will be contracts containing clauses fixing the targets and the amount of money to be transferred by the federal government to the local municipality, once these goals are reached. The idea is that, if the municipality does not reach the established targets, it will not receive the funds, or else, receive only an amount proportional to what has been achieved. This kind of contract between federal and local governments is thus similar to a hiring contract, in which the federal government hires the municipality to run a social service. It is naturally more realistic to assume that, for the targets to be reached, the municipality must first receive the funds, and only afterwards the achievement of the targets will be checked. We can then consider the funds received by the local government as payment in advance - called Social Credit - enabling the municipality to carry out a specific service determined by the contract. If the targets are not reached, the municipality will have a debt towards the federal government because it did not reach an agreed-upon target. The debt will be equal to the difference between the advanced payment and the payment the municipality should receive upon obtaining results.

Conclusion

Some conclusions and suggestions concerning both policy and methodological issues emerge from this work.

First we show, by means of building a principal agent model, that this target-based system with condition transfer is an improvement in relation to other alternative educational finance system. Since the transfer from the federal government are conditioned by a improvement in the index, the local government will invest more in education than they would if transfers were not conditional or if they went preferentially to the place with worst educational performance. It is worth noting that the PDE educational plan implementing a target-based system in Brazil happens in a moment when different actors are converging around the need to determine educational targets as the basis of educational policies. In 2000 the Brazilian government signed the Dakar Goals - Education for All Commitment, with six main goals to be reached until 2015; while a very important umbrella NGO involving many relevant actors of civil society, named Compromisso Todos pela Educação (All for Education Commitment) also set five targets to be reached by 2022, when the country completes two centuries of its political independence. Furthermore, we analyzed the strategies the municipalities can adopt to improve the components of the index and how the will allocate the resources between its objective. We show that it will spend its resources in quality-related investment and choose an a passing regime based on how much he will allow the passing criteria to be slackened in order to improve the passing rate, which involves also a choice over the amount of reduction in quality the manager will allow to happen as a consequence of it. The resulting total improvement

in student's average proficiency and in the passing rate will stem from this tension, and will depend as well on the weights given to each component in the index as well as the degree of interaction between them, which involves both the sensibility of the proficiency to a exogenous change in the passing regime and the sensibility of the passing rate to a variation in student´s proficiency.

Second, we also suggest that there is still room for improvement in what concerns methodological issues in the construction of the index it self, pursuing what would be an ideal index. We suggest that (i) an equal weight to the two components of the index - proficiency and the passing rate - is arbitrary and that an optimal weight should be pursued, to avoid an unbalanced behavior by the local managers, such as choosing corner solutions. We also propose that (ii) out-of-school children should also be incorporated in the index, with the double aim of making the local managers responsible for non-enrolled school age children, while also taking into account the process of expansion of enrollment in the evolution of the index.

Last, but not least, we analyzed the issue of how to best evaluate the evolution of the Ideb and the related incentives. We propose a methodology of value-added evaluation, based on differences-in-differences and showed that its advantages vis-à-vis evaluation based on level are abundant. We argue in favor of a transfer system based on the comparative performance between municipalities, with conditionalities depending on the relative value-added by each of them. Perhaps the main advantage of such a system is to eliminate the pro-cyclical effect that can result from aggregate shocks that cannot be diversified.

Finally, we suggested that to it is essential to have a uniform and integrated system of evaluation for the success of a target-based system. We discuss ways of

integrating Provinha Brasil, Prova Brasil, ENEM, Saeb and ENADE, which are the evaluation test already carried out in Brazil in different school years, and building a whole system of proficiency evaluation.

There are a few dynamic extensions of the framework in various directions found in the literature that can be incorporated in the model developed, namely the inclusion of the dichotomy between complete and incomplete contracts with and without renegotiation clauses. We can also incorporate in the model the incidence of measurement error in the variable targeted. One may be able to demonstrate in a dynamic context with complete contracts that the best way to increase alocative efficiency of social transfers is to create institutional mechanisms that prevent bilateral renegotiations. This optimal contract reproduces the sequence of targets and transfers found in the static solution, but this result will tend to disappear when we incorporate incomplete contracts, due to *ex-ante* inefficiencies created by renegotiation possibilities.

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