Does Money in Schools Matter? Evaluating the Effects of FUNDEF on Wages and Test Scores in Brazil*

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Abstract

In this paper we investigate the effects of the 1998 reform in the funding of fundamental education in Brazil (FUNDEF) on the relative wages of public school teachers and on the relative proficiency of public school pupils. The evidence suggests that, on average, FUNDEF raised the public school teachers' relative wages and improved the relative proficiency of the public school students. Some indirect evidence was presented that showed that the effect of FUNDEF on proficiency seems to be related to its effect on wages and on school characteristics. The effect on proficiency seems to be concentrated in the municipal schools in the Northeast of the country.

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1) Introduction

In terms of income distribution, Brazil is one the most unequal countries in the world.[1] Education plays an import role in explaining this fact, as about 50% of the income distribution in Brazil can be associated with education. This happens because returns to education are very high in Brazil and only a small proportion of the population has access to higher levels of education.[2] Despite the fact that access to the first schooling year is almost universal in Brazil, children from a poor background tend to drop out of the school system quite early on.[3] One the reasons behind this high drop-out rate may be the quality of the education they receive in the public system.

In 1998, a reform in the funding of the public fundamental education system was introduced in Brazil, with the creation of **FUNDEF** (Fundo para Manutenção e Desenvolvimento do Ensino Fundamental e Valorização do Magistério – Fund for Maintenance and Development of the Fundamental Education and Valorization of Teaching). FUNDEF main aim is redistribute resources from the richer to the poorer regions and to increase public teachers´ wages. The aim of this paper is to examine whether the introduction of FUNDEF has in fact increased the earnings of the public school teachers, relative to their private schools counterparts, and the relative performance of public school pupils in test scores.

The Brazilian education system is divided in cycles. The first cycle (primary education) consists of four years, the second (secondary) also has four years, the third (high

[1] The 10% in the top of the income distribution appropriate 50% of all income in Brazil.
[2] See Menezes-Filho et al (2002). A college graduate earns about three times more than a high school graduate and only about 10% of the population has a college degree.
[3] See Filmer, D and Prichett, L. (1998)

school) lasts three years and the fourth (college) usually lasts between four and five years. The primary and secondary cycles together form what is called the fundamental education, which was affected by the introduction of FUNDEF.

The system has both private (paid) and public (free) schools. Figure 1 presents the share of pupils studying in private schools and the share of schools that are privately owned in selected grades. One can notice that the share of students in private schools rises with the level of education, which can be explained by the high drop-out rate among kids from a poor background, which tend to study in public schools. Moreover, the share of private schools is higher than the share of students in private schools, especially from the 8^{th} grade onwards, which means that private schools tend to have fewer students than the public ones after that grade.

In terms of college education, the situation is radically different, since students from public colleges perform much better on average in evaluation tests than do the students from private institutions. As such, there is a very competitive exam to gain admission into each of the public colleges, and students from private high schools generally do much better in these admissions exams than do pupils from the public school system that managed to conclude high school. Therefore, most of the students from a poor background, which went through the public high school system, have to go to private colleges or try their luck in the labor market and inequality tends to self-perpetuate.

For all these reasons, it is important to evaluate an education reform that aimed at changing the funding structure of the public school system, in order to redistribute resources to the poorest regions, such as FUNDEF. Barros *et al* (2001), using household level data, found that the wages of public school teachers rose by about 8% with respect to those in the private sector in the southeast of Brazil. Anuatti Neto *et al* (2003) also found

that the relative wages of public school teachers increased between 1997 and 1999, particularly in the municipal system in the Northeast of Brazil, which they attribute to FUNDEF. However, there is no study evaluating the impact of FUNDEF using school level data and examining its effects on the relative proficiency of public school pupils. We think that this paper also relates to a broader literature the tries to evaluate the impact of resources spent on education and on teacher labor market (see Hanushek, 2003, for example).

The structure of the paper is as follows. In section 2 we describe the FUNDEF program and section 3 describes the data. Section 4 presents the econometric methodology, while the results are presented in section 5 and the conclusions in section 6.

2) The FUNDEF Program

In each Brazilian municipality, the public schools may belong to the State system or to the municipality system. The new Brazilian constitution, which took effect in 1988, stated that all States, Municipalities and the Federal Government had to spend a fixed share of their tax and transfer revenues in their public education system. This share was equal to 25% in the cases of states and municipalities and 18% in the case of the federal government. With this new legislation, the amount of resources allocated to education increased, but the so did heterogeneity of the public schools, since richer states with a small share of students in their system were spending much more per pupil than were poor municipalities with a large share of students. Moreover, there was no mechanism to enforce that the education

resources were effectively being spent on the educational system itself and not on other activities that could be remotely linked to education. [4]

The introduction of FUNDEF aimed at changing the structure of funding in fundamental education. Since its implementation (January 1st 1998) and for a period of 10 years, all municipalities and states had to spend 60% of their education resources (that is, 15% of their revenues) exclusively with the maintenance and development of its fundamental education. However, instead of being directly applied by the government unit, all resources were firstly directed to a common fund. In a second moment, the resources were redistributed to the states and municipalities, in direct proportion to the number of students enrolled in each state and municipality fundamental school system. Moreover, 60% of the resources received through this fund had to be spent with teachers´ wages. Finally, a minimum amount of spending per pupil was established, and in the cases where this amount could not be achieved with the fund resources alone, the federal government would complement it.

Hence, FUNDEF affected the education system in several ways. Suppose that a municipality had revenues (from tax and transfers) that amounted to R$100. With the 1988 constitution, it had to destine R$25 to education in any way it preferred. After FUNDEF, it had to donate R$15 to the fund, whereas the amount if received back depended on the number of pupils enrolled in the fundamental education. If its share of pupils was equal to its share of resources to the fund, it would receive the same R$15 back. Moreover, at least R$9 had to be spent in teachers´ wages.

[4] Rich municipalities with a small number of public schools, for example, spent the resources in activities remotely related to the education, like street pavements near the school, sports gymnasium, etc..

Therefore, the impact of FUNDEF on the schools and on teachers' wages in a municipality or state depended on the amount of resources initially allocated to the fundamental education system out of its education budget; on the initial share of wages out of this amount and on its share of enrollments as compared to its share of revenues within the State.

Table 1 reports the financial redistribution that took place between the each state and its municipalities in 1998 for the different regions. The transfers within a State would sum zero, were it not for the federal government transfers that complement the budget if the expenditures per student do not reach the minimum amount. It is clear that in all regions, with the exception of the south-east (SE), the transfer favored the municipalities. This happened because their proportion of enrolments was high relative to the proportion of their revenues.

Figure 2 shows the behavior the expenditures on education in each state as a proportion of the GDP over time. Since the proportion of the revenues spent on education in each unit should be constant over time (determined by the Constitution), the changes in the share of education expenditures should correspond to changes in the revenues/GDP ration. It is clear that there was a rise in the share of education expenditures in the country as a whole between 1997 and 1998, with the main responsible being the states and municipalities of the Northeast, where the rise actually starting in 1997. Therefore, a higher share of resources was being spent on education over the period under analysis.

FUNDEF established that 60% of all education resources should be spent on fundamental education. Figure 3 shows that the states were, on average, already spending more than 60% of its education resources on fundamental education in 1997. This is also true for each state and municipal system separately, except for the state system in Sao

Paulo, Rio de Janeiro and Paraná (figure not shown). Between 1998 and 1999, one can notice a decline in share of resources accruing to fundamental education and a rise in the high school share of education expenditures.

Figure 4 shows that the Municipal system as a whole was already spending about 70% of its education resources on the fundamental cycle. The São Paulo municipalities were the only ones spending less than the minimum required, on average (figure not shown). However, the share of resources spent on the fundamental education rose by about 8% between 1997 and 1998, with a similar decline in the amount destined to the pre-school system. This could be the result of the effort made by municipalities that were not previously spending the minimum required and had to substitute resources away from the pre-school to the fundamental education.

Figure 5 presents the evolution of the total number of students in the fundamental education in each system (state, municipality and private schools) between 1997 and 1999. It is clear that the total number of students rose over time, with a rise in the number of students in the municipal system more than compensating for the decline in the number of students in the state system. It seems therefore that students are being transferred fron the state to the municipal system, which could perhaps be associated with the shifts in the allocation of the education resources from the states to the municipalities. It is interesting to note however, that these movements to the municipal system and away from the State system occurred even in the states which experienced a shift in resources in the opposite direction, like São Paulo and Minas Gerais, which means that it could actually reflect a trend that pre-dates the introduction of Fundef.

In Figure 6 we present the evolution of the real expenditures per pupil in the fundamental education in the state and municipal systems and in Brazil as a whole. It is

clear that there was a rise in real expenditures between 1997 and 1998, in both the state and the municipal systems, despite the rise in the number of students, followed by a decline in the level of expenditures in the state system between 1998 and 1999.

Figures 7 and 8 present the equivalent numbers for the Northeast and Southeast regions separately. One can notice from figure 7 that in the northeast the pattern is very similar to the one observed for the country as a whole. The stabilization of real expenditures between 1998 and 1999 despite falling expenditures in both the municipal and state systems can be explained by the rise in the federal transfer to the units that did not reach the stipulated minimum amount of expenditures per pupil. Figure 8 shows that in the Southeast region, where the state system was a net beneficiary of the FUNDEF program, real expenditures in the municipal system fell continuously between 1997 and 1999.

Figure 9 shows that the number of schools offering fundamental education fell between 1997 and 1999 especially due to the fall in the number of State schools, although there was a slight fall in the number of municipal schools as well. This happened both in the Northeast ad in the Southeast (figures not shown), with the exception of the number of municipal schools in the southeast, which rose between 1997 and 1998, despite the fall in real expenditures documented in the previous figure.

Despite the fall in the number of schools, Figure 10 shows that the total number of teachers actually rose between 1997 and 1999, mainly due to the rise in the municipal system, which out-weighted the fall in the state system. It seems therefore that teachers also moved from the municipal to the state system, following their students. This was true both in the Northeast and in the Southeast regions as well (figures not shown). It is important to note that the number of private schools and of their teachers has remained constant over this time frame, since they will form our control group.

Finally, Figure 11 shows that average class sizes remained basically constant between 1997 and 1999 in the system as a whole, but there was a rise in the average class size in the municipal system, which was compensated by a fall in the private schools. This was especially true in the Northeast (figures not shown).

3) Econometric Methodology

The empirical strategy we will follow to evaluate the impact of the FUNDEF program is based on the differences-in-differences methodology, used in Card (1990) and described in details by Angrist and Krueger (1999). In the first step of his methodology we evaluate whether the FUNDEF impacted the public schools teachers' wages relative to their private schools counterparts. In the second step we investigate whether FUNDEF has improved the proficiency of the public schools pupils with respect to their private schools counterparts.

FUNDEF was introduced in 1998. Therefore, if FUNFED was effective in raising public schools teachers' wages, one should observe an increase in their relative wages in 1999 with respect to their relative wages in 1997. More formally, suppose that the conditional mean wages are defined by:

$$E[w_{oi}] = \beta_t + \gamma_s \qquad (1)$$

In the absence of FUNDEF, the teachers' wages would be equal to the sum of a year effect that is common to all schools and a school effect (public or private) that is fixed over time.[5] Suppose also that the effect of FUNDEF was to raise wages by a constant, that is:

$$E[w_{fi}] = E[w_{oi}] + \delta \qquad (2)$$

[5] As we do not observe the same schools in 1997 and 1999, we prefer to work with the conditional mean function.

This means that the teachers' wages in both private and public schools in 1997 and 1999 can be written as:

$$w_{it} = \beta_t + \gamma_s + \delta F_i + \varepsilon_{it} \qquad (3)$$

where F_i is a dummy variable equal to 1 if school *i* was directly affected by FUNDEF, that is, it was a public school observed in 1999. Differentiating the wages across schools and years, we have:

$$\{E[w_i / s = pub, t = 99] - E[w_i / s = priv, t = 99]\} - \{E[w_i / s = pub / t = 97] - E[w_i / s = priv, t = 97]\} = \delta \qquad (4)$$

As many school and students' characteristics may have changed between 1997 and 1999, and in public schools differently from in the private ones, we will stack the micro data for all schools and years and estimate an equation like:

$$w_{it} = \beta_t + \gamma_s + \delta F_i + \theta X_{it} + \lambda S_{it} + \varepsilon_{it} \qquad (5)$$

where X is a vector of school characteristics and S is a vector of the teachers characteristics.

The main identification assumption we need is that:

$$\{E[\varepsilon_i / X, S, s = pub, t = 99] - E[\varepsilon_i / X, S, s = priv, t = 99]\} - \{E[\varepsilon_i / X, S, s = pub / t = 97] - E[\varepsilon_i / X, S, s = priv, t = 97]\} = 0 \qquad (6)$$

that is, there could be no changes in the unobserved characteristics of the public schools or of their teachers, relative to the private ones, between 1997 and 1999. Since we have no idea about the plausibility of this assumption, we will include as many observable characteristics as possible given our data set, and compare their means between 1997 and 1999.

In the second step we will use the same methodology, but using the students performance in test scores instead of the teachers' wages as the dependent variable. Firstly, we will estimate an equation of proficiency at the pupil level, as a function of the dummy variables described above and of the students' characteristics, in order to investigate whether FUNDEF has raised average test scores of the public school students, as compared to private schools ones, unconditionally:

$$y_i = \beta_t + \gamma_s + \delta F_i + \alpha Z_{it} + \varepsilon_{it} \qquad (6)$$

where Z is a vector of the students characteristics. We then introduce the school characteristics to examine its effect on δ:

$$y_i = \beta_t + \gamma_s + \delta F_i + \alpha Z_{it} + \theta X_{it} + \varepsilon_i \qquad (7)$$

and finally, we introduce the teachers' characteristics and their wages:

$$y_i = \beta_t + \gamma_s + \delta F_i + \alpha Z_{it} + \theta X_{it} + \lambda S_{it} + \kappa W_{it} + \varepsilon_i \qquad (8)$$

If the effect of FUNDEF on the students' test scores was the result of improvements of the school characteristics, we should observe a decline in δ once we introduce them in the regression, and the same is valid for the teachers' wages. This is the methodology we use to verify how (if at all) has FUNDEF raised the proficiency of the students in public schools.

3) Data

The data we use in this part of the project come from SAEB (Sistema de Avaliação do Ensino Básico) a survey carried out by the Ministry of Education. This data set has information on the test scores of a sample of students in both public and private schools in

1995, 1997, 1999 and 2001. As FUNDEF was introduced in 1999 (see above) we will only use the 1997 and 1999 waves. Each student in each school was tested for his/her proficiency in one out of three possible subjects: Portuguese, Mathematics or Sciences. The information on the teacher responsible for this subject and the school characteristics were matched to each student to form the final data set. In this version of the paper, we will use only the test scores of the students that were in the 8th grade, the last grade of the fundamental education.

The data set contains a very detailed set of characteristics of each student, school, teacher and director for all schools in the sample. Table 2 presents the summary statistics of the students' characteristics. The percentage of boys is slightly higher in the private schools, although girls form the majority of students in both systems. It is interesting to note that the mean age in the private schools is much lower than in the public ones, with may reflect late start or higher grade repetition. The differences in the family background are quite striking, as about 48% of the mothers of private school students have a college degree as compared to 9% in the public schools! This difference remained basically the same in 1999. The percentage of pupils that have failed the grade exams in the past is very high, reaching 27% in the private and 59% in the public system in 1997, declining in both systems by about 5 percentage points between 1997 and 1999.

Table 3 presents a summary of the teachers' characteristics. The first thing to notice is that sample sizes increased between the 97 and 99 sample. This may bias our estimation results if it affected the composition of the public and private school teachers differently in terms of unobservable characteristics.[6] One can notice that about 93% of private school

[6] Both the 1997 and the 1999 samples are representative at the level of each State. It is not clear why the sample sizes increased in the period.

teachers were college educated in 1997, as compared to 80% in the public schools, a difference of about 13 percentage points. In 1999 the difference in terms of college education was in the range of 10 percentage points. In terms of experience and age, there were no marked differences between the 1999 and the 1997 sample means. In terms of average wages however, we can see that the difference between the private and public schools that was R$512 in 1997, declined to about R$290 in 1999, a reduction of about 43%![7]

Table 4 presents the description of some school characteristics. This is the most problematic part of the data, since there are not many school characteristics in the 1999 survey, and there are differences in the way that the questions were formulated between the 1997 and the 1999 surveys. Therefore, a comparison between the 1997 and 1999 data is problematic, and we should concentrate on the comparison between public and private schools in each year.[8] One can notice that in 1997 about 97% of the private school had computers, whereas only 37% of the public schools had at least one. In 1999 the question asked about the number of computers *used by students*, and so the proportion decreased to 66% in the private schools and 17% in the public system. It is interesting to note that the difference in terms of the director's wage between the private and public schools has also declined between 1997 and 1999, from approximately R$900 to about R$490, a change of about 45%, in line with the teachers' wages.

4) Results

[7] The original information on teachers' wages was in the form of intervals, so we used the midpoints of each interval to construct the means, and converted into real wages, using the average inflation rate in the period.
[8] We recently noticed that the 1999 teacher survey does contain information on several school characteristics that could be used and compared to the ones present in the 1997 survey. The next version of the paper will include these variables.

Table 5 below presents the results of regression that looks at the determinants of teachers' wages for the pooled 1997 and 1999 sample. The first column shows that real wages increased in 1999, that was in public schools are lower on average then in the private ones and that wages in science teachers are lower than those of the Mathematics teachers. The second column however shows that there was an increase of about 32% in the average wages of public school teachers in 1999, as compared to their private schools counterparts. Column 3 then includes the teachers' characteristics and we can see that FUNDEF coefficient declines a little, but remains statistically significant. In column (4) we control for the school characteristics, including the director's wage and the coefficient remains statistically significant, meaning that Fundef raised the public school teachers' wages by about 20%. Interestingly enough there is a positive correlation between the director's and the teachers' wages, which may reflect 'matching' or school unobserved characteristics.

In Table 6 we present the results of the second–state regression, about the determinants of the students' performance in test scores. In the first column, one can note that there was a decline in students' proficiency in 1999 and that students fare worse in Portuguese and Sciences than in Mathematics (the omitted category). Moreover, boys tend to perform better than girls, young pupils than older one, and white then non-whites. Family background, as measured by mother's schooling does has a strong impact on test scores. Moreover, pupils that failed in the past (a measure of unobserved ability) tend to do worse. The results as a whole are in line with other studies in the school proficiency literature.

In column (2) we include the public school indicator and the FUNDEF dummy, that is, the interaction between public school and 1999. It seems that public school students tend

to do worse than private school ones, but that this difference has declined between 1997 and 1999, after the introduction of FUNDEF. Column (3) includes the teachers' characteristics (other than their wages) and there is hardly any change in the FUNDEF dummy, implying that the change in teacher characteristics is not responsible for the improvement in public school students' test scores. In column (4) we include the teachers' wages as an additional regressor. It attracts a positive and statistically significant coefficient and it reduces the FUNDEF dummy by almost a half. This in indirect evidence that the improvements in the performance of the public school pupils may be partly explained by the higher wages of the public school teachers. Column (5) then includes the school characteristics and the magnitude of the FUDNEF coefficient declines further. Finally, column (6) includes the director's wages and this leads to a further decline in the FUNDEF coefficient, which is now not statistically different from zero. This evidence suggests that the improvements in the public school performance may be explained by the improvements in teachers' and directors' wages and other school characteristics.

Given the changes in the process of funding education introduced by FUNDEF, whereby most of the municipalities were net beneficiaries, with the exception of the southeast, we expect the effects of FUNDEF to differ substantially between states and municipalities and across different regions. We therefore repeated the exercises above separately for the state and municipal systems in two regions, Southeast and Northeast. The results are presented in tables 7 to 14

In terms of teachers' wages, tables 7 to 10 show that they increased for public school teachers in both the state and municipal system, in the Northeast as well as in the Southeast, as indicated by column (2) in each table. It is interesting to note however, that they increased by more in the Southeast, where, as can be noted from column (1), the

differences in wages between the public and private schools were higher to start with. Moreover, it seems that the increases in the southeast are robust to the inclusion of other teacher and school characteristics, as shown by columns (3) and (4), while in the state system in the Northeast, the inclusion of school characteristics and directors' wages wipes out the FUNDEF effect. In the municipal level however, the FUNDEF effect is robust to the inclusion on other characteristics.

Tables 11 to 14 repeat the exercises of table 6 for both systems in the Northeast and Southeast regions and the results look quite interesting. While the differences between the private and public schools in terms of proficiency were broadly similar in all systems and regions (about 30 points), one can only observe a rise in the proficiency of public schools in the municipal system in the Northeast. In the other system/regions, the FUNDEF dummy attracted a coefficient that is not significantly different from zero. Moreover, in the Northeast municipal level, the magnitude of the coefficient also declines when other possible FUNDEF outcomes are included in the regression, like teachers' wages (column 5), and the directors' wage and other school characteristics (column 6).

5) Conclusions

In this paper we investigate the effects of a 1998 reform in the funding scheme of fundamental education in Brazil (FUNDEF) on the public teachers' wages and on the proficiency of public school pupils. The evidence suggests that, on average, FUNDEF raised the teachers' relative wages and improved the relative proficiency of the public school students. Some indirect evidence was presented that showed that the effect of FUNDEF on proficiency seems to be related to its effect on wages and on school

characteristics. The effect on proficiency however, seems to be concentrated in the municipal schools in the Northeast of the country.

Tabela 1: FUNDEF Financial Impact by Brazilian Regions-(1998)

Region	State Government				B – A	Municipal Government				B - A
	Contribution to FUNDEF (A)	Revenues from FUNDEF				Contribution to FUNDEF (A)	Revenues from FUNDEF			
		Principal	Federal Compl.	Total (B)			Principal	Federal Compl.	Total (B)	
N	731,7	655,6	66	721,6	(10)	262,5	338,5	46,6	385,1	122,6
NE	1810,6	1203,2	157,9	1361,3	(449,5)	966,1	1573,8	216,1	1789,9	823,8
SE	4327,7	4500,2	-	4500,2	173,2	1973,3	1799,9	-	1799,9	(173,4)
S	1283,4	1152,5	-	1152,5	(130,9)	717,2	848,1		848,1	130,9
CO	452,0	446,3	-	446,3	(5,7)	247,0	252,5	-	252,5	5,5
Brazil	8604,7	7957,8	223,9	8181,7	(423,0)	4166,1	4818,8	262,7	5075,5	909,4

Source – Education Secretary – MEC **R$ Millions**

Table 2: Descriptive Analyze - Student's Characteristics

	1997				1999			
	Private		Public		Private		Public	
Boy	4.613	46,0%	10.921	42,3%	5.018	48,7%	8.882	44,8%
White	6.790	67,8%	13.187	51,0%	6.879	66,8%	9.933	50,1%
(Age – 7)	7,4 (1,2)		9,0 (2,2)		7,3 (1,1)		8,6 (1,8)	
Mother's education = Secondary	2.076	20,7%	16.470	63,7%	1.988	19,3%	12.954	65,3%
Mother's education = high school	2.972	29,7%	4.831	18,7%	3.518	34,2%	3.201	16,1%
Mother's education = college	4.831	48,2%	2.330	9,0%	4.581	44,5%	1.192	6,0%
Failed Before	2742	27,4%	15083	58,4%	2446	23,8%	10581	53,4%
Sciences	3304	33,0%	8.484	32,8%	3.394	33,0%	6.386	32,2%
Score	285		239		282		238	
	50		43		48		43	
Portuguese	3.447	34,4%	8.785	34,0%	3426	33,3%	6740	34,0%
Score	281		240		267		227	
	47		45		46		41	
Mathematics	3.267	32,6%	8.573	33,2%	3.475	33,8%	6706	33,8%
Score	292		237		288		239	
	50		42		50		42	
Number of Observations	10.018		25.842		10.295		19.832	

Table 3: Descriptive Analyze - Teacher's Characteristics

Teacher's Characteristics	1997				1999			
	Private		Public		Private		Public	
High School	68	6,8%	662	19,0%	285	12,2%	1074	22,4%
College	926	93,2%	2811	80,5%	2052	87,7%	3720	77,4%
Experience >= 6 and <=10	256	25,8%	736	21,1%	661	28,3%	1095	22,8%
Experience >= 11 and <=15	218	21,9%	754	21,6%	509	21,8%	968	20,1%
Experience >= 16 and <=20	143	14,4%	519	14,9%	251	10,7%	719	15,0%
Experience >= 21	169	17,0%	540	15,5%	356	15,2%	766	15,9%
Age >= 21 & <=25	110	11,1%	357	10,2%	266	11,4%	503	10,5%
Age >= 26 & <=30	159	16,0%	593	17,0%	527	22,5%	867	18,0%
Age >= 31 & <=35	236	23,7%	682	19,5%	544	23,3%	1.002	20,9%
Age >= 36 & <=40	167	16,8%	638	18,3%	384	16,4%	851	17,7%
Age >=41 & <= 45	150	15,1%	611	17,5%	291	12,4%	766	15,9%
Age >= 46 & <=50	112	11,3%	354	10,1%	190	8,1%	483	10,1%
Age >= 51	41	4,1%	200	5,7%	113	4,8%	270	5,6%
Men	400	40,2%	1.251	35,8%	982	42,0%	1.699	35,4%
Wage	1.104,08 (625,28)		592,00 (396,28)		1.001,21 (629,46)		711,16 (456,48)	
Number of observations	994		3.492		2.339		4.804	

Table 4: Descriptive Analyze - School's Characteristics

School's Characteristics	1997				1999			
	Private		Public		Private		Public	
Computer	107	92,2%	176	37,5%	488	65,9%	226	17,0%
Clean classroom	97	83,6%	217	46,3%	509	68,7%	631	47,5%
Clean bathroom	93	80,2%	105	22,4%	602	81,2%	701	52,8%
Director's Wage	1.981,01 (845,29)		1.070,03 (644,92)		1.497,31 (872,47)		1.009,64 (553,26)	
Number of Observation	116		469		741		1328	

Table 5: First Stage – Dependent variable Ln Wage

	Model 1	Model 2	Model 3	Model 4
Year 99	0,165 (0,013)	-0,073 (0,025)	-0,017 (0,024)	0,072 (0,022)
Public	-0,432 (0,014)	-0,646 (0,023)	-0,577 (0,022)	-0,375 (0,024)
Year 99 * public		0,319 (0,029)	0,291 (0,026)	0,209 (0,025)
Sciences	-0,106 (0,015)	-0,106 (0,015)	-0,051 (0,013)	-0,055 (0,013)
Portuguese	0,002 (0,014)	0,002 (0,014)	-0,021 (0,013)	-0,019 (0,012)
Dummies of states	Yes	yes	yes	yes
Teacher's characteristics				
High School			0,200 (0,145)	0,260 (0,140)
College			0,702 (0,145)	0,686 (0,140)
Years of experience >= 6 and <=10			0,211 (0,016)	0,207 (0,016)
Years of experience >= 11 and <=15			0,327 (0,019)	0,315 (0,018)
Years of experience >= 16 and <=20			0,412 (0,022)	0,395 (0,021)
Years of experience >= 21			0,560 (0,024)	0,543 (0,024)
Men			0,067 (0,012)	0,062 (0,011)
Age >= 21 & <= 25			0,212 (0,054)	0,193 (0,052)
Age >= 26 & <= 30			0,347 (0,053)	0,323 (0,051)
Age >= 31 & <= 35			0,337 (0,054)	0,306 (0,052)
Age >= 36 & <= 40			0,313 (0,054)	0,294 (0,052)
Age >= 41 & <= 45			0,365 (0,055)	0,336 (0,053)
Age >= 46 & <= 50			0,363 (0,057)	0,328 (0,055)
Age >= 51			0,333 (0,059)	0,311 (0,057)

(School's characteristics)				
Clean classroom				0,061 (0,013)
Clea bathroom				-0,017 (0,011)
Computer				0,060 (0,012)
Director's Ln wage				0,229 (0,010)
Constant	6,886 (0,037)	7,044 (0,041)	5,753 (0,157)	4,047 (0,169)
Nº of Observation	11.629	11.629	11.629	11.629
F(k, n-k)	139,88	142,13	210,34	214,60
Prob > F	0,000	0,000	0,000	0,000
R-squared	0,245	0,254	0,436	0,477

*Robust standard-errors in brackets.

Table 6: Second Stage – Dependent Variable – Student's proficiency

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 99	-6,272 (0,345)	-9,352 (0,631)	-9,086 (0,631)	-9,250 (0,626)	-7,824 (0,635)	-7,028 (0,638)
Public		-28,597 (0,577)	-28,443 (0,580)	-25,588 (0,599)	-21,470 (0,659)	-20,361 (0,664)
Year 99 * public		2,893 (0,734)	2,966 (0,733)	1,664 (0,734)	0,759 (0,744)	0,287 (0,745)
Sciences	-1,039 (0,406)	-1,235 (0,392)	-0,868 (0,397)	-0,560 (0,397)	-0,612 (0,396)	-0,723 (0,396)
Portuguese	-7,221 (0,403)	-7,347 (0,391)	-7,481 (0,415)	-7,310 (0,414)	-7,357 (0,413)	-7,402 (0,413)
Dummies of states	yes	yes	yes	yes	yes	yes
Students Characteristics						
Boy	6,218 (0,340)	5,595 (0,330)	5,654 (0,329)	5,625 (0,329)	5,598 (0,328)	5,579 (0,328)
Age – 7	-12,454 (0,666)	-8,892 (0,643)	-8,721 (0,644)	-8,567 (0,643)	-8,439 (0,642)	-8,343 (0,642)
(age – 7)^2	0,384 (0,032)	0,258 (0,031)	0,252 (0,031)	0,245 (0,031)	0,242 (0,031)	0,238 (0,031)
White	5,370 (0,351)	3,648 (0,341)	3,611 (0,341)	3,518 (0,340)	3,405 (0,339)	3,415 (0,339)
Mother's education = secondary	5,624 (0,605)	5,108 (0,597)	4,883 (0,595)	4,783 (0,594)	4,738 (0,594)	4,678 (0,594)
Mother's education = high school	20,834 (0,700)	13,360 (0,695)	12,806 (0,695)	12,585 (0,694)	12,246 (0,693)	12,101 (0,693)
Mother's education = college	33,677 (0,748)	19,556 (0,762)	18,838 (0,763)	18,042 (0,762)	17,416 (0,761)	17,045 (0,761)
Failed Before	-13,455 (0,446)	-12,084 (0,432)	-12,170 (0,431)	-12,112 (0,430)	-12,057 (0,430)	-12,061 (0,429)
Teachers Characteristics						
Ln Wage				5,183 (0,296)	4,819 (0,296)	3,970 (0,304)
High School			-0,301 (3,239)	2,799 (3,255)	3,118 (3,230)	2,533 (3,223)
College			-4,907 (0,482)	-2,397 (0,500)	-1,911 (0,499)	-1,523 (0,499)
Experience >= 6 and <=10			2,131 (0,513)	1,027 (0,515)	1,159 (0,515)	1,217 (0,514)
Experience >= 11 and <=15			2,032 (0,587)	0,297 (0,593)	0,370 (0,592)	0,466 (0,592)

Experience >= 16 and <=20			2,914 (0,697)	0,951 (0,705)	0,960 (0,704)	1,120 (0,704)
Experience >= 21			3,876 (0,774)	1,280 (0,787)	1,486 (0,786)	1,807 (0,785)
Men			0,374 (0,365)	0,105 (0,364)	-0,032 (0,364)	-0,109 (0,363)
Age >= 21 & <= 25			3,714 (1,450)	2,796 (1,462)	2,042 (1,457)	2,035 (1,454)
Age >= 26 & <= 30			2,941 (1,431)	1,474 (1,444)	0,945 (1,439)	1,025 (1,437)
Age >= 31 & <= 35			1,470 (1,452)	-0,008 (1,465)	-0,561 (1,460)	-0,688 (1,457)
Age >= 36 & <= 40			3,005 (1,483)	1,682 (1,496)	1,257 (1,490)	1,322 (1,488)
Age >= 41 & <= 45			4,890 (1,509)	3,149 (1,522)	2,651 (1,517)	2,611 (1,514)
Age >= 46 & <= 50			2,786 (1,569)	1,121 (1,581)	0,625 (1,576)	0,463 (1,574)
Age >= 51			1,304 (1,662)	-0,308 (1,674)	-0,984 (1,669)	-0,867 (1,667)
School Characteristics						
Director's Ln wage						3,202 (0,278)
Clean classroom					1,098 (0,361)	1,139 (0,360)
Clean bathroom					2,990 (0,396)	2,858 (0,396)
Computer					5,110 (0,404)	4,638 (0,405)
Constant	314,221 (3,424)	320,796 (3,297)	315,765 (3,572)	281,400 (4,075)	276,117 (4,081)	259,038 (4,334)
Nº of Observation	65.987	65.987	65.987	65.987	65.987	65.987
F(k, n-k)	655,63	758,33	566,380	564,510	539,530	532,78
Prob > F	0,000	0,000	0,000	0,000	0,000	0,000
R-squared	0,267	0,308	0,311	0,315	0,317	0,318

*Robust standard-error between parentheses.

Table 7: First Stage – Dependent variable Ln Wage – Northeast Brazil – STATE SCHOOLS

	Model 1	Model 2	Model 3	Model 4
Year 99	0,064	-0,095	-0,031	0,215
	(0,031)	(0,052)	(0,049)	(0,042)
Public	-0,343	-0,532	-0,511	-0,032
	(0,030)	(0,053)	(0,050)	(0,053)
Year 99 * public		0,282	0,228	-0,001
		(0,063)	(0,058)	(0,052)

*Robust standard-error between parentheses.

Table 8: First Stage – Dependent variable Ln Wage – Northeast Brazil – MUNICIPAL SCHOOLS

	Model 1	Model 2	Model 3	Model 4
Year 99	0,065	-0,112	-0,037	0,197
	(0,034)	(0,051)	(0,049)	(0,042)
Public	-0,413	-0,636	-0,593	-0,092
	(0,030)	(0,057)	(0,052)	(0,053)
Year 99 * public		0,317	0,365	0,131
		(0,068)	(0,060)	(0,053)

*Robust standard-error between parentheses.

Table 9: First Stage – Dependent variable Ln Wage – Southeast Brazil – STATE SCHOOLS

	Model 1	Model 2	Model 3	Model 4
Year 99	0,198	-0,140	-0,073	-0,062
	(0,033)	(0,050)	(0,046)	(0,045)
Public	-0,713	-1,101	-0,869	-0,835
	(0,032)	(0,053)	(0,050)	(0,059)
Year 99 * public		0,584	0,426	0,425
		(0,066)	(0,059)	(0,062)

*Robust standard-error between parentheses.

Table 10: First Stage – Dependent variable Ln Wage – Southeast Brazil – MUNICIPAL SCHOOLS

	Model 1	Model 2	Model 3	Model 4
Year 99	0,175	-0,116	-0,062	-0,017
	(0,036)	(0,049)	(0,045)	(0,043)
Public	-0,391	-0,737	-0,623	-0,575
	(0,033)	(0,055)	(0,052)	(0,061)
Year 99 * public		0,512	0,419	0,392
		(0,068)	(0,063)	(0,064)

*Robust standard-error between parentheses.

Table 11: Second Stage – Dependent Variable – Student's proficiency - Northeast Brazil – STATE SCHOOLS

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 99	-7,017	-9,260	-9,038	-9,628	-6,487	-4,163
	(0,749)	(1,070)	(1,080)	(1,059)	(1,087)	(1,110)
Public		-26,202	-25,826	-22,119	-13,813	-11,695
		(1,154)	(1,179)	(1,189)	(1,320)	(1,329)
Year 99 * public		1,624	1,729	0,312	-2,252	-3,856
		(1,450)	(1,458)	(1,446)	(1,457)	(1,467)

*Robust standard-error between parentheses.

Table 12: Second Stage – Dependent Variable – Student's proficiency - Northeast Brazil – MUNICIPAL SCHOOLS

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 99	-7,014	-9,470	-9,261	-9,751	-6,669	-4,718
	(0,762)	(1,070)	(1,079)	(1,059)	(1,086)	(1,109)
Public		-30,118	-30,118	-25,710	-18,767	-16,466
		(1,245)	(1,258)	(1,267)	(1,377)	(1,400)
Year 99 * public		6,040	7,081	4,436	1,703	0,811
		(1,459)	(1,467)	(1,463)	(1,475)	(1,478)

*Robust standard-error between parentheses.

Table 13: Second Stage – Dependent Variable – Student's proficiency - Southeast Brazil – STATE SCHOOLS

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 99	-6,105	-8,088	-7,339	-7,339	-6,369	-6,347
	(1,041)	(1,465)	(1,479)	(1,474)	(1,497)	(1,504)
Public		-34,423	-33,315	-29,324	-23,757	-23,717
		(1,596)	(1,642)	(1,869)	(2,188)	(2,201)
Year 99 * public		0,247	-1,140	-2,948	-4,554	-4,571
		(2,008)	(2,046)	(2,080)	(2,183)	(2,185)

*Robust standard-error between parentheses.

Table 14: Second Stage – Dependent Variable – Student's proficiency - Southeast Brazil – MUNICIPAL SCHOOLS

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Year 99	-7,131	-8,175	-7,484	-7,447	-5,760	-5,678
	(1,045)	(1,467)	(1,476)	(1,471)	(1,510)	(1,515)
Public		-27,484	-26,625	-23,736	-16,953	-16,926
		(1,628)	(1,641)	(1,720)	(2,052)	(2,052)
Year 99 * public		0,797	-0,342	-2,526	-6,632	-6,659
		(2,005)	(2,029)	(2,063)	(2,179)	(2,179)

*Robust standard-error between parentheses.

Figure 1 - Share of Private Schools - 2002

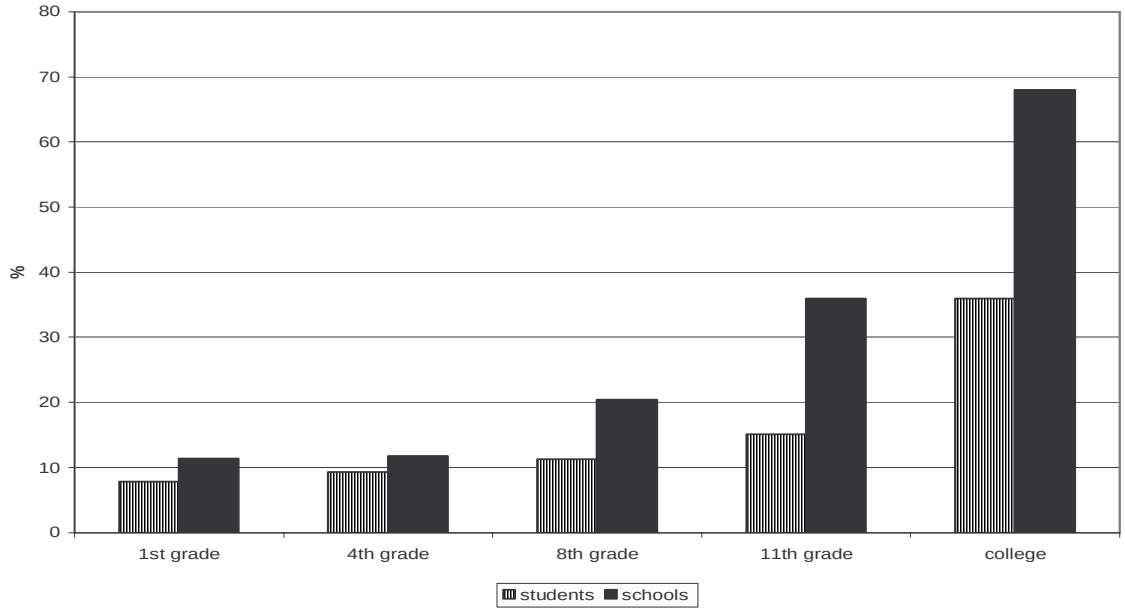


Figure 2 - Expenditures on Education per GDP by Region

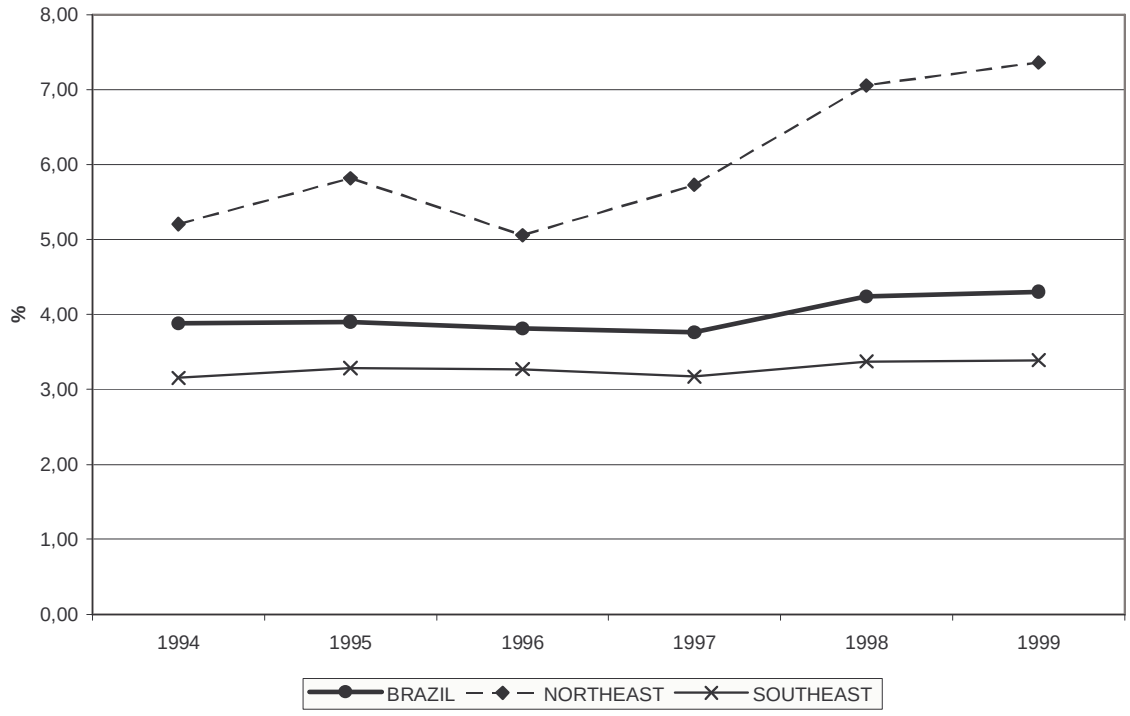


Figure 3 - Expenditure Share in Each Cycle - State System

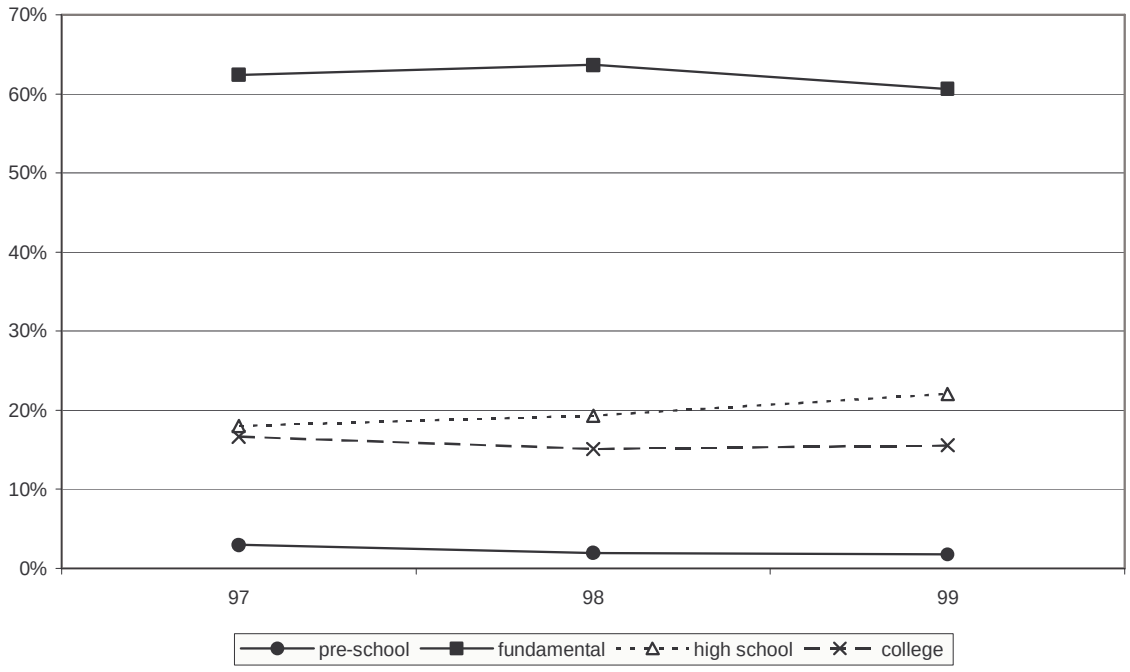


Figure 4- Expenditure Share in Each Cycle - Municipal System

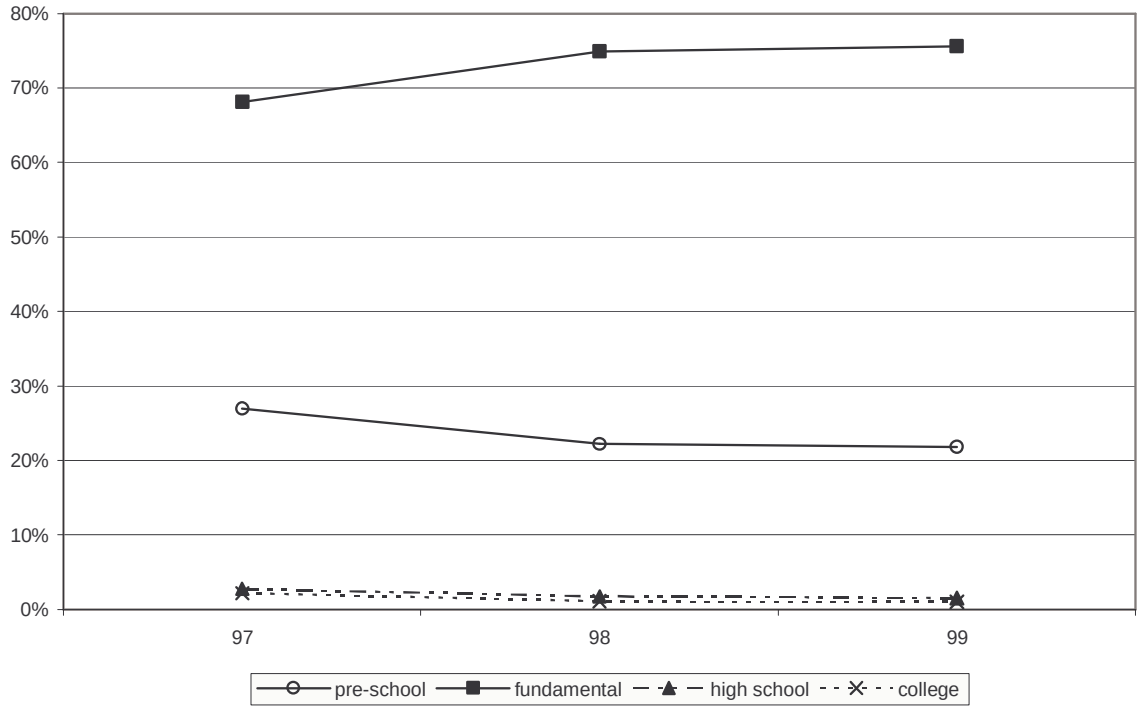


Figure 5- Number of Students in Fundamental Education - Brasil

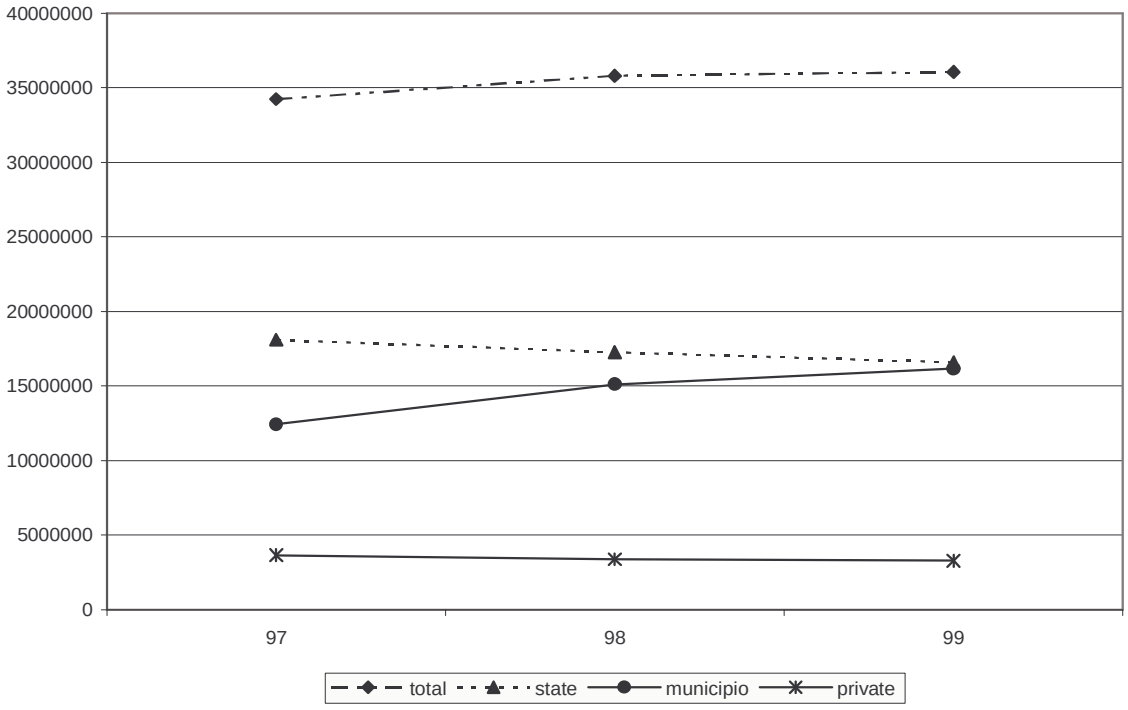


Figure 6- Real Expenditures per Pupil - Fundamental Education - BRAZIL

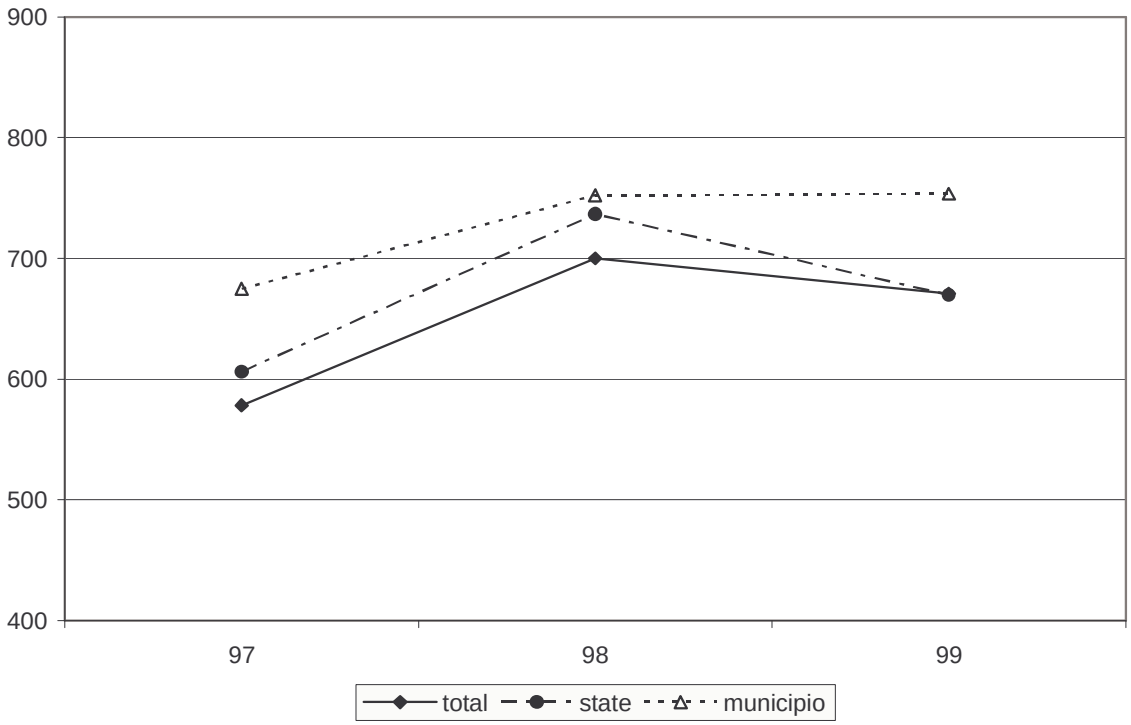


Figure 7- Real Expenditures per Pupil in Fundamental Education - NE

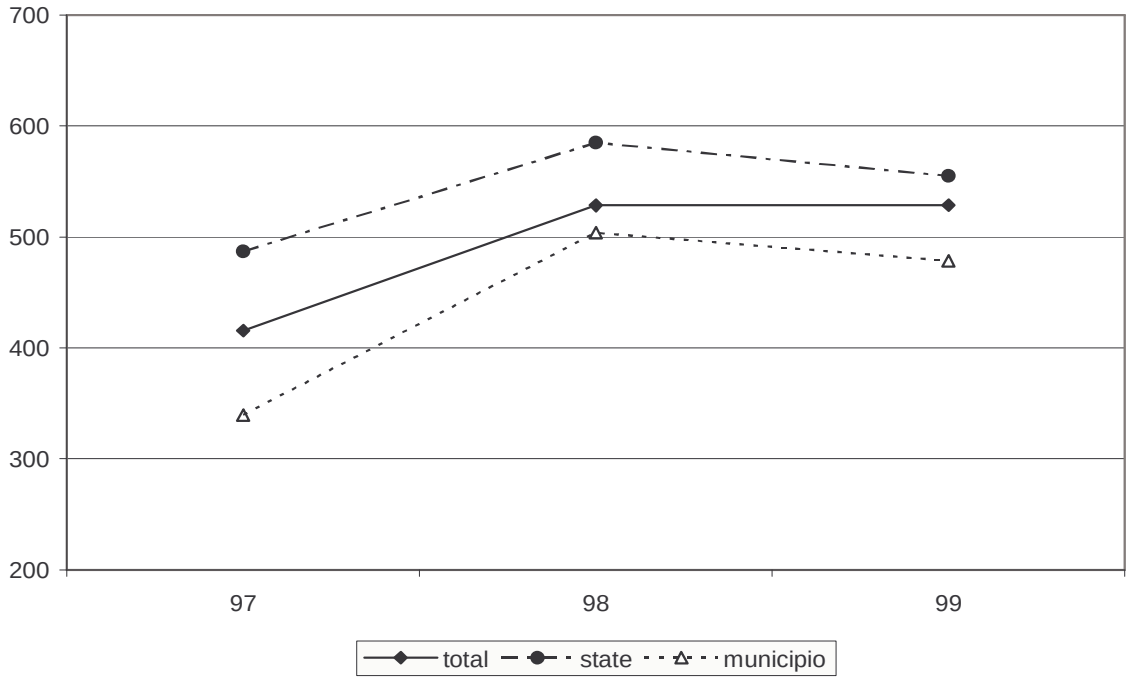


Figure 8 - Real Expenditures per Pupil - Fundamental Education -SE

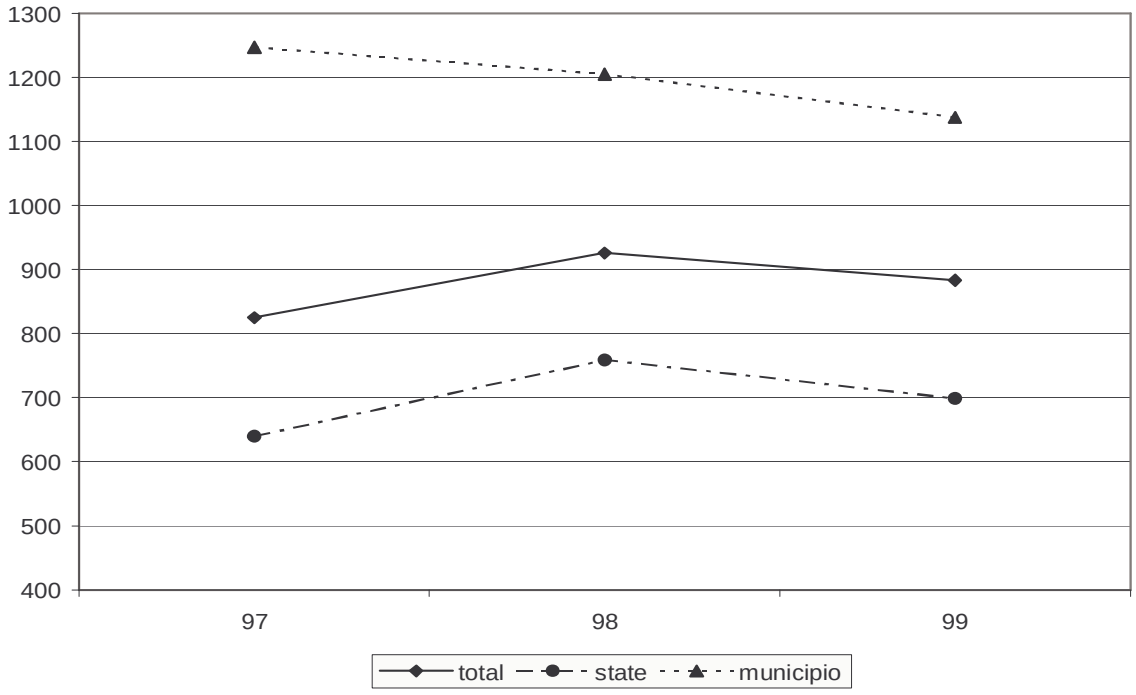


Figure 9 - Number of Schools - BR

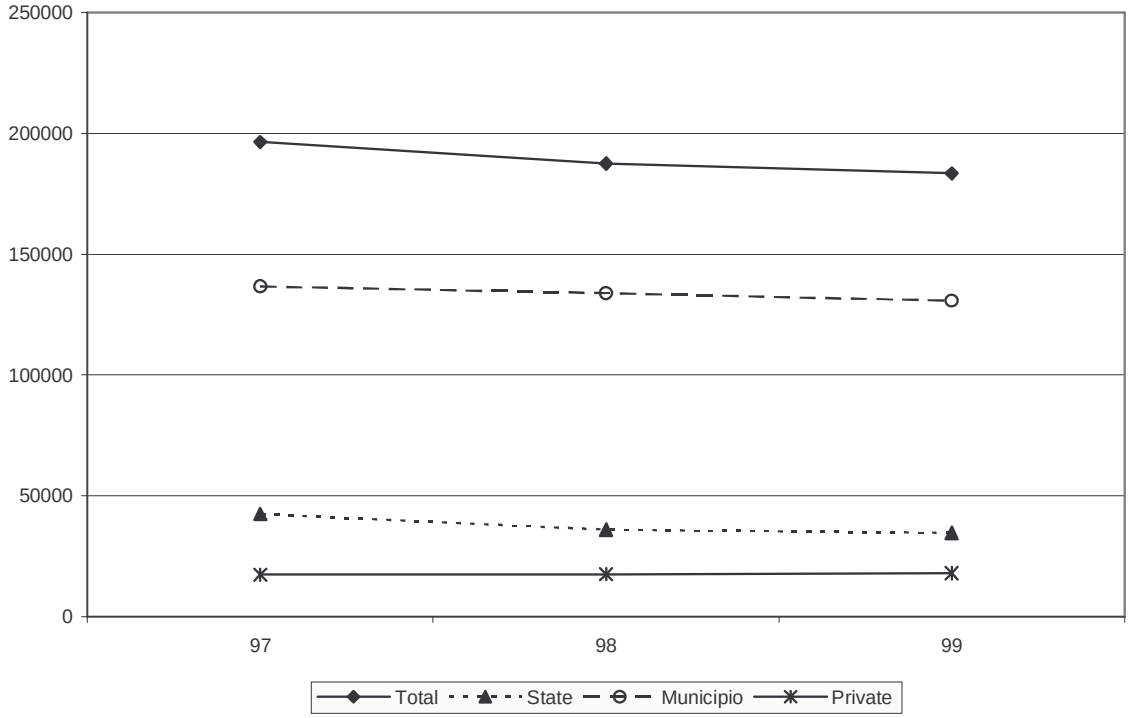


Figure 10 - Number of Teachers - BR

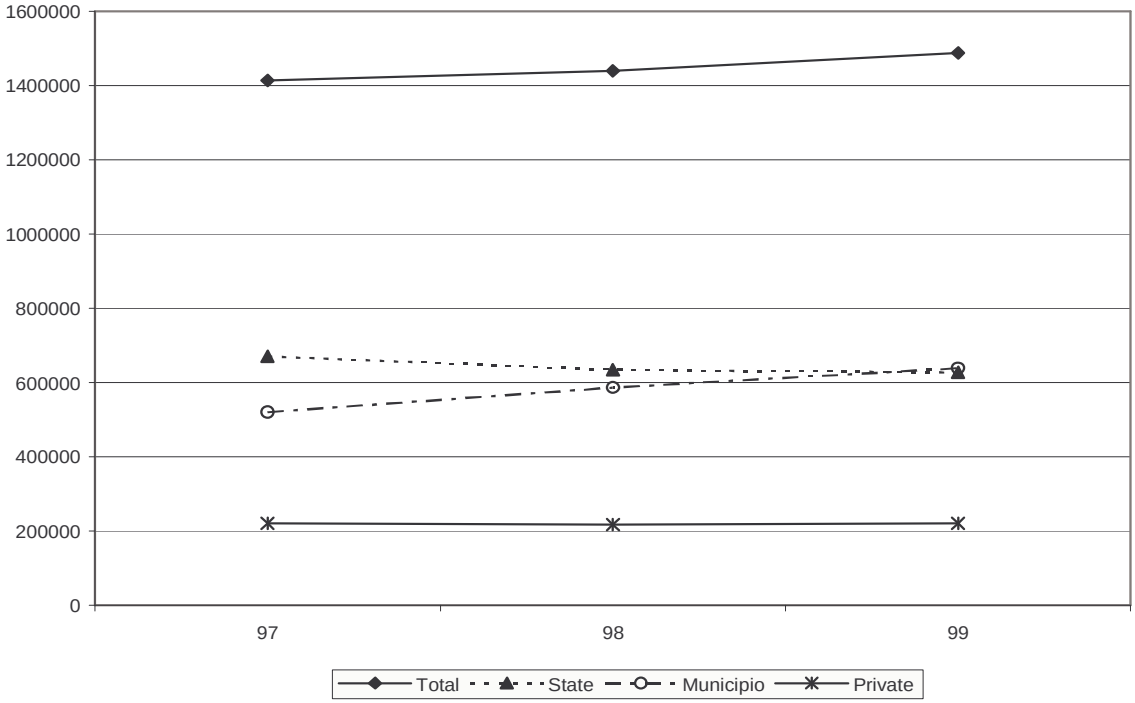
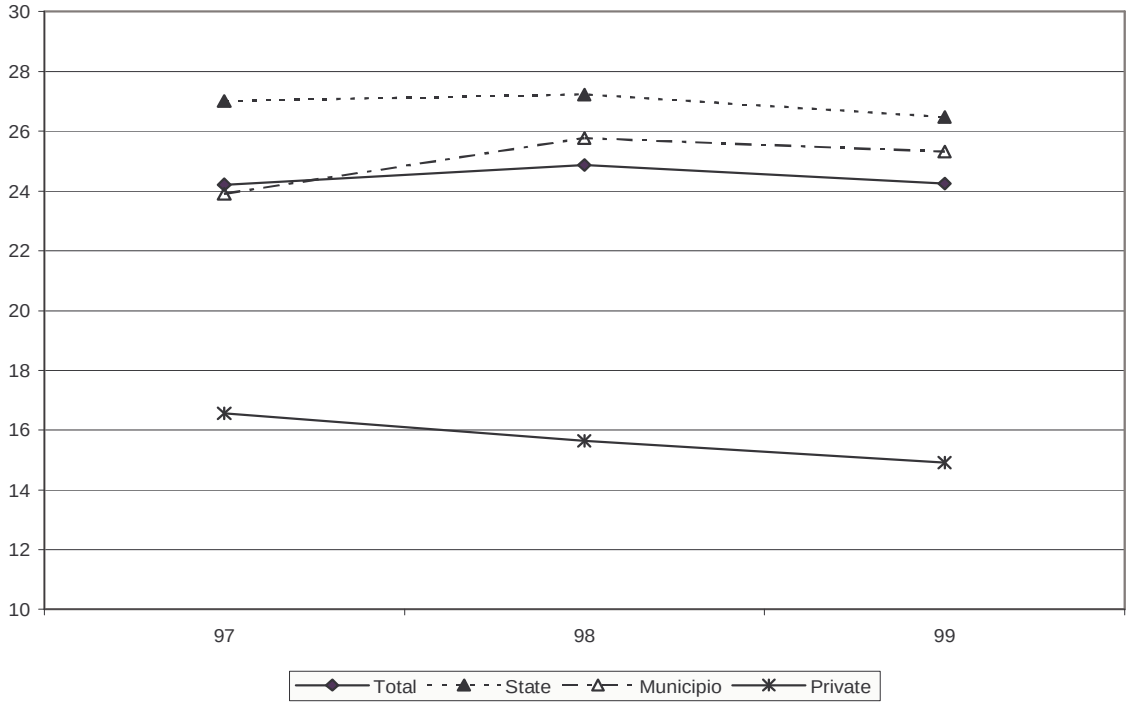


Figure 10 - Class Sizes - BR



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