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CHANGES IN THE LABOUR MARKET FOR PRIMARY TEACHERS IN BRAZIL
FOLLOWING THE FUNDEF REFORM

By

Maribel Alves Fierro Sevilla

A DISSERTATION

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ABSTRACT

CHANGES IN THE LABOUR MARKET FOR PRIMARY TEACHERS IN BRAZIL FOLLOWING THE FUNDEF REFORM

By

Maribel Alves Fierro Sevilla

During the 1990's, under a context of economic adjustment, high inflation, and high unemployment rates, educational policies in developing countries have focused on the expansion of educational systems in order to provide education for all school-age population. In Brazil, the rapid expansion of primary schooling have also resulted in increasing the number of teachers regardless of their quality, and consequently, there have been a decline in the quality of the educational services provided and an increase in learning opportunity inequalities. This paper focuses on the Brazilian policy to address these problems: the reform of the finance of primary education through the institution of the Fund for Maintenance and Development of Primary Education and Teacher Enhancement (FUNDEF). The reform aims at reducing disparities in education finance among school networks of primary education and guaranteeing minimum per pupil revenues to support an adequate minimum average level of teacher earnings. This study shows that the impact of FUNDEF on teacher earnings and teacher supply was observable even only after two years of reform implementation. Analysis using the PNAD/IBGE data suggests that, there were significant increases in teacher wages of

municipal teachers due to the reform. The relative average wage rate of primary teachers changed and there were heterogeneous reform effects depending on the teachers' years of education and school location. Surprisingly, there were also positive reform effects on the supply of teachers, but these effects were very small. The impact of the reform on the teacher supply occurred directly and through the wage differentials brought by the reform. The fact that changing the distribution of resources and implementing a more equitable school finance mechanism also supports making the teaching career more attractive is one of the most interesting findings of this study. Increases on education finance equity positively affects the functioning of education systems and its reserve of workers, the teachers, which in turn might reflect in future improvements in the quality of the teaching-learning process in the Brazilian primary education.

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CHAPTER 1

THE BRAZILIAN CASE

Introduction

Both qualitative and quantitative research findings suggest that policies focused on the quality of teachers may be related to the improvement of educational quality, mainly measured by student achievement (Fuller and Clark, 1994). Within the context of economic adjustment, high inflation, and high unemployment rates, educational policies in Third World countries have focused on the expansion of the school system.

Investments in the educational sector have concentrated on infrastructure and input strategies that promote the necessary rapid expansion of the systems by supplying schools with more classrooms, more teachers, and more instructional materials (Fuller et al., 1999). Constrained by scarce resources, the rapid expansion of primary schooling may have also resulted in increasing the number of teachers regardless of their quality, and consequently, there may have been a decline of the quality of the educational services provided and increasing inequalities in learning opportunities.¹

The Brazilian case exemplifies this trend. The net enrollment rate in primary education increased from 67 percent in 1970 to 96 percent in 1999 (MEC, 1999a), even though repetition rates are very high and completion rates low. At present, attention has shifted from expanding the educational system to examining its quality, and, as a result, teacher quality has emerged as a major issue. At the federal level, a series of programs has

¹ The importance of teachers in promoting opportunity to learn has been widely discussed. See Stevenson and Stigler (1992), Anderson (1991), and Schmidt, et al. (1997).

been created to qualify current teachers,² and a newly enacted law mandates that part of the resources reserved for primary education be compulsorily allocated to supporting teacher policies.

The new law created by the Brazilian federal government instituted the *Fundo de Manutenção e Desenvolvimento do Ensino Fundamental e de Valorização do Magistério* (Fund for Maintenance and Development of Primary Education and Teacher Enhancement) (FUNDEF) in order to support this policy, guaranteeing minimum revenues per pupil in primary education throughout the country, independent of the type of public school Brazilians attend. FUNDEF was enacted by law in December 1996 and implemented throughout the country in 1998. Sixty percent of this fund must be allocated toward paying teachers, training them, and ensuring their qualifications. The recruitment and retention of qualified teachers, through the development of policies to provide incentives and support to the teaching profession and continuing education, are crucial for improving a country's quality of education (Murnane, 1991). Therefore, this study's objectives are to determine whether this new policy has produced any changes in the quality of the teacher labor force (as defined by level of education, years of experience, and average wage rates), to identify where these changes may have had significant effects, and to discuss its implications for the quality of education in Brazil.

In order to achieve these objectives, this research addresses five main questions: Does the reform affect teacher wages? Which teachers (municipal or state) have benefited most from the reform? Has the reform affected teacher supply? What types of teachers

² Some of the programs are *Programa TV Escola* (1995), *Parâmetros Curriculares Nacionais – PCNs* (1997), and *PRO-FORMAÇÃO* (1998).

have been attracted to the education sector? Have the relative changes in teacher wages influenced teacher participation decisions?

This chapter presents the Brazilian case. It discusses the characteristics of the Brazilian educational system, the problem of primary teacher supply, and the specific policy reform under consideration. Chapter 2 addresses the reform's effects on teachers' wages. The impact of the reform on teacher labor supply is discussed in Chapter 3. The last section summarizes the main results and presents concluding remarks. This study is important because it provides an empirical evaluation of the impact of a particular policy reform on the teacher labor market. The findings of the study provide information that can be used to determine whether the policy has resulted in improvements that might justify its continuation when it is revised in 2003.

Unequal opportunities to primary education: The Brazilian Case

The quality of Brazilian primary education has shifted over time. While Brazilian education was quite successful in the 1960s, it experienced a period of stagnation in the 1980s and early 1990s. By the year 2000, the Brazilian education sector had begun to show signs of significant recovery. In 1965, educational opportunities in Brazil were superior to those of other developing countries. A large share of the school age population was attending primary education and gender disparities in access to education were minimal. Secondary education was not exceptional, but still, the expected number of years of schooling for a Brazilian student was above the international average (Birdsall et al., 1996). By 1987, however, Brazil lagged behind with an educational system that covered a much smaller share of its eligible population than it had in the past. Primary

education was barely above the international average and secondary education was far below the international average (Birdsall et al., 1996).

Several authors attribute the hard times of the 1980s to the economic environment and poor policy choices (Birdsall et al., 1996). The problems of low expenditures, efficiency, efficacy and equity in primary education, and the poor educational policies directed to serve political purposes have been broadly discussed (Gomes, 1992, 1996, 1997; Plank, 1990, 1991, 1995, 1996a, 1996b). While there is a general consensus on the structural problems the Brazilian educational system faces, the multiplicity of actors involved in the finance, management, and delivery of the education system has made addressing these problems complicated.

In 1988, the Federal Constitution Reform triggered a decade of significant expansion of primary education and improvement of the overall educational system. This legislation created a framework for structural changes in the country and the effects of its implementation began to become visible in the mid-1990s. By 1994, the country was experiencing a deep process of structural adjustment that launched a new period for the education sector in 1995. Despite the overall scarcity of resources devoted to primary education, Brazil began to enjoy the benefits of economic stability, which made it possible to promote substantial increases in the number of schools, students, and teachers (MEC, 1997a).

The Dimension and Structure of the Brazilian Education System

In Brazil, parallel networks of schooling provide primary, secondary and tertiary education. Some schools are managed and financed by federal, state, or municipal

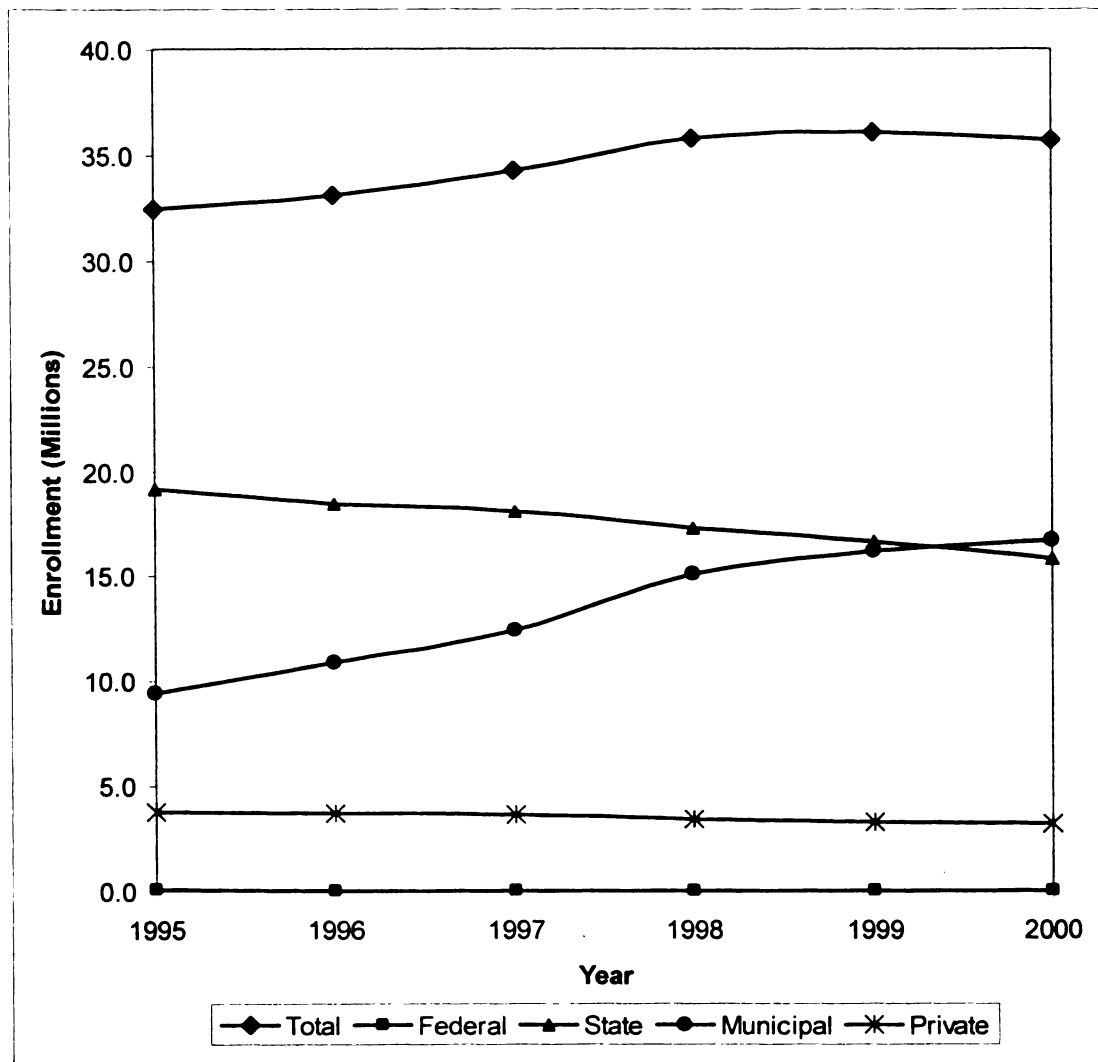
governments, and others, by the private sector. In primary and secondary education, in 1999, the federal school network is a residual of the centralized system and represents only 0.1 and 1.6 percent of the primary and secondary schools in the country, respectively (MEC, 2000a). Federal institutions are predominantly higher education institutions (18.5% of higher education institutions) (MEC, 2000b). All these networks of schooling follow the national education policy, which defines the structure, function, and content of education.

In 1999, the public schools had, in all levels and modalities of basic education, a total of 50 million students,³ with about 36 million in primary education (MEC, 2000a) (see Figure 1). This represents a large expansion of the education coverage in compulsory primary education. As Figure 1 indicates, most primary education students were enrolled in schools sponsored by state and municipal governments, as opposed to those funded privately. The net enrollment rate for the school-age population (7-14 years old) increased from 67 percent in 1970 to about 93 percent in 1999 (MEC, 1998b, 1999a). Completion rates at this level have also increased. With the increase in primary education enrollment rates, the demand for teachers has also grown.

As more students have been completing primary school, demand for secondary education has increased significantly. Between 1994 and 1999, enrollment at the secondary level grew by 57.3 percent. This amounts to an additional three million students. Between 1995 and 2000, secondary education enrollment grew from 5.3 million to 8.1 million (MEC, 1998b, 2001a) (see Figure 2).

³ See Figure 7 – Structure of the system in appendix B.

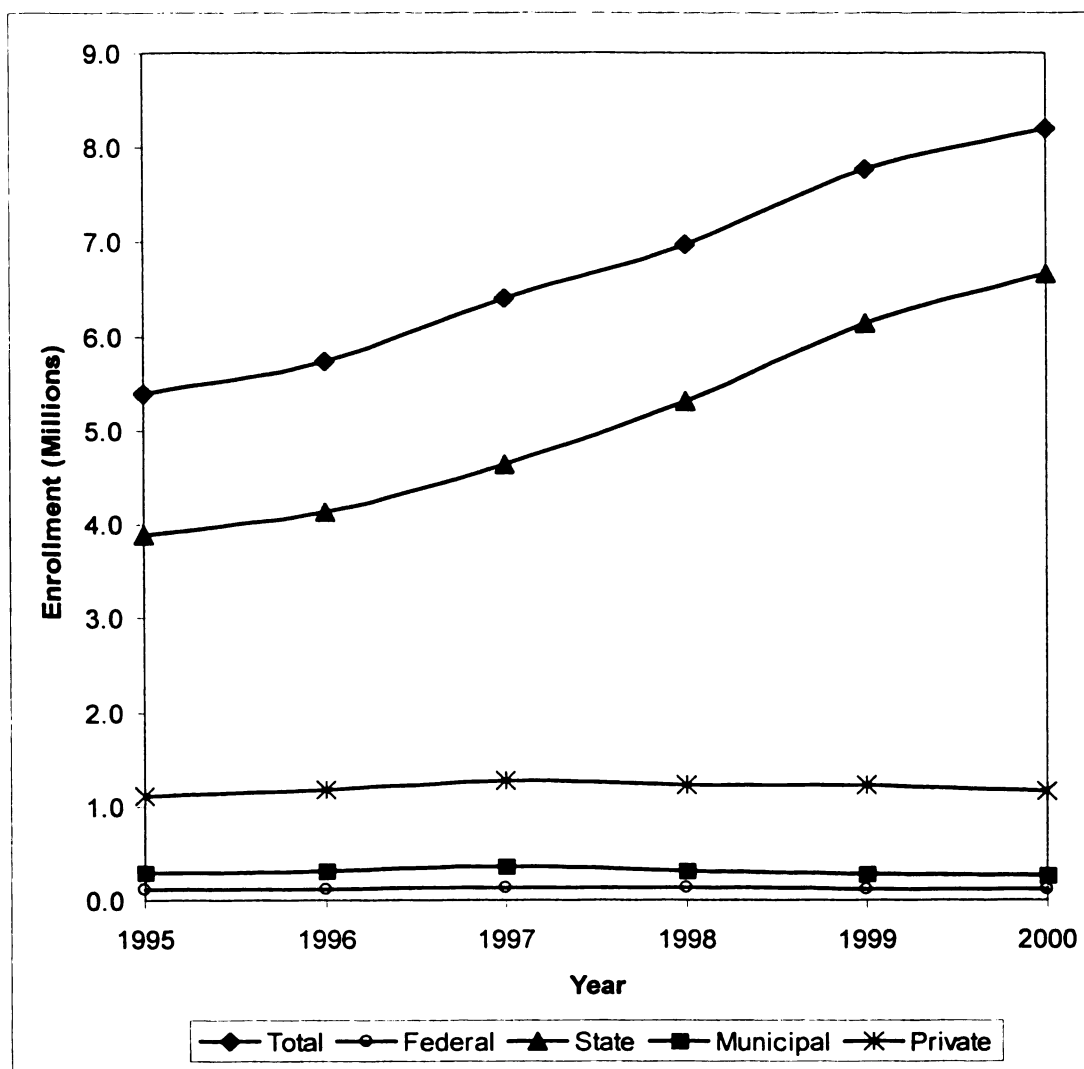
Figure 1: Enrollment in Primary Education by Sector, 1995-2000



Source: MEC, 1996, 1997a, 1998a, 1999b, and 2000a.

The private sector has decreased its participation in both primary and secondary education in the last five years. Despite this trend, there has been an increase in overall enrollment of 34.4 percent in secondary education in the last five years, all of which has occurred in the public sector (see Figure 2).

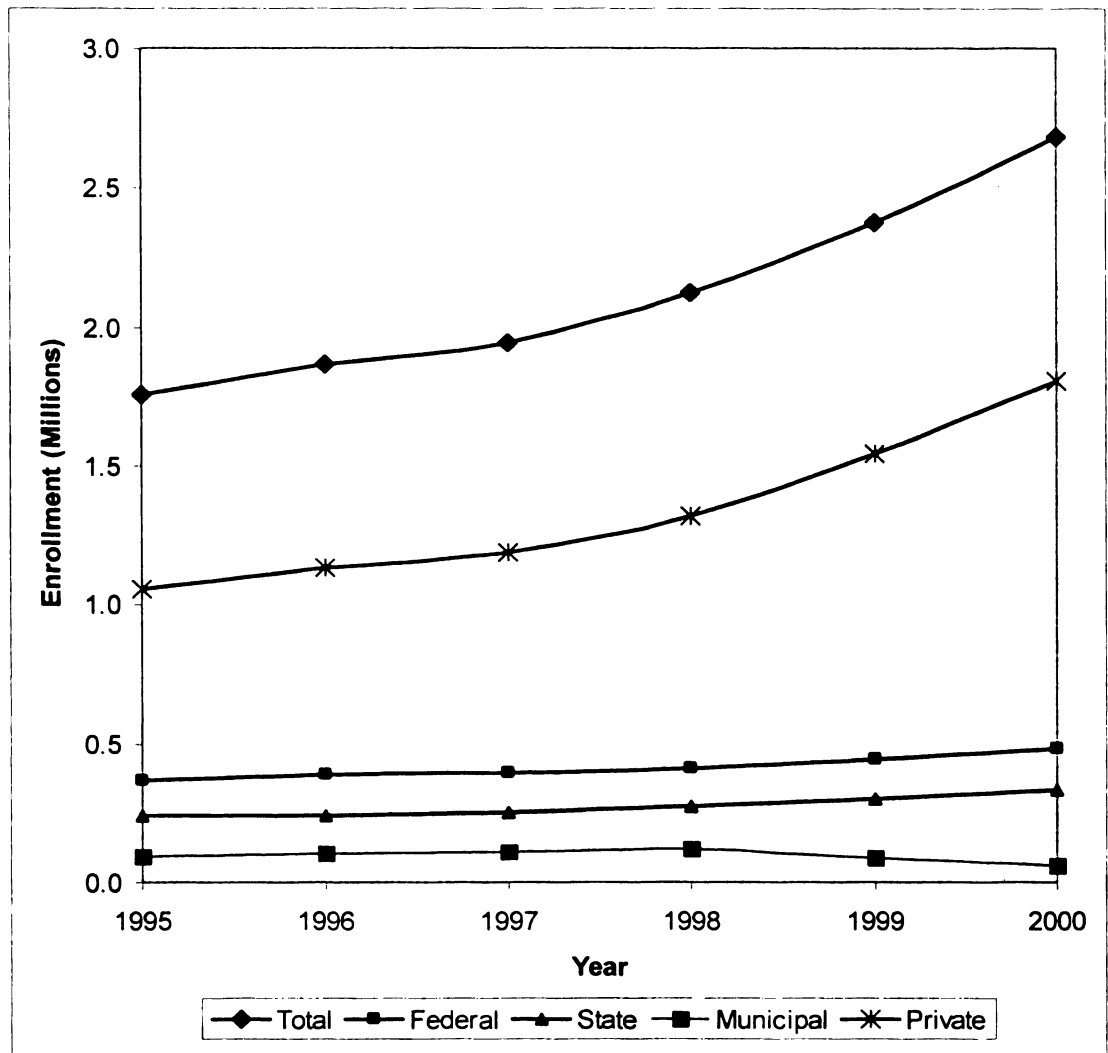
Figure 2: Enrollment in Secondary Education by Sector, 1995-2000



Source: MEC, 1996, 1997a, 1998a, 1999b, and 2000a.

In higher education, however, the private sector has markedly increased its participation, even though the federal budget for this level of education has grown in the last five years by 41.23 percent. This is significantly more than its change in expenditures on primary education, which increased by 32.25 percent during the same period.

Figure 3: Enrollment in Higher Education by Sector, 1995-2000



Source: MEC, 1998c, 1999c, and 2000b.

Notwithstanding the quantitative expansion of enrollments, the quality of the education provided has been the weakness of the Brazilian education system. The main indication the system's low level of quality is its high repetition rates. Table 1 below shows the average number of completed grades for a cohort of students in primary education. On average, a student completed only 6.8 grades out of the 8 grades in 9.7 years.

Table 1: Average Number of Completed Grades and Average Time Spent on Primary Education, 1990-1995

Year	Average Number of Completed Grades	Average Time in Primary School
1990	6.16	9.32
1993	6.55	9.65
1995	6.77	9.69

Source: MEC, 1998d.

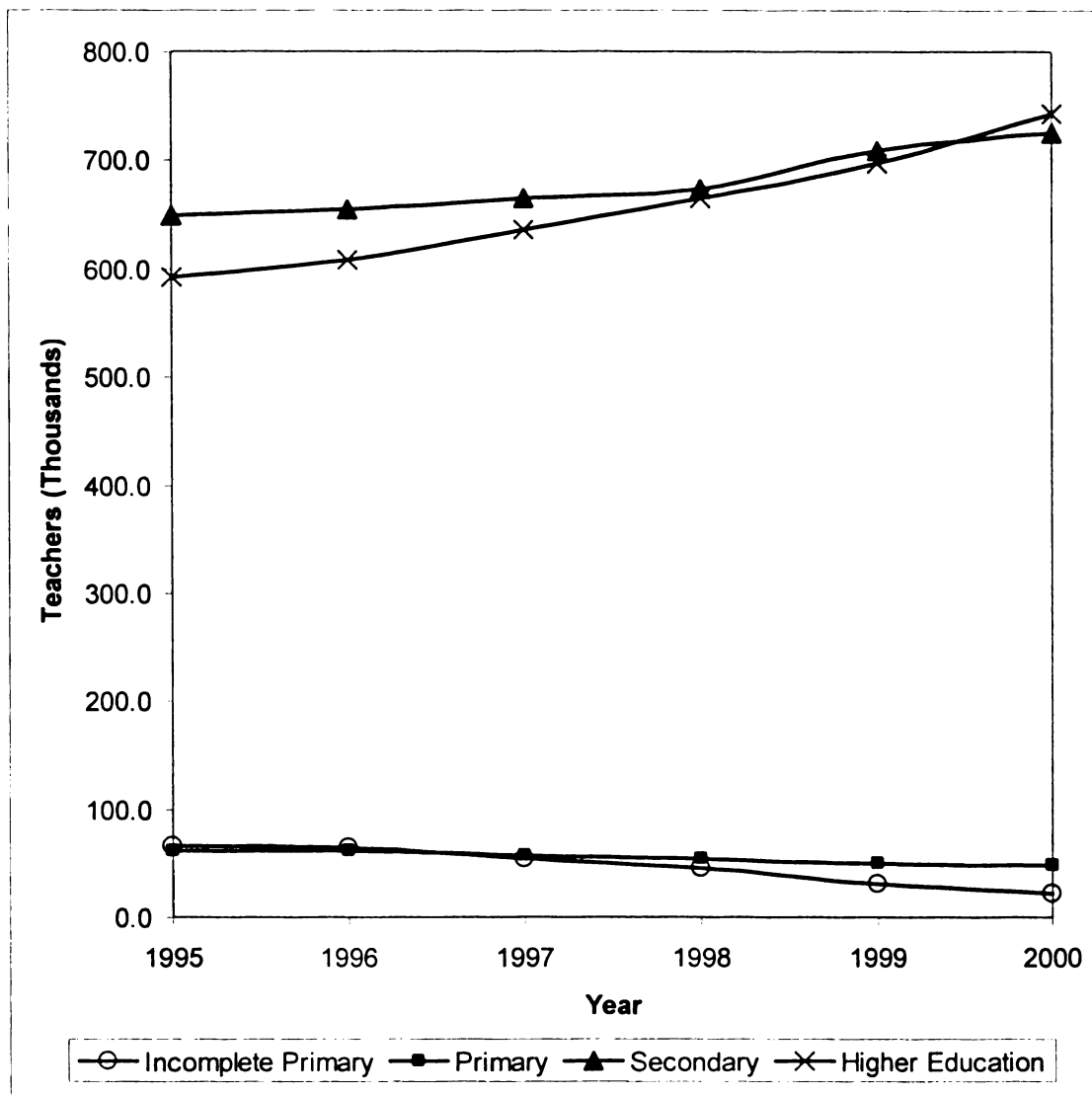
The expansion of the educational system accentuates the shortage of qualified teachers to respond to the growing demand for education at all levels. In 1999, there were 1.5 million teachers in primary education,⁴ of which only 46.9 percent had any higher education (MEC, 2000a). This corresponds to an average of 24.3 students per teacher in primary education.

Teachers without higher education can be considered non-qualified teachers, *profesores leigos*, even though teachers with complete secondary education and teacher training, *curso normal*, meet national requirements to teach pre-school and grades 1-4.⁵ In secondary education, qualified teachers represent 88 percent of the total number of teachers. However, many of these teachers with higher education do not have subject area teacher training. There is a lack of qualified teachers in such subject areas as chemistry, physics, and mathematics (MEC, 1999a).

⁴ Educational statistics count the number of teaching posts by educational system, referring to the number of teachers in each system. However, a teacher may teach in more than one system, in varying types and levels of education. Therefore, the total sum of teaching posts may upwardly bias the total number of teachers. However, at present the number of teaching posts offers the best estimate available for the total population of teachers in the country.

⁵ Before 1997, teachers with secondary education and teaching training were considered qualified to teach in the first six grades of primary education. Teachers with complete higher education with teaching training (*Licenciatura Plena*) were qualified to teach the last two grades of primary education and secondary education (LDB, 1997).

Figure 4: Number of Primary Teachers by Qualification Level, 1995-2000



Source: MEC, 1996, 1997, 1998a, 1999a, and 2000a.

The number of unqualified teachers has been dropping in recent years. In 1999, only 2.1 percent of the total number of primary teachers in the country had less than eight years of education (incomplete primary education) and 2.5 percent had only eight years of education (primary education) (Figure 4). Their continued presence in some Brazilian

schools, however, may still threaten students' opportunity to learn. In absolute numbers, in 1999 roughly 765,000 children were taught by teachers with incomplete primary education and 1,192,000 children were taught by teachers with only primary education.

The teacher supply problem is not entirely unique to Brazil; it is experienced in both developed and underdeveloped countries. In Brazil, the problem has three main aspects: (a) providing enough teachers to maintain the school systems' expansion; (b) replacing unqualified with qualified teachers, as well as expanding the teacher workforce by attracting more qualified teachers; and (c) creating a system to maintain new and higher levels of preparation of the teacher workforce, while providing in-service training to prepare current teachers to respond to technological changes and higher standards.

In general, teaching remains an occupation with relatively low salaries and even lower prestige (Sedlak & Scholssman, 1986) in almost every country. In the United States, teachers' wages have declined almost 15 percent relative to those of other college graduates and nearly 20 percent relative to all other workers since 1940 (Hanushek & Rivkin, 1997). The quality of teachers has also declined (Manski, 1985; Weaver, 1983), despite the increasing demand for education and the rise of educational attainment in developed countries (Schultz, 1987). When the supply of teachers is limited, quality might be sacrificed if salaries remain low relative to other professions (Baker & Smith, 1997).

In developing countries, relative teacher quality exhibits no clear patterns (Schultz, 1987). Teacher earnings are even more difficult to describe across countries in Latin America (Liang, 1999). Studies that compare teacher salaries with those of other professions in Latin America have reached mixed results. Depending on data, variable

definitions, and comparison groups, the results can be different even within the same country (ILO, 1991; Liang, 1999; Psacharopoulos, 1996). In Argentina, Vegas (1999) shows that in some metropolitan areas, teachers are paid less than their counterparts in the labor force, but this is not true for all metropolitan areas in the country. In Bolivia, Piras and Savedoff (1998) report that teachers receive higher hourly wages than their counterparts in other occupations. Liang (1999) shows that teachers are underpaid relative to other workers in 12 Latin American countries if differences in hours of work are not taken into consideration. In Costa Rica, Honduras, and Paraguay however, after controlling for gender, schooling, experience, private sector, and location, differences in wages disappear. In the same study, Liang (1999) also estimates wage equations controlling for hours of work. In that case, teachers are underpaid relative to other workers only in urban Ecuador and Brazil.

In Brazil, the trends are similar to those observed in developed countries. Teachers' wages have been low relative to those of other occupations; for example, in 1982, the average monthly earnings of a teacher was US\$181.71 (Barreto, 1990); in 1995, it was US\$161.00.⁶ Low teacher salaries have been significantly related to the country's quality of education (Harbison, 1992), the teachers' average education level, and the average pupil-teacher ratio (26 students per teacher in 1999).

One of the barriers to improving teachers' level of qualification is their low remuneration relative to that of other occupations in the country. Primary teachers earn on average less than other workers outside the educational sector. Only for primary teachers with completed higher education are teacher earnings superior to the average

⁶ The average monthly earnings in Brazil for 1995 were estimated using PNAD/IBGE data for 1995.

earnings of workers in other occupations. Teacher wage differences will be further discussed in Chapter 2.

Causes of the unequal opportunity for education

As observed in the previous section, Brazil undertook an effort to expand its access to education, but this represents only one pathway to assuring the right to quality public education for all. In developing countries, because of the lack of resources, educational policies focus on either expanding their educational systems or improving the quality of basic education (Birdsall et al., 1996). This lack of resources then may accentuate existing disparities in the system. The relative quality of education also can be linked with the structure of the education systems. In Brazil, several factors may affect the quality of education, such as the large number of independent schooling delivery systems, the large variation in income per capita across and within regions (between rural and urban areas), and an inefficient redistributive system of educational finance (Plank, 1996).

As mentioned by Birdsall (1996), higher investments in education as a share of GDP would have been necessary if the quality of education was to be kept constant during the expansion during the 1990s. The rise in enrollment rates during the 1990s came at a significant cost in terms of the quality of education provided and equity of the system, as indicated by the great qualitative variation among municipalities within and between states. For example, promotion and repetition rates from 1989 to 1997 show significant regional differences in quality. In 1989, the Northeast and North regions presented promotion rates of 34 and 33% in the first five grades of primary education,

while the Southeast achieved 70%. Repetition rates show strong differences for the same year. The Northeast and North presented 62 and 63% of repetition rates in the first five grades of primary education, while the Southeast presented 29%. In 1997, the gap was still large between the regions, representing a difference of almost 50%. Promotion rates for the Northeast and North were 45 and 43% while for the Southeast, 83%. Repetition rates for the Northeast and North were 55 and 53% and for Southeast it was 38% (Klein, 1997).⁷ Slow economic growth and the continued increase of the school-age population constrained the growth of spending on basic education per child. The expansion of the system meant low expenditures per pupil at a time when more resources per child were necessary to cover the costs of including the less advantaged students from lower socioeconomic backgrounds and distant, low population-density areas (Birdsall et al., 1996).

The wide variance in educational opportunities for Brazilians can be explained, at least in part, by the fact that the government overlooked the unequal availability of resources in the different country regions.⁸ Deep structural regional inequalities are observed in almost every socioeconomic indicator, including demography, income levels and distribution, schooling, and public service quality. Just as various states exist at different levels of economic development, there is a large variance among municipalities.

⁷ For a description of the regional inequalities of the Brazilian educational system, see Castro (1999).

⁸ The decentralization trend has taken place since the decline of the military government with a gradual decentralization of revenues and public expenditures from the federal government to state and municipal governments. In 1988, the Brazilian Federal Constitution established a structural reform in the fiscal system. Essentially, this reform strengthened the political power and spending autonomy of state and municipal levels of the education system. State and municipal governments can directly decide on changes to their local revenues, creating or eliminating taxes (MEC, 1997b). Besides providing means, the Constitution also defines the share of revenues that each level has to spend on education and the levels of education for which each sphere of government would be mostly responsible. Once again, there was a constitutional guarantee of revenues to the education sector. However, decentralized systems involve substantial transition costs, including the administrative costs of the government structure itself, the compliance costs of making decisions collectively through government, and the information problems facing governments in discerning the public interest. The normative instrument basically reflects the Brazilian administrative decentralization process and federal government's strong distrust of state and local political authorities' competence and motives to invest resources efficiently in the sector.

Changes in how the education system was financed to support decentralization provided incentives for many of these municipalities with low financial capacity to create and/or expand their municipal school networks. This is evidenced by the accelerated increase in enrollment in primary and secondary municipal schools shown in Figures 1 and 2. As a result of economic inequalities among municipalities, different school systems -- state, municipal and private -- with very different capacities, share the responsibility for providing education. Municipal schools, on average, provide educational services as well as the private and state school networks, but many times under worse economic conditions.

Redistributive inefficiency in the system of educational finance

According to the Federal Constitution of 1988, the federal government must apply annually to the maintenance and development of education, at least 18 percent of the resulting revenues of taxes, including the resources coming from inter and intra-governmental transfers. The state, federal district, and municipal governments must also contribute at least 25 percent of the same revenues. Fifteen percent of the portion allocated to education must be specifically spent on primary education (Brasil, 1998a). In simpler terms, primary education maintained by municipal governments must invest 15 percent of total local tax revenues and state and federal transfers, while state governments invest 15 percent of total state tax revenues and federal transfers. Primary education also receives additional resources from social contributions as well as supplemental programs such as the student lunch program and health programs targeted to students in primary education (Brasil, 1988b).

In practice, compliance with these expenditure requirements is difficult to assess. The system of public accounting does not facilitate the identification of irregularities in expenditures (Gomes, 1992; Plank, 1996a). Nevertheless, analysis of public expenditures in 1995 indicates that state and municipal governments exceeded their constitutional obligation (MEC, 1997b). In fact, state and municipal regulations require that a larger share of the tax revenues and intergovernmental transfers be assigned to education than required by the federal government. In 1995, for example, the average state share of effective expenditures in education was 31.4 percent of total state recurrent revenues (MEC, 1997b).

The Ministry of Education (MEC) shows that transfers play an important role in drastically reducing the inequalities of tax revenues collected in the various states. In less developed states, after transfers, the total tax revenues for primary education achieve approximately twice the original share of tax revenues for primary education before transfers (MEC, 1997b). The same report comments that this phenomenon is even more accentuated in municipalities of the North and Northeast regions. For example, in four states of these regions, the transfers are responsible for 90 percent of the recurrent revenues.

However, even though inequalities have been reduced, equality is not achieved because a large proportion of the taxes is returned to where they were collected. Richer municipalities and states collected more and got more resources. Until 1997, the distribution of federal resources devoted to equalization was based on negotiation with states and municipalities. Gomes & Verhine (1996) point out that, contrary to their objective, these transfers reinforced inequalities between the states since the distribution of

resources happened without technical criteria (Oliveira, 1992). For example, inequalities within states were accentuated because rural municipalities with less access to the federal administration of these grants also possessed less organization and technical capacity to successfully apply for resources.

These characteristics indicate how the Brazilian education system was built upon a decentralized structure and reinforced an implicit collaboration between systems that provide basic education in Brazil. However, the implicit collaboration, under a context of parallel and competitive networks of schooling (Gomes, 1992; Plank, 1996a), ended up leaving decisions about who is responsible for providing primary education to the discretion of state and municipal politics. Plank concludes that educational resources were still contingent on factors such as regions, wealth, and political affiliation, where the use of funds for political interests undermined the objective of providing basic education for all (Plank, 1996a). In this arena characterized by very unequal capacities, some states and many municipalities received few or no extra resources at all.

Therefore, there was the need for educational reform to address these problems. This reform, which took effect in 1996, changed the criteria for allocating intergovernmental transfers to public school systems based on enrollment. This mechanism changed how the educational system was financed, leading to a more equitable educational system in Brazil. In the long term, such a policy may promote growth as well.

The solution proposed: The Fund For Maintenance and Development of Primary Education and Teacher Enhancement – FUNDEF

Background

The current Brazilian system of fiscal federalism resulted from years of institutional reforms that, for the most part, took place at the end of the authoritarian regime (1964-1985) and during the transitional years to democracy. The decision-making power of the federal government has become less concentrated, which resulted from a gradual decentralization of revenues and public expenditures from the federal government to the state and municipal governments (MEC, 1997). Even though federal grants to state and local governments were common before 1995, the expenditures were mainly dictated by federal regulations, leaving the autonomy of the other levels of government arguable. In 1995, the return of the mandated compulsory allocation of a share of the total tax revenues to the education sector with the Calmon Amendment favored changes in how primary education would be financed (Castro, 1998).

In the 1990s, the collapse of central authority due to political crises, including the apparent incapacity of the central government to guide educational policies and the concerns about the efficiency of the existing allocation of resources, created increasing demands for more decentralization. The Federal Constitution played an important role in the country's effort to consolidate decentralization in the provision of education, despite people's mistrust in the capacity of state and local governments to invest efficiently in education. The finance system lacked mechanisms to deal with equity disparities in the structure of public finance, however. In the middle 1990s, the federal government, under the administration of Fernando Henrique Cardoso, assumed the role of compensating for

the high fiscal inequalities among municipalities and states in order to regain control over the coordination of national policies. The result was a policy design that aims to guarantee minimum school financial equity in order to create conditions for implementing such parallel reforms as national parameters for curriculum and requirements for teacher's qualification levels.

The reform

As mentioned before, the Federal Constitution of 1988 initiated a period of reforms in the Brazilian educational system. Another important reform was the revision of the Law of Guidelines and Bases for National Education (LDB), approved in December 1996. This reform, main policy guideline for Brazilian education, reinforces the responsibilities of each educational system. It gives greater autonomy to Brazilian schools, including an allowance for a more flexible curriculum. In addition, it demands that teachers complete higher levels of education. All of these changes were perceived as necessary in order to improve Brazil's quality of education.⁹

Because the implementation of these changes was still constrained by limited capacity of the education finance system, a reform was necessary. This happened with the Constitutional Amendment N. 14 approved in September of 1996. This amendment created the Fund for Maintenance and Development of Primary Education and Teacher Enhancement (FUNDEF), regulated by the Law 9, 424, December 1996. Legislative process and politics were responsible for the late enactment of the LDB. In fact both mandates were simultaneously under Congress' consideration, so that both would act as coherent policy instruments to support and reinforce each other.

⁹ For a summary of the Brazilian educational policies and reforms instituted in the Fernando Henrique Cardoso administration see MEC (1999f) Brazilian Education: Policies and Results.

The FUNDEF was supposed to be implemented throughout the country in January 1998, but states that wished to anticipate the process were able to start it in 1997 if the state and federal district constitutions allowed it. By the end of 1996, the federal government was providing financial incentives to the states that would pioneer the implementation of the FUNDEF.¹⁰ Only the state of Para anticipated the implementation of the FUNDEF in 1997. The federal government¹¹ proposed an educational finance reform that holds each state and municipal government responsible for educating a number of students, which previously determined the amount of funding for each state and municipal government.¹² The FUNDEF strengthens the central role of the federal government. The standard of quality is defined centrally, mainly by a national minimum revenue per pupil.¹³ In order to guarantee equal opportunities and the national minimum standard of quality education, all resources are aggregated into a fund from which the federal government performs its redistribution and/or complements the fund in order to guarantee a minimum revenue for each pupil. Implementation is still the responsibility of the state and municipal governments, which now have a great challenge to face since providing education for all is the means to maximizing their own educational revenues.

¹⁰ The FUNDEF operationalization guide mentions that additional resources would be provided by the Ministry of Education mainly for improvement of school quality, including rebuilding, enlargement of buildings, and equipment (MEC, 1997c).

¹¹ In Brazil, the federal government has the first responsibility for Brazilian education policy, through the actions of the Ministry of Education – MEC. The MEC is responsible for formulating and evaluating the national policy, as well as for coordinating the actions of the different systems and levels of education.

¹² In 2000, 57 municipalities went to court to leave the FUNDEF, which distributes resources depending on the number of students enrolled in the public systems in each municipality. On the contrary of Anápolis (capital of the state of Goiás), the 56 municipalities were in the process of losing resources with the redistribution mechanisms of FUNDEF, as mentioned by the MEC. "The problem is not to win or lose money, but to avoid that municipal revenues are managed by the Federal Government", commented the procurador-geral de Anápolis, Roldão Izael Cassimiro. Agência Estado, 05/01/2000, 15h 11min.

¹³ The minimum annual expenditure per pupil is defined by law, based on the ratio between the estimated total revenue from the FUNDEF for year i and the total enrollment of the previous year ($i-1$) in primary education plus the estimated growth of the enrollment for the actual year i . See MEC (1997c).

Goals and Objectives

The changes to the finance system of primary education provide the mechanism by which the federal government controls and performs its redistributive and complementary role *to assure equalization of educational opportunities for the entire school age population and the illiterate*, as well as *minimum standards for quality of schooling*.

These are the general goals of the reform. The objectives are to:

- Guarantee allocation of resources in primary education;
- Raise the bottom of the distribution of educational revenues to a national minimum revenue per pupil;
- Define the redistribution of responsibilities between state and municipal school systems, based on their provision of schooling.¹⁴

The indirect objectives are to create a finance system capable of raising teacher quality and guaranteeing minimum average teacher earnings.

Target Population

All states, municipalities and federal district are affected by the national policy. Each state has its own school network (the state educational system) and practically each municipality within the state has its own school network (the municipal educational system) as well. Table 1 in the appendix lists the states and the number of municipalities within each state, as well as each state's total enrollment. In 1996, if the redistribution mechanism had taken place, the number of school networks that would have received funds

¹⁴ The Constitutional Amendment N.14, passed in September 1996, changed the first Paragraph¹ of Article 60 of the 1988 Federal Constitution and determined that the distribution of responsibilities and resources between states and municipalities is assured by the institution of the FUNDEF. Before the amendment, the public sphere had the responsibility for providing primary education together with the organized civil sector through the use of at least 50% of the resources originated from taxes and governmental transfers. The amendment specifies that state, federal district and municipal governments have to invest not less than 60% of the revenues mentioned before (25% of taxes and governmental transfers) to guarantee universal primary education and fair remuneration for teaching.

would have been 532, almost 10% of the total number of public school networks in the country.¹⁵ Once additional federal resources invested were minimal (roughly 4% of the total), the increases in revenues for these 532 municipalities may have occurred by transferring resources from other municipalities or state networks of schooling.

Operationalization

The fund. The instrument created by the financial reform is, in fact, an accounting procedure. It is a fund instituted in each state, municipality, and federal district, created as a special account, whose resources can only be used for the maintenance and development of primary education. The balance of this account can be invested, but all resources, including those that originated from investments and the balances from previous years, must be spent on primary education. The resources can also be used as counterparts in contracts to finance projects and programs in primary education.

The resources. The fund is composed of resources from the main state and municipal taxes. From state taxes, it includes state sales taxes (ICMS and QP-IPI-EX), income taxes (IP), and federal transfers to the state (FPE). From municipal taxes, the fund is composed of municipal sales taxes (ISS), state transfers to local governments (QP-ICMS, QP-IPI-EX), and federal transfers to local governments (FPM, ITR). The institution of the fund does not free state and municipal governments from their obligation to spend 25 percent of the total revenues (tax revenues, inter- and intra-governmental transfers) in the maintenance and development of education.

The redistribution mechanism. The redistribution of resources from the fund between municipalities and state governments is performed in proportion to the number of

¹⁵ Estimated by FACEM, São Paulo.

students enrolled in each school network.¹⁶ When the value of the fund transferred per pupil to the municipal or state government is below the annual minimum national value, the federal government supplements these resources, so that within each state, municipal and state governments will have the same minimum revenues per pupil. The objective is to raise the low level of education expenditures to the minimum revenue per pupil necessary to finance quality education. The transfers of resources are conducted monthly directly to the municipal and state accounts linked to the fund account.

The value of national minimum revenues per pupil. The minimum national revenues per pupil are defined by presidential act and are based on the ratio between the estimated total revenue from the FUNDEF for year i and the total enrollment of the previous year ($i-1$) in primary education plus the estimated growth of the enrollment for the actual year i . The total enrollment is based on the Educational Census, the information for which is provided by the state, federal district, and municipal governments.¹⁷ For 1997, the value estimated for the fund was \$300 dollars per pupil (R\$300,00 in Brazilian currency).¹⁸

Implementation

The implementation of the policy begins with the definition of the criteria for redistributing the resources, that is the value of national minimum revenues per pupil. State, municipal, and federal district governments each create a specific account for the fund. The resources are automatically transferred to this account, usually three times monthly. The government budgetary procedures have to take fund into account, including and adapting their Budget Plans. State, municipal and federal district governments also are required to

¹⁶ The law considers only students in classroom.

¹⁷ Rectification of the number of enrollments cannot be done until after 30 days of the publication of the Census results.

¹⁸ In 1996, the exchange rate was US\$1.00 to R\$1.00.

institute boards that supervise and control the distribution, transfer, and use of resources. Each government level must define career plans for the teaching profession that include mechanisms by which the system will qualify its teachers and eliminate unqualified teachers by 2003.

Within each state, state and municipal governments can reorganize their educational systems by transferring students, schools, and human resources. The FUNDEF law also establishes that education boards at the state, municipal, and school levels must be created to exert social control over the use of these resources. Sixty percent of the monies from the fund must be spent on teachers' wages and training, and 40 percent on other school expenditures. The share of 60 percent was defined in accordance with previous a regulation implemented in the country, the Camata Law, which stipulated that personnel expenditures should not exceed this percentage. This regulation was inspired by studies that investigated the percentage of public revenues spent on personnel expenditures for public services in European countries (55 to 65 percent), as well as Japan, the United States, and Canada (Dourado, 1999). The law was approved for all public services, despite the fact that in the educational sector, most Brazilian municipalities were already spending more than 60 percent, sometimes 80 percent on personnel (Dourado, 1999). A study from UNESCO (1991) indicated that, in developing countries, the average percentage of education revenues spent on teacher wages roughly varies from 80 to 90 percent. This suggests that the 60 percent rule is not necessarily practicable in Brazil.

Reform theory and expected reform effects

The theory of reform describes the set of beliefs and underlying actions that support what the policy states, what it expects to achieve, and also how it expects to achieve it. The policy reform model is a construct of how the policy is supposed to work.

The FUNDEF is an accounting procedure that provides a mechanism for accounting for the resources spent on primary education. Before the FUNDEF, it was very difficult to verify how much was effectively spent on primary education versus the other levels of education in the school systems. The FUNDEF increases resources to primary education, since municipal and state systems, which spend less than the nationally defined minimum standard per pupil, receive additional resources from the federal government. The increase of resources is justified on the grounds of the equalization principle and the goal of financing a quality education for all children.

The theory that links increasing resources and quality of education is represented in Figure 5. Increasing resources for primary education through federal complementary funds will raise the bottom of the distribution of educational revenues to national minimum revenues per pupil. It is expected that the national minimum revenues per pupil will cover the costs of quality schooling. Responsibility for primary education is decentralized to state and municipal level, depending on the number of students enrolled in each school network. Each school network will have incentives to provide education for a larger number of students, to maximize their revenues, and to attend to the demand for education.

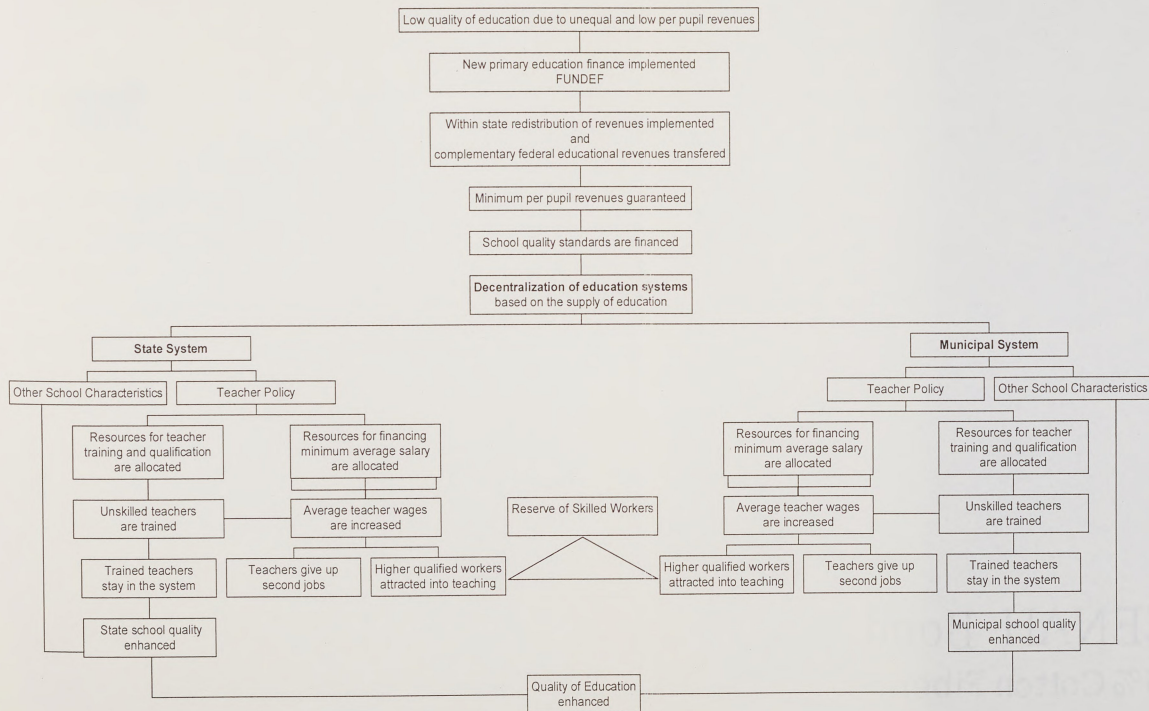
Since 60 percent of FUNDEF resources must be spent on teachers, state and municipal school systems will be able to define teacher policies, which enhance the quality of education, and consequently will attract more students. These policies may include

using resources to qualify unskilled teachers and to guarantee minimum average salaries or even increase salaries, which will help retain experienced teachers without the additional costs of hiring new skilled teachers. The development of training and qualification programs is expected to reduce teacher turnover.

Increased salaries may induce teachers to give up their second jobs. Teachers who used to moonlight in order to earn enough money may now put their full energies into teaching. Greater energy and attention lead to more thoroughly prepared lessons, greater variety in pedagogical strategies, more effective teaching, better student learning, and thus better quality of schooling.

Another assumption of the reform is that the minimum per pupil revenues established annually by the federal government will in fact be sufficient to finance increases in teacher wages, and thus, the school networks will be able to attract more qualified individuals into teaching. It may also be the case that school systems offering higher salaries will lure good teachers away from other school systems. Competition between two systems may lead to increased quality of schooling, better management of education through cooperation, and more shared responsibilities among the systems. But the very least, school systems offering higher salaries may induce current teachers to stay on the job longer, thus preventing vacancies from opening up. This may also enhance the quality of schooling.

Figure 5: Reform Theory



Immediate results

In 1996, per pupil revenues ranged from 63 to 1,696 *reals*, across states and municipal school networks. That is, a municipal school in the state of Roraima invested 27 times more per annum than a municipal school in the state of Maranhão. Even in the single state of Roraima, a student enrolled in a state school received roughly 1/3 less in terms of public revenues invested than a student attending classes in a municipal school. In the North and Northeast regions, with the exception of the state of Roraima, state schools receive higher per pupil annual revenues. In the more developed regions of the Southeast, South, and Center-West, municipal schools spend significantly more than state schooling systems.

Table 2 shows the differences between state and municipal per pupil revenues in 1996 (columns A and B) and the per pupil revenues in 1998 under the FUNDEF reform (columns E and H). It also shows the predicted per pupil revenues in 1998 had the reform not been implemented.¹⁹ The comparison between the actual and hypothetical amounts of how much would have been the per pupil revenues by school network within the Brazilian states if FUNDEF had not been approved (columns D and G) help us to observe the percentage change in per pupil revenues. School networks had to administer (columns F and I) the re-distributive and compensatory allocation of resources by the FUNDEF reform in 1998. This comparison shows impressive differences in revenues between municipal and state networks of schools. Indeed, in 20 out of the 26 Brazilian

¹⁹ Predicted revenues were calculated using data from STN/SIAFI with the same methodology of education finance before the introduction of the FUNDEF reform. These figures include only the tax revenues that were considered by the FUNDEF reform to allow for comparisons between before and after the reform. Specific local tax revenues which may also be included in the per pupil revenues were not considered in this estimate and represent less than 3% of the total amount, as estimated in MEC (1997b).

states, the average state school revenues per pupil would have been much higher than in municipal schools if the reform had not taken place.

The marked differences between school networks suggest that, within the same town, an individual with access to a public state school is likely to have a better quality education than an individual enrolled in a municipal school in these 20 Brazilian states.

Because of the FUNDEF, now there are virtually no differences in revenues per pupil *within* each state based on the main taxes allocated to primary education. The FUNDEF thus corrected the within state disparities among public schools. There was an average increase of 108.7 percent in per pupil revenues in the 20 states where municipal schools would have had fewer resources. In the remaining six states, located mainly in the most developed regions of Brazil, there was a contrasting decrease in municipal school revenues.

In 1998, state school revenues per pupil in these six states would have been, on average, 36.9 percent (SD=25.8) lower than those in the municipal school networks. Differences among states and regions still exist in spite of the reform, but the disparities in levels of educational revenues between school networks within states are being considerably minimized²⁰ (See Table 2, columns E and H).

The changes in per pupil revenues before and after the FUNDEF reform by school networks within Brazilian states are composed of two main effects. The first is the redistribution effect within a state, where 15 percent of main state and municipal tax revenues are aggregated and then returned to municipal and state educational administrations in a manner proportional to each school network's enrollment.

²⁰ It is important to remember that there are still other taxes (e.g., local taxes) that are not included in the FUNDEF; therefore, wealthier localities may still have higher per pupil revenues despite the reform.

Table 2: Per Pupil Revenues in Primary Education by School Network, 1996-1998.

Brazil and States	1996			1998					
	State	Municipal	Difference (%)	State Networks			Municipal Networks		
				Before FUNDEF	After FUNDEF	Change (%)	Before FUNDEF	After FUNDEF	Change (%)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
North	437	440	-0.8	409	369	-9.8	251	369	47.0
Rondônia	301	148	50.9	438	388	-11.4	289	388	34.3
Acre	639	241	62.3	754	607	-19.5	304	607	99.7
Amazonas	386	193	50.0	488	425	-12.9	319	425	33.2
Roraima	624	1696	-171.8	810	901	11.2	2,986	901	-69.8
Pará	192	110	42.8	269	315	17.1	184	315	71.2
Amapá	584	448	23.4	767	690	-10.0	595	690	16.0
Tocantins	333	247	25.7	421	383	-9.1	309	383	23.9
Northeast	387	150	61.3	427	321	-24.8	170	321	88.8
Maranhão	312	63	79.8	385	315	-18.2	101	315	211.9
Piauí	328	96	70.8	437	315	-27.9	159	315	98.1
Ceará	435	139	68.0	509	315	-38.1	152	315	107.2
Rio Grande do Norte	360	185	48.5	439	346	-21.2	245	346	41.2
Paraíba	376	209	44.4	485	325	-33.0	220	325	47.7
Pernambuco	350	165	52.7	422	315	-25.4	201	315	56.7
Alagoas	558	142	74.5	830	336	-59.5	151	336	122.5
Sergipe	453	187	58.8	529	395	-25.3	231	395	71.0
Bahia	313	162	48.3	350	315	-10.0	183	315	72.1
Southeast	561	667	-18.9	529	550	4.0	602	550	-8.6
Minas Gerais	271	461	-69.8	296	354	19.6	515	354	-31.3
Espírito Santo	463	592	-27.9	448	463	3.3	496	463	-6.7
Rio de Janeiro	1013	220	78.3	1,262	619	-51.0	270	619	129.3
São Paulo	497	1397	-181.1	568	657	15.7	1039	657	-36.8
South	447	392	12.3	544	482	-11.4	407	482	18.4
Paraná	428	269	37.0	499	418	-16.2	328	418	27.4
Santa Catarina	386	494	-28.2	620	561	-9.5	475	561	18.1
Rio Grande do Sul	526	411	21.8	486	477	-1.9	460	477	3.7
Center-West	366	331	9.6	373	371	-0.5	370	371	0.3
Mato Grosso do Sul	399	291	27.0	410	366	-10.7	306	366	19.6
Mato Grosso	405	367	9.2	445	421	-5.4	379	421	11.1
Goiás	296	335	-13.2	328	346	5.5	382	346	-9.4
Distrito Federal	..	..	..	..	..	..	..	..	..

Source: MEC (1997d). Per pupil revenues in 1996 estimated using finance data from the MF/STN and enrollment data from MEC (1997c). (Nominal Per Pupil Revenues in *Reals* –Brazilian Currency).

This redistribution results in equal per pupil revenues within states. The second is the complementary role of federal transfers to guarantee a national minimum standard for expenditures per pupil. The federal government defines a national minimum per pupil value depending on its capacity for investment in education. After redistribution, if the total per pupil revenues within a state is below this national per pupil value, federal transfers complement the resources to guarantee the national minimum. The national minimum amount during the reform implementation year was R\$315,00 (*real*, Brazilian currency). This was only worth about US\$190.00 per pupil in 1998.

Verhine (1998) comments that the Brazilian government was unable to maintain the originally defined yearly value of US\$300.00 per pupil due to tightly mandated government spending restrictions from the International Monetary Fund (IMF). The lack of mechanisms to protect the national minimum value from the instability of the economy and the devaluation of currency may be one of the most ominous aspects of the new finance design because it may continuously decrease the purchasing power of the public educational management system. Monlevade and Ferreira (1997) point out that the national minimum is very low and there is no guarantee that the amount will increase in accordance with rising costs.

During 1998, eight states located in the poorest regions of Brazil, the North and Northeast, were unable to achieve this revenue per pupil after the FUNDEF redistribution. Consequently, they received federal complementary resources (MEC, 1999). A consolidated report from *Secretaria do Tesouro Nacional* (National Treasury Secretary) shows that the total federal transfers were 424.4 million *reals*, representing only 3.2 percent of the total revenues invested in primary education under the FUNDEF

reform. The same report indicates that six states would receive positive adjustments from federal complementary funds in 1999 because their 1998 per pupil average was still below the national minimum despite FUNDEF transfers (See Table 1A in Annex).

The effects of the FUNDEF have varied greatly by state. In the state of Roraima, for example, the impact of FUNDEF is remarkable. It represents resource transfers from municipal to state schools on the order of 70 percent. On the other hand, the highest loss in revenues from state to municipal schools took place in the state of Alagoas. Municipal schools in this state now have 123 percent more revenues than they would have had without FUNDEF. Because of: a) the drastic changes in revenues, and b) the compulsory allocation of part of these per pupil revenues to teacher training and wages some changes in teacher supply and wages may be noticeable after only three years of the FUNDEF reform.

CHAPTER 2

THE EFFECTS OF THE REFORM ON TEACHERS' EARNINGS

Introduction

The total financial resources that a country chooses to invest in education is a critical decision that raises many issues for debate, for example, whether and to what extent education costs in a specific country guarantees quality education for all. Among the costs of education, teachers' salaries account for most of the public expenditure on education (Psacharopoulos, 1987, 1996), which makes teacher earnings an important policy question especially in countries under economic constraints, such as developing countries. Teachers' earnings are also important because the high share of education expenditures spent on teachers may be related to education quality. Economic analysis suggests that relative costs of several inputs should be proportional to the marginal contribution of each separate input to the productivity. If schools are operating efficiently and are paying teachers relative to their productivity in teaching, teachers' earnings can also be used as a proxy for quality (Harbison & Hanushek, 1992). Research has been investigating the relationship among low quality of education and low quality of teachers, which in its turn has been related to the low pay of teachers.²¹ Finally, salary policies are commonly used by policymakers as a way of improving schools; by increasing salaries education officials and the public expect to attract and retain quality

²¹ Hanushek, Kain and Rivkin (1998) suggest that at least 7% of the variance in student achievement scores may be explained by variation in teacher quality. Murnane, Willett and Levy (1995) have shown that individual test scores is positively associated with teacher wages, even though studies of the relationship between teacher wages and student outcomes has produced mixed results. In Brazil, however, Harbison and Hanushek (1992) found a positive and significant relationship between teacher salaries and student achievement in schools in the rural Northeast (p.109). They observed that teacher wages were very low in rural areas, representing 60% of the minimum wage (p.108).

teachers. Especially in what concerns beginning teachers, as the education sector competes with other sectors for additional personnel to cope with growing enrollment and an aging work force of experienced teachers, increased salaries potentially provide the means of attracting and retaining the increased number of qualified young teachers who will be needed in the years ahead.

As mentioned in the first chapter of this dissertation, during the late 1990s, Brazilian education reform addressed these issues by defining a new education finance mechanism called the Fund of Maintenance and Development of Primary Education and Teacher Enhancement (FUNDEF), enacted in 1996.²² The main objective of this nationwide fund is to guarantee minimum revenues per pupil in primary education all over Brazil such that, regardless of the type of public school attended, minimum resources are guaranteed. There is a minimum standard of financing aimed to provide certain schooling opportunities for all Brazilians in primary education. The total annual revenues committed by the federal government when establishing the national minimum revenues per pupil²³ defines the bottom of the quality distribution of primary education schooling in the country. The policy instrument also addresses salary policies. In order to attract and maintain teachers with higher educational levels, 60 percent of per pupil revenues are compulsorily allocated to cover the training and wage expenditures of teachers. The magnitude of the changes in per pupil revenues among school networks within states is impressive in many states of the country, which may be reflected in

²² The Fund of Maintenance and Development of Primary Education and Teacher Enhancement (FUNDEF) was formally created by the Constitutional Amendment N.14, on September 12th, 1996. It was subsequently regulated by the Federal Law N. 9424 (December 24th, 1996) and the Executive Decree N. 2264, in which the FUNDEF implementation phase is determined to begin in January 1st, 1998.

²³ When the Fund was originally created in 1996, the national minimum revenues per pupil was defined at R\$300.00, corresponding to US\$300.00 per pupil year (Law N. 9,424, December 24, 1996).

changes in teachers' earnings (See Chapter 1, Immediate Results in page 39). For 20 out of 26 Brazilian states, there was an average increase of 108.7 percent in the per pupil revenues in municipal schools. In the other six states, located in the most developed regions, however, there was a 36.9 percent decrease in the per pupil revenues in municipal schools.

This chapter analyzes the effects of the FUNDEF reform on the distribution of primary teacher earnings in Brazil in state and municipal networks of public schooling. This analysis is based on data from 1995 to 1999. It reveals important information about teachers' earnings and the differentiated reform effects by regions of the country. The next section describes the data and empirical specification used in this analysis, followed by a section with the results and concluding remarks.

Data and empirical specification

Data

The Ministry of Education (MEC), the Brazilian Institute of Geography and Statistics (IBGE), and the National Treasury Secretary (STN) responsible for public accounts provided information for this analysis. I have constructed a data set by merging individual records from all Brazilian households sampled in the National Research for Sample of Households (PNAD-IBGE) from 1995 to 1999, with the accountability reports from STN and The Educational Census data from MEC. By defining an identification number for each data set consisting of year, state, and type of administration, it was possible to merge all three files into the analysis data set.

The National Research for Sample of Households (PNAD-IBGE). This survey is a random sample of Brazilian households with individual data on 1,659,403 people of whom some are primary teachers in public or private schools during the years of 1995 to 1999 (See Table 2A, in the Appendix).²⁴ For every individual in the sample, there is demographic, economic, family and work information, among others. From this total sample, I restrict the analysis to Brazilian workers who: 1) were employed in the year of reference, 2) were at least 15 or less than 64 years old, 3) were in the non-agriculture sector, and 4) worked during the day (5AM-10PM). A total of 302,172 observations satisfied these criteria. They were utilized in the analysis of earnings.

The Educational Finance Data (STN). Data on educational revenues were provided from the STN databank and yearly reports. They are basically yearly budgetary balance reports of the federal, state, and municipal public accounts. Particularly, the data on the FUNDEF were provided at the state level and by school administration. This data was used to estimate the per pupil revenues used in the estimation.

The Enrollment Data (MEC). Information for this analysis was obtained from the Ministry of Education. Specifically, the National Institute of Pedagogic Research (INEP) is legally responsible for disseminating all educational data. It includes information in all levels of education and from all school networks. Data on total primary school enrollment from the Educational Census of 1995 to 1999 were used.

Variables used in the estimation. Table 3A in the Annex describes the variables used in the estimation and reports means and standard deviations of the variables by occupation over the five years studied. The proportion of primary teachers in the sample varies from 0.045 in 1993 to 0.05 in 1998. The majority of primary teachers is female.

²⁴ There was no PNAD research in 1994 ("Notas Metodologicas", PNAD/IBGE, 1998).

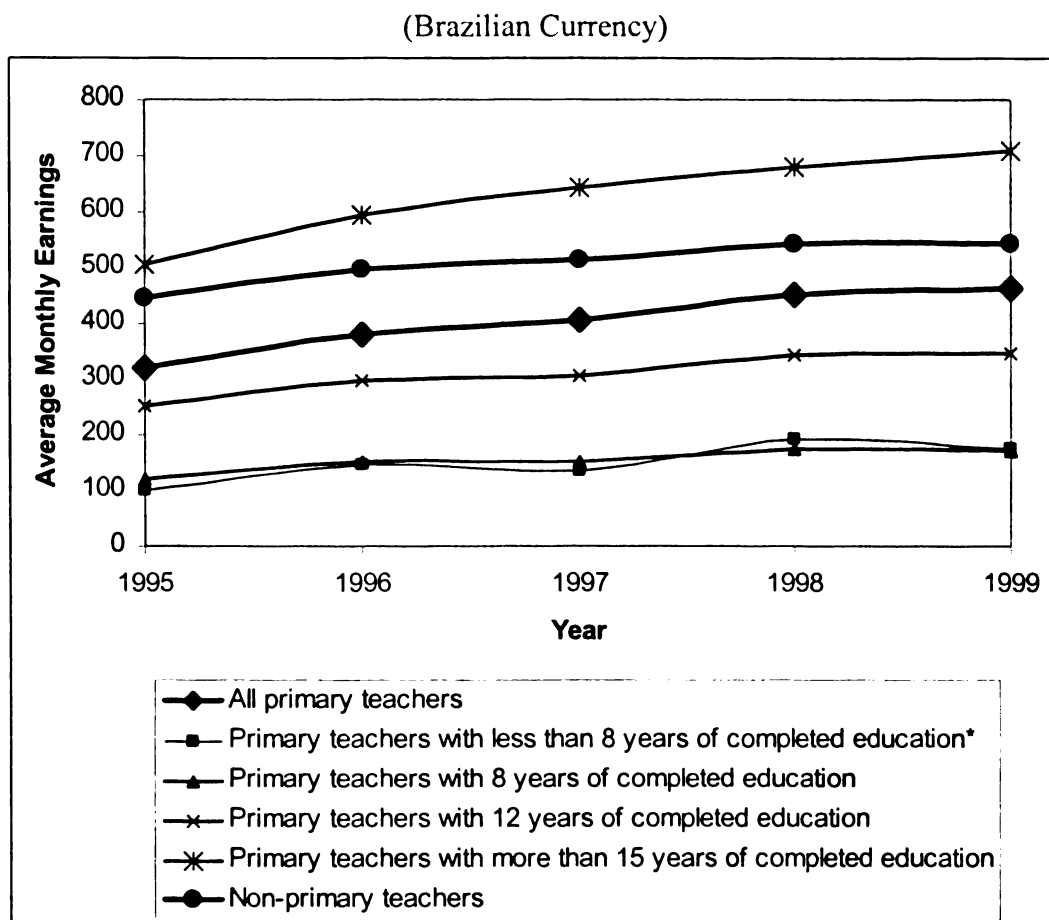
Females represent around 91-93 percent of the primary teacher population across the years, whereas female participation in non-teaching occupations in this sample corresponds to 31-35 percent. The majority of the workforce—teachers and non-teachers—is white. Minority groups (self-declared black, yellow and indigenous people) represent 6 percent of non-teachers and 4 percent of teachers. In this sample, the majority of teachers and non-teachers live in urban areas (around 91-93 percent for non-teachers and 85-86 percent of teachers) where economic activities are concentrated.²⁵ Across all years, around 71-83 percent of teachers are civil servants, whereas only 23-24 percent of the non-primary teachers work for the public administration. Among teachers in the public sector, the sample varies from 41-47 percent of state primary teachers and 16-19 percent of municipal teachers. This is expected since the majority of state schools is concentrated in urban areas.

Years of education and monthly earnings. Average levels of education for teachers are higher than those of non-teachers and this disparity has grown over the years. The average teacher, in 1999, had 13 years of education (complete secondary education), whereas non-teachers on average only concluded 9 years of education (complete primary education). In 1999, without controlling other factors, average monthly earnings for non-teachers surpassed earnings of primary teachers, even though non-teachers had on average five years less of education than their teacher-counterparts. In 1995, the average gap in earnings between teachers and non-teachers was 28 percent, but in 1999, this disparity was reduced to 15 percent. The exception is for teachers with higher education.

²⁵ While the proportion of teachers living in urban areas is a good estimate of the entire population, the proportion of non-teachers does not include individuals working in the agriculture sector. For this reason this proportion may be upward biased.

This group of teachers receives monthly earnings superior to those of non-teachers (See Figure 6).

Figure 6: Average Monthly Earnings by Occupation, 1995-1999



Source: Estimates using PNAD/IBGE datasets from 1995 to 1999. Sample used in this analysis (Nominal values in Brazilian Currency).

* Wages for primary teachers with less than 8 years of completed education do not include individuals with less than one year of education.

Teacher monthly earnings have been increasing slightly over the years. Barreto (1990), using data from 1982 to study primary teachers' wages profiles, reported national monthly average earnings for primary teacher of US\$183. Average monthly earnings ranged from US\$35-\$249, depending on the location of teachers' residences—urban or

rural—and geographic region. In 1999, the PNAD data show that the average monthly earnings for a teacher were US\$254

In 1995, monthly earnings for primary teachers with 12 years of education were R\$250 (SD=166). For non-teachers with the same education level, monthly earnings were R\$517 (SD=539). By 1999, there had been a 39 percent increase for teachers. Average predicted monthly earnings were R\$347 (SD=218). For non-teachers with 12 years of education there was only an 8.7 percent increase in monthly earnings (average predicted value is R\$562 (SD=621). That is, a teacher with complete secondary education still earns less than the average worker in other occupations, assuming the same education level, but the earnings differential between primary teachers and all other workers has diminished.

Empirical specification

The methodology applied is a quasi-experiment. The FUNDEF reform, an exogenous event, changes the per pupil revenues in public school networks in Brazil. The objective of this analysis is to compare the mean wage difference between primary teachers and individuals in other occupations before and after the reform. Therefore, the treatment group includes primary teachers in Brazil, who ought to be affected by the reform. The control group comprises Brazilians in non-teaching occupations. The comparison group of workers in other occupations than teaching may not be a proper control group because members in other professions may systematically differ from teachers on human capital and other personal characteristics.²⁶ However, despite this

²⁶ Even controlling for these characteristics, as Psacharopoulos (1987) points out, the reference salary in the control group profession may itself be subject to rents.

methodological issue, this approach has been commonly used in the teachers' earnings literature, because of the importance of considering changes in relative rather than absolute teachers' pay.²⁷ The specification applied in this analysis captures the impact of the reform considering how teachers' wages have fared in comparison to other occupations. In order to control for systematic differences between control and treatment groups over time, I utilize data from five years: three years²⁸ before reform implementation and two years (1998 and 1999) after it. Additionally, I check for the robustness of the results by comparing the treatment group of primary teachers with a control group comprising teachers in pre-school and secondary education, because this last group of teachers may be more homogeneous than a control group of individuals in non-teaching occupations. For a graphical representation of the estimation methodology, see Appendix C. Interpretation of parameters under the difference-in-difference framework (DD) and difference-in-difference-in-difference framework (DDD).

The equation of interest is given as:

$$\ln(wage)_i = \beta_0 + \delta_0 y95_i + \delta_1 y97_i + \delta_2 y98_i + \delta_3 y99_i + \beta_1 primtch_i + \delta_4 y95 * primtch_i + \delta_5 y97 * primtch_i + \delta_6 y98 * primtch_i + \delta_7 y99 * primtch_i + \sum_{j=2}^m X_{ij} \beta_j + u_i \quad (1)$$

where $\ln(wage)$ is the natural logarithm of individual wage rate. Parameter β_0 measures the average log wage of non-teachers in 1996. The model also includes year dummy variables, $y95$, $y97$, $y98$, and $y99$, which equal one for their corresponding year and zero, otherwise. There is no dummy variable for 1996, the year of the reform enactment, since it is the base year defined for this analysis. These year dummy variables capture year

²⁷ See Liang (1999), Piras and Savedoff (1998), Psacharopoulos (1996), Bee (1995), Komenan (1990), for example.

²⁸ The years were 1995, 1996, and 1997.

specific variation in wages. This takes into consideration the fact that the distribution of such earnings may differ in different time periods. The parameters on these year dummies, $\delta_0, \delta_1, \delta_2, \delta_3$ capture changes in each specific year's earnings for all workers compared to those of 1996, the base year. The dummy variable, *primtch*, indicates if the individual has teaching as his/her main occupation, assuming value one if the individual is a primary teacher and zero otherwise. The coefficient on *primtch*, β_1 , measures the difference in earnings between primary teachers and non-teachers that is not due to the implementation of the reform.

Interaction terms between year dummies and *primtch* are also included in the model. Immediately in 1997, there was the opportunity for some school networks to adapt themselves to manage the predicted gains and losses resulting from the 1996 reform before the 1998 implementation year. The model captures this possible effect through the parameter, δ_5 , on the interaction term between *y97* and *primtch*, *y97*primtch*.²⁹ The parameter δ_5 captures whether or not changes in primary teacher earnings were already taking place in 1997.

The impact of the reform on teachers' wages is estimated by the interaction terms, *y98*primtch*, —which equals one for all primary teachers in 1998 and zero, otherwise—, and *y99*primtch*, —which equals one for all primary teachers in 1999 and zero, otherwise. The main parameters of interest are δ_6 on *y98*primtch*, and δ_7 on

²⁹ In fact, one state of Brazil, the state of Pará located at the North Region, initiated the new finance system in 1997, since the FUNDEF law granted the choice to any state to anticipate the reform implementation for 1997. The state of Para received from July to December 1997, federal complementary transfers of 3.8 million reais. (STN/SIAFI, 1998. Relatório do FUNDEF). Federal Law N. 9424 (December 24, 1996). In a separate model, I also included the dummy variable PA, indicating if individuals are from the state of Pará, and interactions to investigate if anticipating the reform implementation had promoted any interesting effect on teacher earnings.

*y99*primtch*. They capture the interaction effect of being a primary teacher during the first and second year of the reform implementation, 1998 and 1999. They measure the percent difference in monthly earnings between primary teachers and non-teachers due to the reform in each respective year, provided that changes in earnings due to other factors are constant for teachers and non-teachers.

In addition the model also incorporates a vector of control variables, X_{ij} , to take into consideration human capital and job specific characteristics that are relevant to workers' productive attributes and earning differentials. The workers' education characteristics are incorporated into the model using year dummy variables for each year of completed education (*educ1yr* to *educ15yr*) to capture non-linear effects of education on earnings.³⁰ The variables *age*, *age2*, *age3* and *age4* are also included to capture non-linear productivity effects of skills, levels of ability, and other types of experience acquired throughout the life cycle. *Tenure* and *tenure2* are years of experience in the current job and years of experience in the current job squared, respectively. The quadratic form for tenure is also included to capture non-linear effects of tenure on earnings. Even though tenure is a potentially endogenous variable —since it is likely to be related to unobserved individual and job characteristics that affect the wage—, this variable is included in the specification because economic literature has shown that the wage-tenure profile is a key determinant of the extent to which individual earnings are tied to specific jobs within different occupations.³¹

³⁰ For detailed discussion on the wage-education distribution in Brazil, see Strauss, J. and Thomas, D. (1996). The authors found out that the wage-education functions are not linear and not even high order polynomials, and the convexity of the function may be reflection of a positive correlation between the quantity and quality of schooling (p.148). For evidence on the impact of school quality see Behrman and Birdsall (1983) and Berhman, Birdsall and Kaplan (1996).

³¹ For the wage-tenure discussion, see Hamermesh (1984), Antonji and Shakotko (1987).

There are still other factors that may affect earnings and by which teachers and non-teachers may differ systematically over the years. These other factors are incorporated into the model in the form of binary information: *female*, *white*, *black*, *yellow*, *indigenous*, *urban*, *municipal*, and *state*. The dummy variable, *female*, equals one if the individual is female and zero if male. The parameter on *female* represents the percentage difference in earnings for females versus males. It determines if there are any forms of gender discrimination by examining whether or not, on average, women earn less ($\beta_{female} < 0$) or more ($\beta_{female} > 0$) than men, holding other factors constant.

In PNAD research, race and ethnicity characteristics are captured by the variable *color*. The individual chooses one of the following identities on the survey questionnaire: *white*, *black*, *yellow*, *mixed*, *Indigenous*, or *ignored*. *Yellow* refers to Asians or persons with Asian descendants. *Indigenous* refers to native Brazilians or Indigenous groups. *White* equals one if the individual declared being white and zero otherwise; *black* equals one if the individual declared being black and zero, otherwise; *yellow* equals one if the individual declared being yellow and zero, otherwise; *indigen* equals one if the individual declared being Indigenous and zero, otherwise. The reference group chosen is mixed, which represents roughly 36 to 38 percent of the total sample population over the years. *Urban* describes an individual who lives in urban areas (*urban*=1); and zero, otherwise.

Furthermore, I discussed in the first part of this paper how the reform redistribution effect has differently affected state and municipal networks from different states in the country. In order to control for these state differences, I included state dummy variables.

In equation (1), the specification assumes that the reform is the unique source of variation on workers' earnings during the year 1998 and 1999. However, it is likely that the FUNDEF reform promoted changes in state and municipal educational policies which may have also affected teachers' earnings. In this case, to control for these possible differentiated effects, I estimate the following equation using the difference-in-difference-in-differences estimation (DDD):

$$\begin{aligned} \ln(wage)_i = & \beta_0 + \delta_0 y95_i + \delta_1 y97_i + \delta_2 y98_i + \delta_3 y99_i + \beta_1 primtch_i + \gamma_1 municipal_i + \\ & + \delta_4 y95 * primtch_i + \delta_5 y97 * primtch_i + \delta_6 y98 * primtch_i + \delta_7 y99 * primtch_i \\ & + \gamma_2 y95 * municipal_i + \gamma_3 y97 * municipal_i + \gamma_4 y98 * municipal_i + \gamma_5 y99 * municipal_i \quad (2) \\ & + \gamma_6 * primtch * municipal_i + \gamma_7 y95 * primtch * municipal_i + \gamma_8 y97 * primtch * municipal_i \\ & + \gamma_9 y98 * primtch * municipal_i + \gamma_{10} y99 * primtch * municipal_i + \sum_{j=2}^m X_{ij} \beta_j + u_i \end{aligned}$$

The third-level interactions among the year dummies, the primary teacher dummy variable and the administration dummy variables, particularly, *state* and *municipal* dummy variables, allows for differences on the impact of the reform on teachers' wages depending on school network. The variable *municipal* equal to one indicates that a worker serves under the municipal administration, otherwise it is zero. Teachers working for municipal school networks are identified through this variable. If the worker is ruled by state administration laws, the dummy, *state*, equals one. Otherwise, it is zero. This variable identifies if a teacher works for the state network of schools.

In this specification³², the parameters of interest are γ_9 on $y98 * primtch * municipal$, and γ_{10} on $y99 * primtch * municipal$. These parameters capture the interaction effect of being a primary teacher working for a municipal network of schools compared to primary teachers working for the state network of schools in the first

³² The same specification was used replacing the municipal dummy variable by the state dummy variables.

and second year of the reform implementation. It measures the percent difference in monthly wage rates between municipal and state primary teachers relative to the percent difference in monthly earnings between municipal and state non-teachers in 1998, compared to those teachers in 1996, due to the reform, provided that changes in earnings due to other factors are constant for teachers and non-teachers. This parameter is represented by the equation:

$$\gamma_9 = \left\{ \begin{array}{l} [\ln(wage)_{teacher\ municipal} - \ln(wage)_{teacher\ state}]_{98} - \\ [\ln(wage)_{non-teacher\ municipal} - \ln(wage)_{non-teacher\ state}]_{98} - \\ [\ln(wage)_{teacher\ municipal} - \ln(wage)_{teacher\ state}]_{96} - \\ [\ln(wage)_{non-teacher\ municipal} - \ln(wage)_{non-teacher\ state}]_{96} \end{array} \right\} \quad (3)$$

Some other variations of the specifications in equation 1 and equation 2 were also defined to investigate if there were differential reform effects by education group, tenure year, and age group. First, as discussed in reform documents³³, the reform should benefit mainly qualified teachers identified by their level of education. In that case, wage increases should be observed for teachers with complete secondary education or more. Teachers' education level is acting as a proxy for quality. The relatively higher wages for more qualified teachers should be proportional to their higher productivity in teaching, even though institutional wage schedules are usually defined considering also other factors instead of actual teaching performance, such as experience, in-service teacher training, and education level itself. Several studies have claimed that the low quality of

³³ Federal Law N. 9424 (December 24th, 1996).

teacher force also points to the relative low pay of teachers in Brazil, in other developing countries, or in developed countries.³⁴

Second, if the reform aims at attracting new and better people into the teaching profession, and the means to achieve this is to promote more attractive wages for new teachers, the reform effect should be more noticeable for newly hired teachers. The equation 2 with the third interaction term between year dummies, *prmtch* and *tenure* years captures whether the reform brought significant differences in wages for newly hired teachers than they would have received in the absence of the reform. The third interaction term with age groups may explain if there are different effects depending on the teacher age cohort.

I estimate equation (1), (2) and variations of these equations using pooled-ordinary least squares and fixed effects estimator. If the unobserved individual errors are not correlated with all control variables (X_{ij}), OLS gives consistent estimates. Serial correlation over time is expected, however. This problem would generate wrong standard errors. To control for heteroskedasticity due to changes over time, I estimate the robust standard errors. On the other hand if mean levels of unobserved earnings incentives vary across states, and this variation is due to unobserved career incentives and policies which are defined at state level, then u_i and X_{ij} are correlated and OLS estimates are inconsistent. I apply the state fixed effects estimator to separate idiosyncratic unobserved error u_i from the aggregate unobserved errors at state level when including state dummy variables.

³⁴ See Lockhead and Verspoor (1991), Harbison and Hanishek (1992) comments that salary policies are often used as a way of improving schools; by increasing salaries policymakers expect to attract new and better people into teaching (p.108).

As some may argue, it is possible that there are many unobservable characteristics of non-teachers, including self-selection problems that would yield biased estimation. Comparisons of primary teachers with a control group formed by teachers in other levels of education are possible; however this comparison may still be problematic. The problem of comparing primary teachers with pre-school and secondary teachers, who should not be affected by the reform, arises from the fact that the FUNDEF reform is an incentive to increase primary school enrollment which may reduce investments in other levels of education. This may affect the demand for teachers in pre-school and secondary education, consequently affecting teacher earnings in these levels of education. It is interesting to observe whether or not there is a negative impact on teachers' wages in other levels of education.

The last model included the variable *perpupil*, indicating the value of per pupil revenues in each school network per year and interactions. This is a direct measure of the reform effect used here to assess how robust the results of the analysis are. In this case, the sample includes only teachers from state and municipal schools which data on per pupil revenues were available. The Federal District was also excluded because it only has one network of schools (municipal network) so state and municipal comparisons wouldn't be possible. This robustness check is presented in the end of the chapter.

Results

Determinants of earnings

The estimation results in Table 4A (in appendix) are consistent with the economic literature on determinants of earnings³⁵ and these determinants are also significantly important to predict changes in relative teacher earnings. The estimated effects show the

³⁵ Mincer (1985), Becker (1964).

direction expected. For example, the effect of schooling on earnings is positive and significant for all years of education dummies. Consistent with the results of Strauss & Thomas (1996), when estimating log-wage functions by gender and region for Brazilian workers using data from 1982, the conditional log-wage functions for all workers are not linear. They capture important differences in returns across the education distribution. Wage rates of workers with complete primary education (8 years of completed education) are 48 percent superior to those of workers with less than one completed year of education. If the worker has secondary education (11 years of completed education), the wage differential between his/her wage and workers with no education is 85 percent. If he/she has complete higher education or more (15 or more years of education), his/her salary is 165 percent greater than that of workers with less than one year of completed education.

As noted in previous research³⁶, the effects of education on earnings increase exponentially beyond primary school and these results have important implications for income inequality in Brazil. In 1996, for example, there is an 80 percent difference between the average wage rates for workers with higher education and those for workers with complete secondary education, which is statistically significant at the 1 percent level. This outcome is relatively similar across the country, but the largest difference found is in the Northeast. In that region, we observe wage differential of 88 percent for workers with higher education. Earnings also increase with experience throughout the country. This is indicated by the positive and significant proxy variable for human

³⁶ Strauss and Thomas (1996) pointed out that the returns of education have increased for recent cohorts. (p.175), Lam (1999) analyses links between schooling inequalities and earnings inequalities in Brazil and South Africa.

capital: age. As expected, years of work experience in the main job (tenure) also have a positive and significant effect throughout all regions of the country.

A number of demographic variables are significant across regions, as well as nationwide (See Table 4A). Female workers earn approximately 29 percent less on average than males when all other factors are held constant. In the North region, this differential is lower than in all other regions at 24 percent. Conversely, in the Northeast region, one of the poorest regions of the country, the difference is 32 percent. Nationwide and in all regions, these differences are statistically significant at the 1 percent level. Although the North region also lags behind in terms of development, the demand for labor is high because the relative demographic density is very low. This may explain why gender-wage differentials are lower in this region. In the developed regions, however, there are still signs of discrimination against women. The gender-wage differential is around 29 percent and statistically significant at the 1 percent level. There are also signs of race discrimination. White individuals earn around 10 percent more than members of other groups across the nation and its regions. Differences in wages by sector also exist. Individuals working for the federal government receive on average 38 percent more than workers in the private sector. If an individual works for the state government, on average, he/she receives 6 percent more than an individual in the private sector. In contrast, municipal employees receive 7 percent less than workers in the private sector. These wage-sector differentials also differ by region in the country. As expected, in the more developed Southeast, the wage-differential between the federal government and private sector decreases to 3 percent. State and municipal employees, however, receive 0.6 and 9.5 percent less, respectively, than those who work in the private sector.

This difference is significant only for workers in federal and state administrations. The North Region is the only region where municipal workers receive more than private sector employees, by 3 percent, and this difference is statistically significant at the 1 percent level.

The national average effects of the FUNDEF reform

The question of interest is whether the FUNDEF reform has a positive impact on teacher earnings, after controlling for other observable factors such as years of education, experience, region of the country, and location of workers' residences. Table 4A reports the estimated effects of FUNDEF on teacher wages for different specifications and samples. Column I particularly shows the results from simple difference estimation (SD) for a sample of primary teachers (N=13,859). Before the reform enactment, in 1995, primary teachers' wages were 15.6 percent less than in the year 1996, and this difference was statistically significant at the 1 percent level. After the reform enactment, there was an overall increase in primary teachers' wages. For example, in 1997, teachers' wages were statistically superior to wages in year 1996 by 5.6 percent. This increase was significantly accentuated with the reform implementation in 1998 and 1999, representing changes in wages of 18.9 and 24.2 percent, respectively, compared to year 1996. These positive changes in primary teachers' wages indicate that it is possible that, on average, the FUNDEF reform has positively affected teacher earnings in primary education all over the country.

However, SD (simple differences estimation) does not allow us to separate the effects of the FUNDEF reform from aggregate time trends that may also affect teachers' earnings. In order to separate the influence of the aggregate time trends from the reform

effects, I compared primary teachers with all other individuals (non-primary teachers), whose wages may also be influenced by the country's economic situation, but not by the reform. In column II, I estimate the difference-in-differences equation (DD), comparing primary teachers with non-primary teachers in order to observe how the reform has affected teachers in relation to all other workers in the country. As observed in the SD estimation, the DD estimation also suggests that the introduction of the FUNDEF reform increased primary teacher wages, but this increase started only after the reform implementation in 1998 and 1999. Even for the state of Pará, which initiated the reform in 1997, teachers' wages did not present any increase that was statistically significant in comparing Pará with the rest of the country. However, if this state is compared to the other states in the North Region anticipating the reform implementation favored teacher wages in Pará (See Table 5A, Columns I and II in appendix).

For 1998, holding other factors constant, the country observed a positive and significant reform effect of 9.2 percent in teachers' earnings (Table 4A, Column II). This effect suggests that the mean wage difference between primary teachers and all other workers in 1998 is 9.2 percent more than the mean wage difference in 1996. Such an effect is economically significant considering that the inflation rate for this year was about 2.5 percent (INPC/IBGE, 1998). The FIPE report (1999) found an increase of 12.9 percent in 1998, but the study covered only teachers from all Brazilian state capitals and 200 other municipalities.

The estimates reported in my study shows that the reform effect was also positive in 1999. There was an increase of 15.7 percent in teachers' wages. As mentioned before, if the reform had a positive impact, it may have happened mainly in the most distant and

small municipalities of the countryside, predominantly in the rural municipal networks of schooling, where low revenues and low teacher earnings were predominant. In December of 1996, the MEC proposal for the creation of the FUNDEF, using data from 1995, predicted that with the institution of the FUNDEF, state networks of schooling would lose resources to municipal networks in 20 out of 26 states of Brazil, due to the redistribution mechanism of the law (MEC, 1997d). Table 2 shows this trend. In 1998 and 1999, the municipal networks of schooling (Column III) in the poorest regions of the country (See Table A11, Column IV and V) benefited most from the reform.

In Table 4A, Column III shows the net effect of the FUNDEF reform across municipal networks of schooling. Comparing municipal networks of schooling against all other types of schools, teachers' wages in municipal schools have increased since 1997, surprisingly. In 1997 the increase was 6.4 percent and statistically significant. In 1998 and 1999, there were also positive and statistically significant increases in wages of 14.6 and 16 percent, respectively. The estimates for year 1997 may have resulted from information about the reform disseminated by governmental reports in 1996 (MEC, 1997d). Positive estimates regarding the impact of the FUNDEF on schools' network budgetary constraints for 1997 may have also acted as incentives to review teacher wage policies in municipal schools. After controlling for the other types of schooling (Column VIII), the increases in municipal teacher wages were statistically significant, compared only to primary teachers in state schools.

Column IV shows that wages of primary teachers in state schools decreased by 20.2 and 26.3 percent compared to primary teachers in other types of schools, and

relative to all other workers in 1998 and 1999 respectively, after the reform.³⁷ There were no significant changes in wages for teachers in federal schools compared to all other individuals (Column V), to municipal workers alone (Column VIII), and in relation exclusively to the private sector (Column VI). These results should be interpreted carefully since the number of cases in the sample for federal teachers is very small.

Wages for primary teachers in private schools also increased by 22.1 and 21.5 percent in the years 1998 and 1999 after the reform, compared with wages of all other workers in the same period, relative to 1996. There have been annual increases in the wages of primary teachers in the private sector during the period between 1995 and 1999 compared with all other teachers, but this difference has been decreasing over time since 1995. This information may suggest that due to decreasing demand for private education, private schools have been forced to cut costs which may have negatively affected teachers' wages. The number of students in private schools has been decreasing since 1995. In 1995, these students represented 11.6 percent of total enrollment in primary schools; the share has decreased to 9.1 percent in 2000.

If primary teacher wages in private schools were compared to primary teacher wages in municipal schools (Column VIII), wages in private schools were statistically significantly superior to wages in municipal schools before the FUNDEF reform. After the reform, this difference is small and non significant.

The reform has increased the wages of municipal teachers, making changes on wages in municipal schools similar as the ones in private schools. Controlling for all types of schools,

³⁷ To be exact 20.2 is the percentage difference in monthly wage rates between state primary teachers and non-state primary teachers relative to the percentage difference in monthly earnings between all other workers at the state administration and all other workers in other types of administration in 1998 compared to those in 1996, due to the reform.

average difference in primary teacher wages between 1996 and 1998, or 1996 and 1999 from state schools are 25.7 and 29.7 percent less than the average difference in primary teacher wages in municipal schools between 1996 and 1998, or 1996 and 1999, relative to the average wage differences between all other workers in state and municipal administrations (Column VIII).

Table 6A presents the similar specifications as in Table 4A, but compares only primary teachers with all other individuals who work for municipal and state administrations. Column I shows the results of the DD estimation. They are consistent with the results in Table 4A.

The DD estimates indicate that primary teachers had increases of 8.8 and 14 percent in 1998 and 1999, respectively, and these results were statistically significant at the 5 percent level. In Column II, which shows the difference-in-difference-in-differences estimation results (DDD) for the sample of municipal and state workers, the reform effects are also consistent with Table 4A.

The results indicate that the FUNDEF reform had strong and significant effects on municipal networks of schooling. For 1998 and 1999, teacher wages in municipal schools were significantly higher by 23 and 26 percent than wages in state schools in 1996, at the 1 percent level, relative to non-teachers in state and municipal jobs. In Column III, I restrict my sample to compare only primary teachers against pre-school and secondary teachers. The DD estimates show positive effects on primary teacher wages relative to pre-school and secondary teachers, but these effects were only statistically significant in 1999. Municipal teachers had also an increase in wages relative to pre-school and secondary teachers of 2.3 percent, in both 1998 and 1999, but these differences were not statistically significant (Column IV).

The effects of the FUNDEF reform and teachers' years of education

MEC data on primary teachers were indicating a progressive increase in levels of qualification of teachers (MEC/INEP, 1999). The PNAD data also confirm this trend

(see Table 3A). It is possible that the reform effects on wages observed in Table 4A have accentuated this trend.

Table 7A reports the estimated effects of FUNDEF on teacher wages by level of education. Column I shows the SD estimation for the sample of primary teachers with years of education aggregated in age groups. As expected, the higher the level of education, the higher the percentage of increase in teacher wages. These increments are statistically significant at the 1 percent level.

Column II reports the DD estimation for the sample of primary teachers versus pre-school and secondary teachers. The effects of the reform in this comparison are also positive and significant, consistent with the previous results reported in Table 4.

Column III shows that in 1998 there were no significant reform effects on the wages of primary teachers depending on years of schooling, compared with teachers with less than eight years of schooling. There are no differences on wages between primary teachers with 9 to 11 years of completed schooling and teachers working in other levels of education with the same years of schooling. The same happens for teachers with 12 to 14 years of schooling and for teachers with 15 or more years of schooling. The effects of reform on the average primary teacher wages may not be taking into consideration teacher levels of qualification.

In 1999, however, the reform effects on wages by teachers' years of schooling suggest that less qualified teachers received more than qualified teachers. Primary teachers with 12 to 14 years of schooling compared to primary teachers with 0 to 8 years of education received, in 1999, 35.9 percent less than primary teachers with 12 to 14 years of schooling compared to those teachers with 0 to 8 years of education in 1996,

relative to the wage difference of pre-school and secondary teachers within the same education groups between 1996 and 1999. For the group of primary teachers with more than 15 years of completed schooling, the effect was -25.5 percent. Both effects were statistically significant at the 1 and 5 percent levels, respectively (Table 7A, Column III).

These results suggest that the increases in wages due to the reform may have been offset by increases in wages of pre-school and secondary teachers in the same educational groups (Table 7A, Column III) and by increases in wages of all other workers (Table 7A, Column V). In other words, even though the reform may have increased average wages for primary teachers, it doesn't change the fact that primary teacher is still an occupation with lower pay relative to other occupations. Therefore, individuals with higher levels of education still may receive higher wages in other occupations, even after the reform.

Comparing with all other workers (column V), the results are consistent and the dimension of the effect varies slightly indicating that even comparing with a less homogeneous group, the results hold.

The effects of the FUNDEF reform on newly hired teachers

The question of interest here is whether there are differential reform effects depending on how long teachers have been working in the current job. Whether newly hired teachers are better off after 1998, may suggest that the reform has positively affected the wages of these teachers. In Table 3A column II, I compare primary teachers with non-teachers. The effect of the reform on newly hired teachers is negative and represents a decrease of 13 percent in teachers' wages relative to non-teachers' wages for the year 1997. In 1998 and 1999, this tendency is accentuated. Teachers' wages were 16

percent lower than in 1996 relative to non-teachers in both years 1998 and 1999, and these results are significant at 1 percent level. However, for teachers with one year of experience relative to non-teachers, the reform effect is positive in 1997, 1998 and 1999, representing an increase of 10 percent, 12 percent and 2 percent, respectively. These effects are only significant for the years 1997 and 1998.

In Table 3A, Columns III and IV, I run the same specification for the sample of primary, pre-school and secondary teachers. In this case, the reform effect is positive and significant only for teachers with three years of tenure. This may reflect changes in wage schedules after the reform. For teachers who acquired two years of experience, the observed increase of 17.8 percent on wages may serve as incentives for teachers to continue in the school system³⁸.

Column IV compares primary teachers with teachers in pre-school and secondary education who work in the state or municipal administration. This comparison may be more accurate to describe the reform effect. In this case, new hired state teachers received 23.4 percent less than their counterparts in municipal schools during the year 1999. This difference is statistically significant at 10 percent level. These results are consistent with the results indicating positive effects of the reform on wages for municipal teachers.

I also run additional regressions include age group dummies to access if there are changes in wages by cohort groups. The results show no effects. In fact, for all age groups and years there are no significant effects (Table A9, in appendix)

³⁸ For teachers who are “funcionário público estatutário”, after two years, they are granted job stability and wages usually are upgraded.

Regional differences

In this section, we discuss the reform effect by regions of the country, since the impact of the reform is likely to differ depending on the country's region. Table A10 illustrates the net effect of the reform in Brazil and Table A11 to A15 reports the estimates for the five main geographic regions of the country. The DD estimates show a positive reform effect on primary teacher wages in almost all regions of the country, except the Center-West. These effects were statistically significant only in the Northeast and Southeast Regions.

The Northeast region has one of the greatest educational deficits. The percentage of illiterates in 1995 was around 30 percent. The 1996 net enrollment rate was only 82.5 while the 1996 national average was 90 percent (MEC/INEP, 1999). Teacher level of qualification is also very low. Around 17.7 percent of the teachers have completed primary education or less (MEC, 1998, p.92), equivalent to 8 years of education or less.

Not surprisingly, the effect of the reform is very high. It brought by an increase of 18.3 and 28.6 percent in average earnings in this region (Table A12A, Column II). The DDD estimates also confirm a positive effect for primary teachers in municipal schools, whose wages increased on average 17.9 and 15.6 percent in 1998 and 1999, respectively (Column IV). If compared to average teacher wages in private schools, controlling for all other types of teachers, municipal teachers received an increase of 23.6 and 20.9 percent in the same years, which was statistically significant at the 1 percent level (Column V).

Even though teacher-earning levels were extremely low in this region, such an increase may imply fewer investments in teacher training where it is most needed. This

increase in earnings may serve to attract more qualified teachers, but it may also constitute an undeserved premium to poorly qualified teachers in the system if changes are not discriminatory.

The reform effect was negative for teachers in state schools compared to all other types of schools, however (Column III). There was an average decrease of 16.6 and 25.3 percent in the relative teacher wages in state schools, which was statistically significant at the 1 percent level. Despite this decrease in average wages, there were no statistically significant differences in wages between state and private schools for primary teachers if we control for all types of schools (Column V). In this region, municipal primary teachers were the greatest beneficiaries of the reform, confirming that the redistribution reform effect was able to minimize wage differences among the school networks.

In the Southeast Region, the DD estimates shows positive and statistically significant increases of 9 and 12 percent in primary teachers' average wages in 1998 and 1999 (Table A13A, Column II). The FUNDEF redistribution effect reduced municipal school network revenues in favor of state networks³⁹. The DDD (Table A13A, Column III) shows that the impact of the reform is positive for teachers in state school networks compared to all types of schools, representing increases of 10 percent and 7 percent in 1998 and 1999, respectively. These increases were only statistically significant in 1998. Furthermore, if comparing wages in state versus private schools, the increase in wages was significantly higher, on the order of 17 and 15 percent for average primary teacher wages in state schools (Column V). The DDD estimates show negative effects, but not significant effects on wages for teachers in municipal schools after 1996 for this region

³⁹ The exception is in the state of Rio de Janeiro, where municipal networks gain revenues with the FUNDEF reform. (See Table 2).

(Column IV). Except for the state of Rio de Janeiro, the average municipal school network lost resources in favor of state school networks. This may explain why there were positive effects for teachers in state schools, instead of for those in municipal schools. In this region, teachers have higher levels of education, so expenditure on teacher training may not be as much in demand as in other regions. Consequently, additional resources brought by the law after 1998 may have been predominantly directed to increase teacher earnings in state schools. In fact, the regional average monthly earnings for a primary teacher with 12 years of education was R\$361.40 (SD=1.41), whereas the monthly national average was R\$308.05 (SD=1.48).

In the South Region, even though the DD estimates shows positive reform effects, the DDD estimates (Table A14A, Columns II and III) show negative effects for state and municipal schools in 1998 and 1999. Compared to private schools, the effects were positive. No effects for this region were statistically significant.

In the Center-West, Table 15A shows negative effects for primary teachers in state and municipal schools, but these effects were not statistically significant (Columns II, III and IV). There were positive effects for primary teachers in federal schools compared to private schools, but these estimates may be capturing policies for federal employees, not FUNDEF reform effects (Column V).

For the North Region, there were positive reform effects of 3 percent and 14 percent in 1998 and 1999, respectively, using DD estimates (Table A11A, Column II). These effects were significant, only for the year 1999. The DDD estimates (Table A10, Columns III, IV and V) show non-significant effects. As noted before, the state of Pará, which changed its finance system in 1997, presented significant and positive reform

effects since 1997 comparing teachers in this state with the Region. Table A4 shows a positive effect of 24 percent, in 1997; 10 percent in 1998, and 19 percent in 1999. These effects were statistically significant only in 1997 and 1999. The effects observed in 1997 are surprising because additional resources were transferred to Pará only after July 1997.⁴⁰ In 1998, however, the reform effect in this state was not significantly different than in the other states in the region. Pará's educational policy prioritized decentralization of the first four grades of primary education to municipal level in 1997 (Sevilla, 1997), which may have increased enrollment in municipal school networks, as well as revenues, which were transferred according to a per pupil formula. However, lack of adequate infrastructure was especially strong in this state. For instance, 20 percent of the municipal schools reported having no access to water supply and 80 percent reported having no access to electricity (MEC, 1999). This may have affected the capacity of municipal networks to continue expanding school places in 1998 and receiving additional students and monies in the first year of the reform. Furthermore, it is possible that additional resources may have been spent on teacher training and other activities making improvements in levels of remuneration trivial.

I also run a joint significant test for changes on teacher earnings in the state of Pará in 1997, 1998 and 1999. In this case, there were statistically significant positive effects ($p=0.091$). The results are consistent with what educational reform theory predicts. Reform effects for the North region, as a whole, may not be immediately observed because the system's structure—system management and administration, school management, and teachers—demand time to adapt themselves to the top-down reforms (Tyack and Cuban, 1995). The results for the state of Pará may well be due to the small

⁴⁰ STN/SIAFI, Monthly FUNDEF transfers to states.

sample size compared with the overall number of cases. The total number of primary teachers in Pará after the reform was 272.

As mentioned in the empirical specification section, we added an additional model for assessing the robustness of the results. Table 3, in the next page, shows the results of this model. Column I presents a simple regression of *lnwage* on human capital characteristics for a sample of primary teachers in state and municipal public administrations. Column II presents the results for a sample of all workers in state and municipal public administrations in Brazil. Consistent with the previous discussions, the reform effect on primary teacher wages is positive and statistically significant in the order of 8 and 12 percent in the years 1998 and 1999. Column III shows the results including the variable *per pupil revenues* and the interactions with *prmtch* and *year* dummies. The effects of the reform due to the changes in per pupil revenues appears significant only for the year 1999, even though negative and very small (-0.0002). This may indicate that changes in the wages of teachers happened due to new policies adopted with the FUNDEF reform, not because of the amount of resources redistributed. The law mandates that the average wage for qualified teachers were in 1998 roughly US\$300, which represents increases on average wage only for teachers in rural and remote areas where wages were below this minimum. This statement may have influenced municipal and state governments to review teacher career plans. However, a better explanation is that the teaching profession attracted more qualified teachers and school administration investments in teacher training have promoted increases on wages.

Table 3: Estimated Reform Effects on Primary Teacher Wages using Per Pupil Revenues

as predictors

lwage1	Total								
	(I)			(II)		(III)			
	Coef.	S.Err		Coef.	S.Err	Coef.	S.Err		
educ1yr	0.02852	0.2750		0.06617	0.0219	***	0.06566	0.0218	***
educ2yr	-0.21862	0.2864		0.10714	0.0176	***	0.10446	0.0176	***
educ3yr	0.18194	0.2298		0.17604	0.0153	***	0.17261	0.0153	***
educ4yr	-0.10157	0.2135		0.24536	0.0128	***	0.23910	0.0128	***
educ5yr	0.01275	0.2179		0.31484	0.0150	***	0.30960	0.0150	***
educ6yr	0.10133	0.2239		0.37448	0.0183	***	0.36815	0.0184	***
educ7yr	0.06529	0.2181		0.43894	0.0178	***	0.43300	0.0178	***
educ8yr	0.10136	0.2122		0.55408	0.0135	***	0.54632	0.0136	***
educ9yr	0.21029	0.2132		0.65977	0.0186	***	0.65196	0.0186	***
educ10yr	0.29687	0.2119		0.69804	0.0166	***	0.68887	0.0166	***
educ11yr	0.51992	0.2096	**	0.95396	0.0123	***	0.94415	0.0124	***
educ12yr	0.63568	0.2102	***	1.13414	0.0174	***	1.13037	0.0174	***
educ13yr	0.71943	0.2108	***	1.24366	0.0203	***	1.23607	0.0203	***
educ14yr	0.79008	0.2103	***	1.34756	0.0174	***	1.34437	0.0174	***
educ15yr	0.89330	0.2100	***	1.65417	0.0135	***	1.64833	0.0135	***
age	0.16562	0.0646	**	0.14860	0.0244	***	0.14864	0.0244	***
age2	-0.00571	0.0026	**	-0.00434	0.0010	***	-0.00433	0.0010	***
age3	0.00009	0.0000	*	0.00006	0.0000	***	0.00006	0.0000	***
age4	0.00000	0.0000	*	0.00000	0.0000	***	0.00000	0.0000	***
tenure	0.01182	0.0023	***	0.01305	0.0011	***	0.01299	0.0011	***
tenure2	-0.00002	0.0001		0.00006	0.0000		0.00006	0.0000	
female	-0.06916	0.0159	***	-0.29012	0.0053	***	-0.28866	0.0053	***
white	0.03379	0.0109	***	0.08873	0.0057	***	0.08923	0.0057	***
black	0.01731	0.0270		-0.03309	0.0107	***	-0.03376	0.0107	***
yellow	-0.02611	0.0725		0.13584	0.0420	***	0.13585	0.0418	***
indigenous	0.16359	0.1282		0.15176	0.0695	**	0.15878	0.0697	**
union	0.11853	0.0101	***	0.15836	0.0056	***	0.15951	0.0056	***
state	0.07368	0.0105	***	0.14640	0.0052	***	0.14738	0.0059	***
urban1	0.14842	0.0149	***	0.10221	0.0079	***	0.10485	0.0079	***
primtch				-0.11980	0.0137	***	-0.03526	0.0229	
perpupil							0.00011	0.0000	***
primrev							-0.00026	0.0001	***
y95	-0.16591	0.0151	***	-0.11941	0.0086	***	-0.10694	0.0133	***
y97	0.05732	0.0150	***	0.06456	0.0089	***	0.09338	0.0150	***
y98	0.21497	0.0144	***	0.12183	0.0084	***	0.16601	0.0213	***
y99	0.27538	0.0143	***	0.13928	0.0084	***	0.21878	0.0231	***
y95prim				-0.04320	0.0182	**	-0.09924	0.0304	***
y97prim				-0.01014	0.0184		-0.04014	0.0315	
y98prim				0.08090	0.0178	***	0.10477	0.0415	**
y99prim				0.12071	0.0177	***	0.23993	0.0430	***

Table 3: (cont'd)

lwage1	Total					
	(I)		(II)		(III)	
	Coef.	S.Err	Coef.	S.Err	Coef.	S.Err
y95pupilrev					-0.00003	0.0000
y97pupilrev					-0.00008	0.0000 **
y98pupilrev					-0.00012	0.0000 **
y99pupilrev					-0.00020	0.0000 ***
y95primrev					0.00017	0.0001 **
y97primrev					0.00010	0.0001
y98primrev					-0.00002	0.0001
y99primrev					-0.00020	0.0001 **
Rondonia	0.13401	0.0414 ***	0.28916	0.0261 ***	0.29053	0.0262 ***
Acre	0.01992	0.0522	0.19456	0.0306 ***	0.19701	0.0310 ***
Amazonas	0.34867	0.0343 ***	0.19159	0.0206 ***	0.19258	0.0207 ***
Roraima	0.46479	0.0851 ***	0.42857	0.0353 ***	0.44221	0.0364 ***
Para	-0.06364	0.0310 **	0.01410	0.0167	0.01707	0.0168
Amapa	0.51867	0.0563 ***	0.38647	0.0350 ***	0.39821	0.0361 ***
Tocantins	0.02775	0.0330	0.05450	0.0187 ***	0.05676	0.0187 ***
Maranhao	-0.11282	0.0375 ***	-0.12335	0.0220 ***	-0.12822	0.0220 ***
Piaui	-0.28257	0.0323 ***	-0.26505	0.0217 ***	-0.26846	0.0217 ***
Ceara	-0.17111	0.0295 ***	-0.11213	0.0148 ***	-0.11498	0.0148 ***
RGNorte	-0.40025	0.0433 ***	-0.28837	0.0221 ***	-0.28703	0.0221 ***
Paraiba	-0.24826	0.0374 ***	-0.20130	0.0194 ***	-0.20314	0.0194 ***
Pernambuco	-0.08178	0.0271 ***	-0.04549	0.0145 ***	-0.04510	0.0145 ***
Alagoas	-0.18775	0.0422 ***	-0.15252	0.0228 ***	-0.15906	0.0227 ***
Sergipe	0.02313	0.0404	-0.01783	0.0197	-0.01572	0.0197
Bahia	-0.07469	0.0230 ***	-0.00317	0.0131	-0.00587	0.0131
Minas	0.30300	0.0225 ***	0.18210	0.0124 ***	0.18238	0.0124 ***
Espirito	0.27434	0.0372 ***	0.26325	0.0190 ***	0.26804	0.0193 ***
Rio	0.31068	0.0255 ***	0.15653	0.0140 ***	0.15667	0.0153 ***
SaoPaulo	0.45227	0.0242 ***	0.36926	0.0126 ***	0.36288	0.0155 ***
Parana	0.35703	0.0251 ***	0.22386	0.0138 ***	0.22727	0.0140 ***
SantaCat	0.16841	0.0332 ***	0.27596	0.0179 ***	0.28016	0.0182 ***
RGSul	0.22384	0.0250 ***	0.24448	0.0138 ***	0.25044	0.0146 ***
MGSul	0.08790	0.0348 **	-0.00648	0.0194	-0.00329	0.0195
MGrosso	0.20566	0.0319 ***	0.19806	0.0180 ***	0.20040	0.0181 ***
constant	-1.90025	0.6004 ***	-2.24629	0.2087 ***	-2.28603	0.2087 ***
Observations	11380		65404		65404	
F test	204.610		1352.590		1352.590	
Prob > F	0.0000		0.0000		0.0000	
R-squared	0.5418		0.5728		0.5735	
Root MSE	0.4746		0.6037		0.6032	

Note: Each specification includes an intercept, the controls for human capital characteristics, years and state effects. The marginal effects significantly different from zero at 1 percent, 5 percent and 10 percent level are indicated with ***, ** and *. The table shows robust standard errors.

Conclusions

The educational finance reform has shown a significant impact on teacher earnings in Brazil during the first year of its implementation and this effect has been accentuated in 1999. The greatest beneficiaries of the FUNDEF reform were municipal networks of schooling, which due to the redistribution mechanism within states, increased their per pupil revenues. Wages for primary teachers in municipal schools increased by 15 and 16 percent in 1998 and 1999, respectively, relative to wages of other workers. Meanwhile, relative wages in state schools decreased. As a result primary teacher wages in municipal schools are on average superior to wages for these teachers in state schools, but similar to wages in federal and private schools. After the FUNDEF reform, wages that were increasing over time in the private sector, continued to increase but at a decreasing rate. These results are robust when comparing teachers and non-teachers who work for municipal and state administrations. If selecting a comparison group of pre-school and secondary teachers, the positive effects of the reform remain.

Primary teachers' average years of education have been increasing over time. In the first year of the reform, there were no differential effects for teachers with different levels of education. In 1999, however, the reform effect indicates that there was positive effects on primary teachers wages, but the increases in wages for primary teachers with complete secondary education were inferior to increases received by unqualified teachers (teachers with primary education or less), relative to pre-school and secondary teachers in the same educational groups. The same effect was observed for teachers with higher

education. This suggests that the reform has most benefited teacher with lower levels of qualification.

In each year after the reform, newly hired teachers have received 16 percent less than their counterparts in other professions. Within the education sector, however, there were no differences between wages of newly hired teachers in pre-school, primary and secondary education. Specifically comparing state and municipal teachers, newly hired teachers in state schools received less than their counterparts in municipal schools, relative to pre-school and secondary teachers.

The reform effects, however, were not homogeneous around the country. It may be the case that resources allocated to primary education are spent differently. Some regions may spend more on teacher training than on increasing teacher earnings. The municipal school networks in the Northeast region were the greatest beneficiaries of the reform. After the reform, municipal wages were significantly higher than state wages for primary teachers in this region. In the Southeast region, the changes in wages for primary teachers in state school networks presented positive effects as compared to wages for teachers in municipal schools. In the South and in the North region the reform did not change relative primary teacher wages.

Individual state variation has not shown a larger greater impact on the reform implementation since OLS and fixed effects estimators are almost the same. The reform does not allow for variation across states, since it determines compulsory allocation of resources for particular types of expenditures: 60 percent on teachers and 40 percent on other recurrent and capital expenditures. Because the primary education coverage of the

country arrived in 1999 to 93 percent, additional capital expenditures may not be in as high demand as in the last decades.

CHAPTER 3

THE EFFECTS OF THE REFORM ON TEACHER SUPPLY

Introduction

In 1996, the Brazilian government instituted an education finance reform, which significantly changed the average per pupil revenues in primary education in certain school networks, and mandated a specific share of these funds for teacher training and wages expenditures. As indicated in Chapter 2, during the first two years of reform implementation, there have been significant increases in wage rates for primary teachers in municipal schools compared to non-primary teacher workers and compared to primary teachers in other school networks.⁴¹ In this chapter, I examine to what extent these reform effects are likely to affect the labor supply of primary teachers in Brazil. The analysis is based on data from the PNAD/IBGE collected from 1995 to 1999. It reveals important information about the determinants of teacher labor supply and the effects of the FUNDEF reform on the participation of more highly educated teachers in the primary education sector. In the subsequent section, I briefly discuss the importance of the supply of teachers, the model estimated and the data, following by the results, discussion concluding remarks.

The reform and teacher labor force participation

Several factors have served to explain the importance of teacher labor supply. The teacher is the primary input in the production of education, and an important item in the

⁴¹ See Sevilla, 2001 (Chapter 3).

expenditure categories in the public sector.⁴² Particularly in Brazil, after 1998, teacher wages can represent as much as 60 percent of the public expenditure on education⁴³, and a large share of all public revenues invested in social areas. In addition, the quality of educational systems in developed and developing countries is highly related to the teacher labor supply. For example, the continuous growth of the population, and consequently, the increasing number of people seeking admittance to schools often far exceeds the number of places available, in developing countries. In order to attend to the demand for education, the supply of teachers should follow the growth of the demand for all levels of education.

However, increasing the number of teachers to address the growing demand for education is not enough to guarantee the quality of education, if the quality of the education. If the quality of the teaching work force must improve as well, school personnel, teachers and administrators will also need to have higher levels of qualification to manage new tasks brought by administrative decentralization or school autonomy movements, such as organizing the school and its relationship with the communities it serves.

Brazilian legislators have adopted policies that aim to make teaching more appealing, by providing the means for schools to review teacher career plans, provide teacher training, and increase salaries. The FUNDEF reform assumes that changes in per pupil revenues and the mandatory allocation of 60 percent of these revenues to teachers' salaries will lead to increased wages which in turn will attract more skilled workers to the education sector. The impact of the reform on teacher quality and wage rates depends on

⁴² See Psacharopoulos (1987), UNESCO (1991), Psacharopoulos (1996).

⁴³ Law 9,424, December, 1996.

how the reform affects the labor supply and occupational choice decisions of individuals, and which type of productivity endowments (such as experience, ability, education, household characteristics --e.g. number of dependents, family income--, these individuals bring to the education sector.

There are important features of the labor supply of teachers that must be known to better understand the impact of the policy reform. First, what the determinants of labor supply behavior and occupational choice are, and second, whether the reform affects those decisions. Changes in primary teachers' years of education were already being observed prior to the reform in the public system (as shown in Chapter 1, p.21). In 1991, there were 1,295,965 primary teachers, of whom 72,285 (roughly 6 percent) had not completed primary education and 67,087 (roughly 5 percent) had only completed primary education. In 1999, there were 1,487,292 primary teachers and the percentage of teachers with uncompleted primary education and completed primary education decreased roughly to 2 and 4 percent respectively (MEC, 1996, 1999).

Furthermore, the reform increased the average per pupil revenues of municipal schools in the country, because it introduced a redistribution and per pupil revenue equalizing mechanism. All the main state and municipal taxes are now collected in a fund within each state in Brazil, and then the monies are returned to the educational systems in proportion to the number of students enrolled. Consequently, revenue shifts from one school network toward another occurred, and there were increases in average wages in some schools. However, the reform seems to not affect the wages for primary teachers by particular educational groups. There weren't differential increases on wages based on the education level of teachers in 1998. In fact, as shown in Chapter 2, primary teachers with

12 to 14 years of education received less increases on wages than the group of primary teachers with eight years of primary education or less in 1999, relative the same comparison in 1996. This result suggests that, in the first two years of implementation, the reform has most benefited teachers with lower levels of education in primary education.

Since primary teacher wages for individuals with lower levels of education increased, despite the policy intention to attract more highly educated teachers, this chapter examines how the supply of teachers with different levels of education and, particularly, qualified teachers (teachers with 12 or more completed years of education) changed after the reform.

The model

In this analysis, I observe an exogenous event, the FUNDEF reform, which changes the per pupil revenues in school networks in Brazil. This study estimates if the FUNDEF policy reform has influenced workers and non-workers' choice to participate in the teacher labor market.

This policy change allows me to use the difference-in-differences framework to observe if there are changes in the probability of being a primary teacher by educational group in the years before and after the reform. I estimate the following equation by a probit model:

$$P(\text{primtch} = 1 | X) = \beta_0 + \delta_0 y93_i + \delta_1 y95_i + \delta_2 y97_i + \delta_3 y98_i + \delta_4 y99_i + \delta_5 \text{yeardummies} * \text{educationgroups}_i + \sum_{j=1}^m X_{ij} \beta_j + u_i \quad (1)$$

where *prmtch* is a binary variable taking the value of one, if the individual is currently working as a teacher, and zero otherwise.

In order to control for systematic differences between control and treatment groups over time, I include the dummy variables *y95* and *y97* for the years before reform implementation (1995, 1996 and 1997), and *y98* and *y99* to capture the effect of the reform after the policy implementation. These dummy variables assume a value of one for their corresponding year and zero otherwise. There is no dummy variable for the year 1996, because this is the base year defined for this analysis. The reform was enacted in 1996, even though implementation started in 1998. These dummy variables capture year specific variation in the probability of being a primary teacher in each specific year. For example, the parameter δ_3 measures the mean difference in the probability of being a teacher (who is participating in the labor market) between 1996 and 1998.

In addition, the model includes a vector of control variables X_{ij} to take into consideration individual human capital characteristics such as education and age and also household characteristics. The variable *ed0to8* indicates if the individual has zero to eight years of education; *ed9to11* indicates if the individual has nine to eleven years of education (the equivalent of having secondary education diploma); *ed12to14* indicates if the individual has twelve to fourteen years of education (corresponding to acquiring teacher higher education diplomas or incomplete higher education), and *ed15* indicates if the individual has completed higher education or more (four-year-college or more). The variable is truncated at 15 years of education indicating that the individual has 15 or more completed years of education. The variables age, and its quadratic forms (age^2 , age^3 and age^4) were included to capture non-linear effects of age on teacher participation decisions.

Other factors that affect labor supply are gender and race. I define the dummy variable *female*, which equals to one if the individual is female and zero if male. This variable indicates whether holding other factors constant there are gender differences in the labor market for teachers. The reference group chosen for race/ethnicity is *mixed*, which represents roughly 36 to 38 percent of the total sample population over the years. The dummy variables applied was *white* equals one if the individual declared being white and zero otherwise; *black* equals one if the individual declared being black and zero otherwise; *yellow* equals one if the individual declared being Asian and zero otherwise; and *indigenous* equals one if the individual declared being Indigenous and zero, otherwise.

Similarly, differences in family characteristics, e.g. marital status, number of children and non-labor income, may affect the household budget constraint, which in turn may influence the individual decision to participate in the primary teacher labor market. I include the dummy variable *married* which indicates if the individual is married. The variable *childl14* indicates if the individual has children younger than 14 years old, and the dummy variable *childm14* indicates whether or not the individual has children who are 14 years old or more. Particularly for females, the labor market participation decision may also depend on whether there are other sources of income in the family. I included the variable *nonlabor* to control for differences in non-labor income including income from other family members.

The main parameters of interest are, however, the interactions between the year dummies and the education groups (*yeardummies*education groups*). These interactions capture whether the reform had a differentiated impact on teacher participation behavior depending on educational group (*ed9to11*, *ed12to14*, and *ed15*). For example, the

interaction between *ed9to11* and the variable *y98*, aims to test whether the reform affected the participation of teachers with completed secondary education compared to teachers with eight or less years of education in the first year of its implementation, relative to 1996.

I also estimated a structural model to predict teacher labor market participation to analyze whether wage differences between primary teachers and non-primary teachers due to the introduction of FUNDEF may affect the probability of becoming a teacher. In this case, the equation of interest is given as:

$$P(\text{primtch} = 1 | X) = \beta_0 + \delta_0 y93_i + \delta_1 y95_i + \delta_2 y97_i + \delta_3 y98_i + \delta_4 \text{diff} + \delta_5 \text{yeardummies} * \text{educationgroups} + \sum_{j=1}^m X_{ij} \beta_j + u_i \quad (2)$$

where *diff* is the predicted difference between teachers and non-teachers wages for a particular educational group, in a particular region and year estimated using equation 3, below.

Since wages and labor supply are jointly determined, there is an identification problem. In order to address this problem I include the variable *enroll* (total enrollment in primary education in the previous year) which may affect wages but not labor supply.⁴⁴ The identification strategy consists of estimating separately the wage for primary teachers and non-primary teachers using equation (3) for each region of the country, using state-fixed effects. Specifically for the primary teacher wage equation, I include the variable *enroll*, which indicates the total number of students enrolled in primary education in the previous year. Enrollment in the previous year may affect educational planners' decisions regarding the demand for teachers for the next year, and consequently, influence school

⁴⁴ I also estimated the models including pupil/teacher ratio of the previous year and the results did not change significantly.

network capacity to pay teachers (teacher wages), but it should not influence individuals' decisions to go into teaching (primary teacher participation decision).

$$\ln(wage)_i = \beta_0 + \delta_0 yeardummies_i + \delta_3 educationgroups + \delta_7 yeardummies * educationgroups + \sum_{j=2}^m X_{ij}\beta_j + u_i \quad (3)$$

In equation (3), $\ln(wage)$ is the natural logarithm of the individual wage rate. Year dummies included are *y95*, *y97*, *y98*, *y99*. The education dummies included are *ed9to10*, *ed12to14* and *ed15*. I also include interactions between year dummies and education groups. In addition I included the human capital variables and indicators of race as in chapter 2. The base year for this analysis is 1996.

Equation (3) is estimated separately for total sample of female teachers. There was limited number of male teachers in the sample to run the same analysis for this group and if the analysis included all sample, it would be neglecting the fact that there are gender-specific differences in the effects of wage and non-labor income on labor market participation decision and occupational choice.

Additionally, as observed in Chapter 2, the reform had positive and significant effects on wages for teachers in municipal schools, which are responsible for the majority of enrollment in rural areas. Therefore, if the reform affected supply of teachers through changes on wages, it is important to test whether primary teacher participation might differ between rural and urban areas. In order to do this, separate sets of equations are estimated for the sample of female teachers in urban and rural areas.

Data and variables

This empirical analysis employs data from the National Research for Sample of Households (PNAD) for the years 1995 to 1999, conducted by the Brazilian Institute of Geography and Statistics (IBGE). The survey is a random sample collected yearly, which was designed to be nationally representative.⁴⁵ It collects information on individual demographics, labor force participation, household characteristics and income.

The sample consists of Brazilian households with individual data on 1,659,403 people, of which some are primary teachers in public or private schools (See Table A1, in Appendix). From this total sample, I restricted the analysis to Brazilian workers who were at least 20 and not more than 50 years old⁴⁶. In addition, I dropped individuals that have incomplete information on demographics characteristics. A total of 599,360 observations satisfied these criteria. They were utilized in the analysis of earnings and labor force participation.

Table A16 shows means and standard deviations of the main variables used in this analysis. The total number of primary teachers in the sample is 13,544, or approximately 2,708 each year, and the total number of non-primary teachers and non-workers is 585,816. Female teachers correspond to 92 percent of the teacher sample, whereas 57 percent of the non-primary teachers and non-workers are female. The average years of education for teachers is 13, corresponding to teachers with completed secondary education. In rural areas, the average number of years of education for a teacher is 11.

⁴⁵ Except for the Region North, where the sample did not include individuals from rural areas.

⁴⁶ Age restrictions are different than the one used in previous chapter, even though the wage model estimated is similar. For the labor supply estimations, I excluded individuals with less than 20 years old because their labor supply behavior may be influenced by schooling decisions, likewise, I also excluded individuals with more than 50 years old, since these individuals' labor supply decisions may be influenced by retirement decisions. Tables including the equations used to derive the predicted wage differences are included in annex.

For non-primary teachers and non-workers, the average years of education is only 8 years, corresponding to completed primary education. In rural areas, the average number of years of education is 7 years.⁴⁷

Female primary teachers receive less than male primary teachers on average, both in urban and rural areas. The average monthly earnings for a female primary teachers is R\$ 394.20 (Brazilian Currency) whereas a male teacher receives on average R\$456.59. In rural areas, the wages are lower for both females and males, but female teachers still receive less than male teachers (R\$226.54 and R\$248.73, respectively). For non-primary teachers, females also receive lower monthly earnings on average than male teachers, R\$371.64 against R\$575.66. In rural areas males receive almost twice as much as females.

The majority of the sample is composed of married individuals (77 percent). In rural areas, 84 percent of the sample is married. The largest contrasts in family characteristics are related to the number of children less than 14 years old. Fifty seven percent of the female teachers have children less than 14 years old, as do the majority of the non-primary teachers and non-workers (62 percent). Roughly 85 percent of the teachers in this sample live in urban areas, whereas for non-primary teachers and non-workers, 90 percent live in urban areas.

Results

The determinants of primary teacher labor force participation.

The estimated labor supply equations are presented in Tables 4, 5 and 6 for the total sample of females, females in urban areas and rural areas, respectively. All the

⁴⁷ Descriptive Statistics for the variables included in the estimation are described in Table 1, in annex.

coefficient estimates on the control variables have the expected signs, and most are statistically significant at the 5 percent level.

Table 4 shows the results for the total number of females in the sample. Years of education increases the probability of being a teacher, and these increases are statistically significant. Particularly for females, Column I shows that more educated females are more likely to be primary teachers. The average difference between female individuals with 9 to 11 years of education and individuals with eight years of education or less in the probability of being teacher is 9 percentage points. This difference increases to 29.1 percentage points and 25.3 percentage points for females with 12 to 14 years of education and 15 or more years of education respectively. All these coefficients are statistically significant.

Age also affects significantly the probability of being a primary teacher in Brazil. The estimated effect for females is 1.5 percentage points (Table 4, Column I). For example, the average female individual in the sample, whose age is roughly 30 years old, is 15 percent points more likely to be a teacher compared to female individuals with 20 years old, holding other factors constant.

Type of family is also significantly related to the probability of teacher wage labor. Married females and females with children are more likely to be primary teachers. For single mothers with children less than 14 years old, there is a 1.73 percentage points decrease in the probability of participating in the labor market for females in rural areas, but a 0.1 percentage points increase in the urban areas. Both of these effects are statistically significant. For individuals with children aged 14 years old or more there is a

significant increase in the probability of being a teacher of 2 percentage points in urban areas, but still there is a 0.6 percentage points decrease for females in rural areas.

The likelihood of being a primary teacher decreases for white, black, yellow and indigenous compared to the mixed category. Analyzing the results for females in urban and rural areas, the results are similar for all variables (See Table 5, Column I and Table 5, Column II), except for females in rural areas, where the likelihood of being a white teacher or indigenous teachers is higher than the mixed racial/ethnic group. Also, the likelihood that a teacher has completed higher education or more is not statistically significant for a teacher in rural areas.

Lastly, the availability of non-labor income lowers the probability of being a teacher for all individuals, and this is statistically significantly different than zero. An R\$1,000 (Brazilian currency) increase in non-labor income is associated with a 0.004 decrease in the probability of being a female teacher, which is statistically significant at the 1 percent level for females.

The largest effect of non-labor income takes place in rural areas for female teachers. In rural areas, family size tends to be higher, so demands for in-home labor are higher and the opportunity cost of participating in labor market is higher too. An increase in non-labor income for females in rural areas is associated to 0.008 percentage points decrease in the probability of being a teacher, which is statistically significant at the 1 percent level.

The reform effects

Table 4, Columns I, show the estimation results for total females in the sample. The coefficients of interest are the interaction terms between year and education group

dummy variables. As noted before, the reference year is 1996, and *ed0to8* is the reference education group.

Each interaction term measures the average difference in the likelihood of being a primary teacher between teachers with eight years of education or less and the specific group observed, before and after the reform. For example, the coefficient of *y98ed9to11* captures the difference in the probability of being teacher with 9 to 11 years of education and the probability of being a teacher with less than eight years of education in the year 1998, relative to 1996. This coefficient aims to answer whether the probability of being a teacher changed in the first year after the reform implementation, and the interest would be to observe an increase in the group aged 9 to 11 years of education, i.e. more educated group, after the reform.

In Table 4, Column I, I present the results for females. For the years before the FUNDEF reform was implemented, the year and educational group (*ed12to14*) interactions show increases on the teacher labor participation of 0.03 and 0.22 percentage points, and these effects are not statistically significant. These results suggest that there were no differences in the probability of becoming a primary teacher across educational groups in the years before the reform implementation for all female individuals in the country. However, after the reform implementation, in 1998, there were increases on the probability of being a primary teacher for all education groups as compared to the probability of being a female primary teacher in the same education groups in 1996, relative to the probability of being a female primary teacher with eight or less years of education. The estimated effects of the reform were increases of 0.37 to 0.65 percentage

Table 4: Estimates of the Reform Effects on Primary Teacher Labor Force Participation

P(primtch=1)	Total					
	(I)		(III)		(III)	
	dF/dx	Std. Err	dF/dx	Std. Err	dF/dx	Std. Err
diff			0.0013	0.0017	-0.0012	0.0015
ed9to11	0.0901	0.0037 ***	0.0901	0.0037 ***	0.0986	0.0014 ***
ed12to14	0.2909	0.0150 ***	0.2932	0.0154 ***	0.3110	0.0080 ***
ed15	0.2529	0.0098 ***	0.2599	0.0135 ***	0.2703	0.0104 ***
age	0.0150	0.0058 **	0.0150	0.0058 **	0.0152	0.0059 **
age2	-0.0006	0.0003 **	-0.0006	0.0003 **	-0.0006	0.0003 **
age3	< 0.0000	< 0.0000 *	< 0.0000	< 0.0000 *	< 0.0000	< 0.0000 *
age4	< -0.0000	< 0.0000	< -0.0000	< 0.0000	< -0.0000	< 0.0000
white	-0.0020	0.0003 ***	-0.0020	0.0003 ***	-0.0020	0.0003 ***
black	-0.0030	0.0006 ***	-0.0030	0.0006 ***	-0.0030	0.0006 ***
yellow	-0.0087	0.0007 ***	-0.0087	0.0007 ***	-0.0088	0.0007 ***
indigenous	-0.0006	0.0039	-0.0006	0.0039	-0.0006	0.0039
Married	0.0055	0.0003 ***	0.0055	0.0003 ***	0.0055	0.0003 ***
childl14	0.0009	0.0003 ***	0.0009	0.0003 ***	0.0010	0.0003 ***
childm14	0.0018	0.0003 ***	0.0018	0.0003 ***	0.0018	0.0003 ***
nonlabor(*1000)	-0.0038	0.0002 ***	-0.0038	0.0002 ***	-0.0038	0.0002 ***
y95	0.0009	0.0011	0.0010	0.0011	0.0018	0.0005 ***
y97	-0.0016	0.0010	-0.0017	0.0011	-0.0003	0.0004
y98	-0.0039	0.0010 ***	-0.0041	0.0010 ***	-0.0010	0.0005 **
y99	-0.0050	0.0010 ***	-0.0054	0.0010 ***	-0.0015	0.0005 ***
y95ed9to11	0.0013	0.0013	0.0012	0.0013		
y95ed12to14	0.0003	0.0019	0.0003	0.0019		
y95ed15	0.0009	0.0015	0.0009	0.0015		
y97ed9to11	0.0017	0.0014	0.0019	0.0015		
y97ed12to14	0.0022	0.0022	0.0024	0.0022		
y97ed15	0.0017	0.0016	0.0018	0.0016		
y98ed9to11	0.0037	0.0017 **	0.0038	0.0017 **		
y98ed12to14	0.0039	0.0024 *	0.0041	0.0025 *		
y98ed15	0.0051	0.0020 ***	0.0053	0.0020 ***		
y99ed9to11	0.0046	0.0018 ***	0.0050	0.0019 ***		
y99ed12to14	0.0057	0.0027 **	0.0064	0.0029 ***		
y99ed15	0.0065	0.0022 ***	0.0070	0.0023 ***		
Rondonia	0.0167	0.0038 ***	0.0167	0.0038 ***	0.0169	0.0038 ***
Acre	0.0224	0.0057 ***	0.0225	0.0057 ***	0.0226	0.0058 ***
Amazonas	0.0079	0.0022 ***	0.0079	0.0022 ***	0.0080	0.0022 ***

Table 4 (cont'd)

P(primtch=1)	Total								
	(I)			(III)			(III)		
	dF/dx	Std. Err		dF/dx	Std. Err		dF/dx	Std. Err	
Roraima	0.0280	0.0076	***	0.0280	0.0076	***	0.0284	0.0077	***
Para	0.0067	0.0016	***	0.0067	0.0016	***	0.0068	0.0016	***
Amapa	0.0244	0.0062	***	0.0244	0.0062	***	0.0247	0.0063	***
Tocantins	0.0402	0.0051	***	0.0401	0.0051	***	0.0406	0.0052	***
Maranhao	0.0537	0.0056	***	0.0541	0.0056	***	0.0538	0.0056	***
Piaui	0.0550	0.0056	***	0.0555	0.0056	***	0.0551	0.0056	***
Ceara	0.0152	0.0020	***	0.0154	0.0020	***	0.0152	0.0020	***
RGNorte	0.0165	0.0029	***	0.0167	0.0030	***	0.0166	0.0030	***
Paraiba	0.0245	0.0033	***	0.0248	0.0034	***	0.0245	0.0033	***
Pernam~o	0.0061	0.0014	***	0.0062	0.0014	***	0.0061	0.0014	***
Alagoas	0.0344	0.0044	***	0.0348	0.0044	***	0.0343	0.0044	***
Sergipe	0.0228	0.0034	***	0.0230	0.0035	***	0.0228	0.0035	***
Bahia	0.0190	0.0020	***	0.0192	0.0021	***	0.0190	0.0020	***
Minas	0.0103	0.0015	***	0.0099	0.0015	***	0.0107	0.0016	***
Espirito	0.0108	0.0024	***	0.0104	0.0024	***	0.0112	0.0025	***
Rio	0.0048	0.0012	***	0.0045	0.0013	***	0.0051	0.0013	***
SaoPaulo	-0.0007	0.0009		-0.0009	0.0009		-0.0005	0.0009	
Parana	0.0033	0.0012	***	0.0030	0.0013	***	0.0035	0.0013	***
SantaCat	0.0085	0.0020	***	0.0082	0.0020	***	0.0089	0.0021	***
RGSul	0.0032	0.0012	***	0.0030	0.0012	***	0.0035	0.0012	***
MGSul	0.0050	0.0019	***	0.0050	0.0019	***	0.0052	0.0019	***
MGrosso	0.0208	0.0030	***	0.0208	0.0030	***	0.0210	0.0030	***
Goiias	0.0148	0.0021	***	0.0148	0.0021	***	0.0149	0.0021	***
obs. P	0.0361			0.0361			0.0361		
pred. P	0.0112			0.0113			0.0114		
N of Observations	343,717			343,717			343,717		

Note: Each specification includes an intercept, the controls for human capital characteristics, years and state effects. The marginal effects significantly different from zero at 1 percent, 5 percent and 10 percent level are indicated with ***, ** and *.

points, suggesting that a growing number of female individuals with more than 8 years of education chose to be a primary teacher after the reform was introduced.

The average estimated effect for female individuals in 1999 indicates that the effect of the reform remains positive and statistically significant after two years for all educational groups, as compared to the base group (ed8to10). There is an increase of 0.65 percentage points in the probability of being a teacher with completed higher education or more compared to the likelihood of being a teacher with 15 or more years of education in 1996 (Table 4, Column I). These results suggest that the reform has attracted more qualified female teachers to primary education.

One of the most important reform effects was the reduction in per pupil revenues disparities within states, as discussed in Chapter 2. School networks in rural areas were commonly poorer than in urban areas, but after the reform, there might be lower differences among schools in rural and urban areas due to the guarantee of minimum per pupil revenues. This suggests that the effect of the reform may differ in urban and rural areas. Table 5 shows the estimated effects for urban areas, and Table 6, shows the estimated effects for rural areas.

In Column I, Table 5, the estimated reform effects for females in urban areas are positive and not statistically significant. I also run a joint significant test for the year dummy variables after the reform implementation and a test for the interaction between year dummies and educational groups after the reform. Both were not statistically significant. These results suggest that even though there was redistribution of revenues from urban to rural areas in the majority of the states, these revenue shifts did not effected the probability of being a female teacher across education groups in urban areas.

Table 5: Estimates of the Reform Effects on Primary Teacher Labor Force Participation
in Urban Areas

P(primtch=1)	Urban					
	(I)		(III)		(III)	
	dF/dx	Std. Err	dF/dx	Std. Err	dF/dx	Std. Err
diff			0.0048	0.0014 ***	0.0041	0.0013 ***
ed9to11	0.0948	0.0051 ***	0.0991	0.0054 ***	0.1030	0.0022 ***
ed12to14	0.3309	0.0187 ***	0.3546	0.0205 ***	0.3689	0.0115 ***
ed15	0.2800	0.0132 ***	0.3263	0.0199 ***	0.3377	0.0151 ***
age	0.0092	0.0049 *	0.0092	0.0049 *	0.0092	0.0050 *
age2	-0.0003	0.0002	-0.0003	0.0002	-0.0003	0.0002
age3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
age4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
white	-0.0017	0.0003 ***	-0.0017	0.0003 ***	-0.0017	0.0003 ***
black	-0.0014	0.0006 **	-0.0014	0.0006 **	-0.0014	0.0006 **
yellow	-0.0068	0.0005 ***	-0.0068	0.0005 ***	-0.0068	0.0005 ***
indigenous	0.0006	0.0036	0.0005	0.0036	0.0005	0.0036
married	0.0039	0.0003 ***	0.0039	0.0003 ***	0.0039	0.0003 ***
childl14	0.0010	0.0003 ***	0.0010	0.0003 ***	0.0010	0.0003 ***
childm14	0.0019	0.0003 ***	0.0019	0.0003 ***	0.0019	0.0003 ***
nonlabor	< 0.0000	0.0000 ***	< 0.0000	0.0000 ***	< 0.0000	0.0000 ***
y95	0.0002	0.0013	0.0000	0.0013	0.0014	0.0004 ***
y97	-0.0008	0.0013	-0.0008	0.0013	-0.0002	0.0004
y98	-0.0020	0.0012	-0.0022	0.0012 *	-0.0011	0.0004 ***
y99	-0.0018	0.0012	-0.0030	0.0011 **	-0.0017	0.0004 ***
y95ed9to11	0.0014	0.0015	0.0018	0.0016		
y95ed12to14	0.0006	0.0018	0.0013	0.0020		
y95ed15	0.0013	0.0016	0.0015	0.0017		
y97ed9to11	0.0006	0.0015	0.0007	0.0015		
y97ed12to14	0.0012	0.0020	0.0014	0.0020		
y97ed15	0.0008	0.0016	0.0006	0.0016		
y98ed9to11	0.0012	0.0016	0.0009	0.0016		
y98ed12to14	0.0013	0.0020	0.0013	0.0021		
y98ed15	0.0022	0.0019	0.0021	0.0018		
y99ed9to11	0.0002	0.0015	0.0010	0.0016		
y99ed12to14	0.0008	0.0019	0.0023	0.0022		
y99ed15	0.0018	0.0018	0.0027	0.0019		
Rondonia	0.0145	0.0034 ***	0.0148	0.0034 ***	0.0147	0.0034 ***
Acre	0.0190	0.0050 ***	0.0195	0.0051 ***	0.0194	0.0051 ***
Amazonas	0.0069	0.0019 ***	0.0070	0.0019 ***	0.0070	0.0019 ***
Roraima	0.0237	0.0067 ***	0.0241	0.0067 ***	0.0242	0.0067 ***
Para	0.0057	0.0014 ***	0.0058	0.0014 ***	0.0058	0.0014 ***
Amapa	0.0210	0.0055 ***	0.0210	0.0055 ***	0.0210	0.0055 ***
Tocant-s	0.0232	0.0040 ***	0.0233	0.0040 ***	0.0234	0.0040 ***
Maranhao	0.0409	0.0056 ***	0.0420	0.0057 ***	0.0418	0.0057 ***

Table 5 (Cont'd)

P(primtch=1)	Urban					
	(I)		(III)		(III)	
	dF/dx	Std. Err	dF/dx	Std. Err	dF/dx	Std. Err
Piaui	0.0349	0.0045 ***	0.0358	0.0046 ***	0.0357	0.0046 ***
Ceara	0.0072	0.0014 ***	0.0075	0.0014 ***	0.0075	0.0014 ***
RGNorte	0.0100	0.0024 ***	0.0104	0.0024 ***	0.0103	0.0024 ***
Paraiba	0.0118	0.0023 ***	0.0124	0.0024 ***	0.0123	0.0024 ***
Pernambuco	0.0040	0.0011 ***	0.0043	0.0011 ***	0.0043	0.0011 ***
Alagoas	0.0235	0.0038 ***	0.0243	0.0038 ***	0.0242	0.0038 ***
Sergipe	0.0152	0.0028 ***	0.0158	0.0029 ***	0.0158	0.0029 ***
Bahia	0.0114	0.0015 ***	0.0118	0.0016 ***	0.0117	0.0016 ***
Minas	0.0072	0.0012 ***	0.0059	0.0012 ***	0.0061	0.0012 ***
Espirito	0.0069	0.0019 ***	0.0056	0.0018 ***	0.0059	0.0018 ***
Rio	0.0035	0.0010 ***	0.0025	0.0010 ***	0.0026	0.0010 ***
SaoPaulo	-0.0005	0.0007	-0.0013	0.0007 *	-0.0012	0.0007
Parana	0.0012	0.0009	0.0005	0.0009	0.0006	0.0009
SantaCat	0.0056	0.0016 ***	0.0046	0.0015 ***	0.0048	0.0016 ***
RGSul	0.0018	0.0009 **	0.0011	0.0009	0.0012	0.0009
MGSul	0.0039	0.0016 ***	0.0040	0.0016 ***	0.0040	0.0016 ***
Mgrosso	0.0122	0.0023 ***	0.0124	0.0023 ***	0.0124	0.0023 ***
Goias	0.0098	0.0017 ***	0.0101	0.0017 ***	0.0101	0.0017 ***
obs. P	0.035		0.035	***	0.035	
pred. P	0.008		0.008	***	0.008	
Number of obs	305264		305264	***	305264	
d chi2(57)	10645		10724	***	10702	
b > chi2	0.000		0.000	***	0.000	
Pseudo R2	0.233		0.233	***	0.233	

Note: Each specification includes an intercept, the controls for human capital characteristics, years and state effects. The marginal effects significantly different from zero at 1 percent, 5 percent and 10 percent level are indicated with ***, ** and *.

In Table 6, Column I shows that the expected positive effects of the FUNDEF reform in rural areas took place only in the second year of the reform implementation, 1999. More specifically, the estimated effect of the reform in the probability of being a female teacher with 9 to 11 years of education compared to 0 to 8 years of education in rural areas is 5.0 percentage points, and this effect is statistically significant at the 1% level. For female teachers with 12 to 14 years of education compared to teachers with 0

to 8 years of education, the effect is 0.61 percentage points, and this is not statistically significant. The largest effect in rural areas occurred for teachers with 15 or more years of education compared to female teachers with 0 to 8 years of education, and represents an increase of 1.96 percentage points. This effect is statistically significant at 10% level. Some fragility in the results for rural areas can be detected. First, the probability of being a teacher for individuals with 9 to 11 years of education was positive before and after the reform. The reform only accentuated the annual trend that has been manifested in previous years during 1999. A second point to be careful about is that I did not observe positive effects of the reform in the year 1998 for female individuals from the education groups of 12 to 14 years of education and 15 or more years of education.

All results for urban areas are not statistically significant.⁴⁸ In rural areas, however, the likelihood of being a primary teacher is positive and significant for teachers with 15 years of education or more in 1998 compared to teachers with 0 to 8 years of education, relative to 1996. Because the participation decisions of males are different than females, separate equations should be estimated for males. However, as mentioned before, because of the small number of male teachers in the sample I prefer to not consider these results reliable to discuss. I found no significant reform effects, but these results may not be accurate due to low number of cases⁴⁹.

⁴⁸ The total number of male primary teachers for urban areas in this sample is 891 and 107 in rural areas.

⁴⁹ For total males, the reform effects through the wage differential is very small, negative and statistically significant. There are not statistically significant effects through the year and education groups' interactions. Similar results are found for male individuals in urban and rural areas. In these areas, the estimated reform effect through wages is negligible, negative and not significant. The estimation results do not support the hypothesis that the change in the wage differential between teachers and non-teachers due to the implementation of the reform may affect the participation of male primary teachers. These results are not robust because of the limited number of cases per year in the sample.

Table 6: Estimates of the Reform Effects on Primary Teacher Labor Force Participation
in Rural Areas

P(primtch=1)	Rural					
	(I)		(II)		(III)	
	dF/dx	Std. Err	DF/dx	Std. Err	dF/dx	Std. Err
diff			-0.0067	0.0021 ***	-0.0133	0.0011 ***
ed9to11	0.1004	0.0109 ***	0.1486	0.0211 ***	0.1960	0.0066 ***
ed12to14	0.4248	0.0329 ***	0.4993	0.0387 ***	0.2863	0.0189 ***
ed15	0.2510	0.0393 ***	0.2313	0.0395 ***	0.2013	0.0163 ***
age	0.0406	0.0227 *	0.0411	0.0228 *	0.0984	0.0225 ***
age2	-0.0020	0.0011 *	-0.0020	0.0011 *	-0.0045	0.0011 ***
age3	< 0.0000	< 0.0000 **	< 0.0000	< 0.0000 **	0.0001	< 0.0000 ***
age4	< -0.0000	< 0.0000 **	< -0.0000	< 0.0000 **	< -0.0000	< 0.0000 ***
white	0.0069	0.0013 ***	0.0068	0.0013 ***	0.0043	0.0013 ***
black	-0.0083	0.0023 ***	-0.0083	0.0023 ***	-0.0090	0.0021 ***
yellow	-0.0080	0.0090	-0.0076	0.0094	-0.0046	0.0115
indigenous	0.0146	0.0366	0.0128	0.0346	0.0099	0.0328
married	0.0054	0.0014 ***	0.0054	0.0014 ***	0.0031	0.0014
child14	-0.0173	0.0017 ***	-0.0170	0.0017 ***	-0.0142	0.0017 ***
Childm14	-0.0057	0.0013 ***	-0.0056	0.0013 ***	-0.0050	0.0013 ***
nonlabor(*1000)	-0.0083	0.0021 ***	-0.0080	0.0020 ***	-0.0085	0.0021 ***
y95	0.0036	0.0027	0.0087	0.0034 ***	0.0131	0.0022 ***
y97	-0.0038	0.0023	0.0003	0.0029	-0.0122	0.0013 ***
y98	-0.0093	0.0021 ***	-0.0034	0.0032	-0.0067	0.0016 ***
y99	-0.0094	0.0020 ***	-0.0021	0.0039	0.0069	0.0025 ***
y95ed9to11	0.0360	0.0092 ***	0.0145	0.0079 **		
y95ed12to14	0.0132	0.0086 *	0.0009	0.0064		
y95ed15	0.0147	0.0132	0.0173	0.0142		
y97ed9to11	0.0307	0.0094 ***	0.0018	0.0072		
Y97ed12to14	-0.0213	0.0011 ***	-0.0214	0.0011 ***		
Y97ed15	-0.0130	0.0022 ***	-0.0098	0.0040		
Y98ed9to11	0.0387	0.0106 ***	0.0070	0.0087		
Y98ed12to14	-0.0029	0.0064	-0.0125	0.0031 **		
Y98ed15	-0.0152	0.0020 ***	-0.0133	0.0026 ***		
Y99ed9to11	0.0504	0.0134 ***	0.0233	0.0111 ***		
Y99ed12to14	0.0061	0.0101	-0.0083	0.0053		
Y99ed15	0.0196	0.0142 *	0.0083	0.0108		
Maranhao	0.1102	0.0260 ***	0.1164	0.0266 ***	0.1298	0.0277 ***
Piaui	0.2587	0.0458 ***	0.2684	0.0464 ***	0.2812	0.0471 ***
Ceara	0.1314	0.0288 ***	0.1364	0.0293 ***	0.1429	0.0302 ***
RGNorte	0.0739	0.0234 ***	0.0773	0.0240 ***	0.0818	0.0246 ***
Paraiba	0.2028	0.0398 ***	0.2114	0.0405 ***	0.2193	0.0411 ***

Table 6: (cont'd)

P(prmtch=1)	Rural					
	(I)		(II)		(III)	
	dF/dx	Std. Err	dF/dx	Std. Err	dF/dx	Std. Err
Pernambuco	0.0473	0.0164 ***	0.0523	0.0173 ***	0.0553	0.0175 ***
Alagoas	0.1430	0.0339 ***	0.1507	0.0348 ***	0.1606	0.0358 ***
Sergipe	0.1470	0.0367 ***	0.1541	0.0376 ***	0.1612	0.0384 ***
Bahia	0.1510	0.0281 ***	0.1589	0.0286 ***	0.1645	0.0288 ***
Minas	0.1470	0.0264 ***	0.1553	0.0269 ***	0.1752	0.0287 ***
Espirito	0.0867	0.0293 ***	0.0962	0.0309 ***	0.1165	0.0338 ***
Rio	0.0277	0.0132 ***	0.0292	0.0135 ***	0.0302	0.0135 ***
SaoPaulo	0.0025	0.0068	0.0049	0.0073	0.0041	0.0070
Parana	0.0535	0.0185 ***	0.0506	0.0178 ***	0.0408	0.0156 ***
SantaCatarina	0.0287	0.0150 ***	0.0245	0.0139 **	0.0205	0.0122 **
RGSul	0.0271	0.0117 ***	0.0264	0.0115 ***	0.0341	0.0129 ***
MGSul	0.0190	0.0169	0.0145	0.0161	0.0158	0.0165
MGrosso	0.2122	0.0427 ***	0.2249	0.0443 ***	0.2572	0.0468 ***
Goiias	0.1356	0.0304 ***	0.1408	0.0311 ***	0.1198	0.0290 ***
obs. P	0.0518		0.0518		0.0518	
pred. P	0.0168		0.0168		0.0168	
N of Observations	42,095		42,085		42,085	

Note: Each specification includes an intercept, the controls for human capital characteristics, years and state effects. The marginal effects significantly different from zero at 1 percent, 5 percent and 10 percent level are indicated with ***, ** and *.

The structural model for labor force participation.

Wage equations

Already in 1998, changes in average wages were observed.⁵⁰ The effect of the reform on primary teacher wages controlling for other observable characteristics is positive and statistically significant. Since the wage difference between primary teachers and all other workers is one of the main determinants of whether the individual chooses primary teaching or not, the changes in the wage difference over time may influence the

⁵⁰ See Sevilla, 2001. (Chapter 2).

probability of being a primary teacher. In order to test this hypothesis, I add the predicted difference between primary teacher and non-primary teacher wages, to capture the effect of the reform through wages.

Labor supply estimates using the structural model

The results for the structural model are presented in Columns II and III for females (Tables 4, 5, and 6). In Columns II, the specification captures reform effects through the predicted wage difference between primary teachers and all other workers (variable *diff*), and through the year dummy and education group variables interactions. These interactions allow other reform effects which may affect the decision to go into teaching that are not captured through the wage difference. In Columns III, I exclude the interaction terms between year dummies and educational groups to observe if there are changes in the effects captured specifically by the wage difference variable (*diff*).

For female primary teachers, (Table 4, Column II), when I use the total sample of females, the predicted wage differential between primary teachers and all other workers has a positive effect on the likelihood of being a primary teacher. The marginal change for this variable is 0.0013, but it is not statistically significant.

This positive effect becomes larger and statistically significant for females in urban areas (Table 5, Column II). The estimated effect is 0.0048 and it is significant at the 1 percent level. For example, a 20% increase in the difference between primary and non-primary teacher hourly natural logarithm of wage rates found would increase by 0.001 the labor force participation of female teachers, i.e. one additional teacher hired for each 1000 newly hired teachers due to this 20% increase on the relative wage differential after the reform. For females in rural areas, the effect of the predicted wage differential in

the probability of being a primary teacher is -0.0067 and this is statistically significant. These results suggest that while the effect of the reform captured by changes in the predicted wage difference is positive in urban areas, it is negative for females in rural areas. The estimated reform effect for rural areas is surprising, considering the fact that the reform may increase wages for teachers and make this occupation more attractive. One explanation would be that there might not be enough individuals that would be qualified to become teachers. Since the reform effects are captured by the wage difference variable (*diff*), the year and education group interactions show small effects. Some of the variation explained by these interactions is already captured by the predicted wage difference variable.⁵¹

Conclusions

In this chapter, I study the effects of the FUNDEF reform on the primary teacher participation behavior. I examine to what extent the likelihood of being a primary education teacher changed after the reform implementation in two ways: first, I apply the difference-in-differences framework to analyze whether there are differences in the probability of being a primary teacher across education groups before and after the reform, and second, I define the wage difference between primary teacher and all other workers by regions and education group, and use this predicted wage difference to measure the effect of the reform on the primary teacher participation.

On average, the difference-in-differences estimations suggest that the reform may have been successful in attracting more qualified female teachers in the first two years of

⁵¹ This is clear when I exclude the year and education group's interactions, in Column III. In that case, the reform effect through wage remains significant and stronger (-0.0133).

the reform implementation, but these effects vary by location. The reform effect is stronger for females in rural areas compared to females in urban areas. However when I attempt to capture the effect of reform by using predicted wage differences I found a positive reform effect for females in urban areas and negative reform effect for females in rural areas. One explanation for these contrasting effects can be that the pool of workers that can be attracted into teaching is limited in rural areas compared to urban areas. If this is the case, when the reform increased teacher wages, it was possible to observe increasing number of individuals going into primary teaching in urban areas. This is consistent with the estimation results found in this analysis. However, in rural areas the increases on wages brought by the reform may not be larger enough to attract more teachers. Qualified workers from other jobs or from the pool of unemployed in rural areas might find even better wages in other occupations. Nevertheless, since it is difficult to explain the results obtained for females in rural areas, this specification would benefit from replicating the same empirical framework using different data set.

Even though I do not report the results for males, in urban areas, the estimation results from both specifications suggest that the probability of being a male primary teacher may not be altered by the FUNDEF reform. Again, this might be due to the small number of cases observed that don't allow me to drive reasonable conclusions for the possible effects of the reform for this specific group.

For the specification including the wage differential, the results are not homogeneous for females from urban and rural areas. I found significant effects of the reform for females in urban areas. It may be the case that resources allocated to primary education are differently spent, so increases in revenues may be invested in teacher

training rather than or in addition to increases on wages. In that case, the size of the wage differential may be important to influence the participation decision of more qualified individuals, particularly in rural areas. This may happen because of other job opportunities that pay better in rural areas, or because of shortage of qualified teachers in those areas.

The results of the labor supply analysis are important. The fact that changing the distribution of resources and implementing a more equitable school finance mechanism also supports making the teaching career more attractive is surprising. Even though the impact on labor supply were very small, the fact that there was an impact at all, and this happened after only two years of reform implementation, highlights already improvements in the education policy that, in the future, might reflect on improvements in the quality of the teaching-learning process.

CONCLUSION

There was a large expansion of the Brazilian system in the last thirty years. This expansion undermined the quality of the system, which declined over time. This decline is associated with the expansion developed under a decentralized education structure, which reinforced an implicit collaboration between systems that provide basic education. However, the implicit collaboration, under a context of several parallel networks of schooling offering the same service, ended up leaving decisions about who is responsible for providing primary education to the discretion of state and municipal politics. The education system expansion was also based on hiring a large number of low educated teachers and without monitoring and accountability mechanisms to guarantee the use of the constitutionally mandated tax revenues on primary education, for example, to train the unqualified teachers.

The FUNDEF reform were able to address these problems by significantly changing the average per pupil revenues in primary education in certain school networks, and by mandating that a specific share of these funds were invested on teacher training and wages expenditures. This analysis demonstrated that the new policy produced changes in the quality of the teacher labor force (as defined by level of education, years of experience, and average wage rates), even though the effects were not homogeneous in the country. In fact, the positive impact on teacher wages and on the supply of teachers is still linked to location and teacher's level of education.

During the first two years of reform implementation, there have been significant increases in wage rates for primary teachers in municipal schools compared to non-primary teacher workers and compared to primary teachers in other school networks. This may constitute the most important impact of the reform since wages in municipal schools were below the optimum, particularly in rural areas. Because of these low wages, teachers attracted to the system in these areas were less qualified and used to moonlight, absenteeism was high and quality of education was low.

The second remarkable finding is that for teachers with lower quality of education, there were also increases on wages. In principle, this effect is what we would like to avoid, but this might serve as incentives for less educated teachers to participate in in-service trainings, improve their practice and remain in the system. In that case, despite the low number of education years completed, these teachers may have concluded in-service trainings and are now receiving higher wages.

Third, the effects were larger in the least developed regions in the country, reflecting the large disparity in financing predominant between North and South Regions and between metropolitan urban areas and distant rural areas, now alleviated after the reform. Because currently there are virtually no differences in revenues per pupil within each state based on the main taxes allocated to primary education, the drastic disparities among public schools revenues were overcome and low revenue municipalities were able to increase expenditures on teacher wages. In addition, disparities among states were also minimized since complementary role of federal transfers guarantee a national minimum standard for expenditures per pupil.

Finally, and less expected were the reform effects on the labor supply of primary teachers. Even though the effects were very small, it is surprising that we observe any effect at all. It is unexpected because the gap between increases in revenues, policy reform to improve wages, and dissemination of the results to the prospective teachers in order to change labor participation decisions is usually large.

FUNDEF has proven a successful policy reform for primary education in Brazil. However, there are still challenges this reform has to overcome in order to achieve a positive impact on quality of learning. The ultimate goal of this policy is to reduce inequalities and to enhance education quality through guaranteeing the means for implementing minimum standards of quality education. The definition of the minimum revenues per pupil based on the availability of resources may not address the needs. Minimum revenues per pupil do not guarantee per se equal opportunity to learn. Basic standards of quality schooling demand more than minimum revenues per pupil. If this minimum is not able to cover all expenses for improving the physical environment of the schools, enhancing the teaching-learning and pedagogical conditions, and improving the quality of the teaching force may not be guaranteed.⁵² Inequalities were minimized, but there is the need to define operational minimum quality standards and assess how much implementing these standards would cost. New policies should address the problem of how to sustain and improve the education quality over time under scarcity of resources.

There is also the need to improve the system of educational statistics to guarantee better data about students, schools, educational programs, and particularly teachers. Any assessment of educational quality and the evaluation of the impact of policies and programs

⁵² For a conceptual framework of factors influencing school quality, see Carron, G. and Chau Ta Ngoc (1996). The quality of primary schools in different development contexts. UNESCO/IIEP.

demand data at school or even classroom level. If a system want to invest in the quality of its workforce, than a better information system on teacher training, supervision, and incentives tailored to teacher outputs is necessary.

Another important aspect of the education policy reform process that cannot be neglected is the relationship between interventions in primary education level and the other education levels in the system. If guaranteeing resources for primary education limits or reduces expenditures at other levels of education, this consequence may in the future affect primary education too. There are several studies that discuss the importance of pre-primary education for the development of children. Therefore, if this policy reduces the access of children to pre-primary education, the policy may have negative impacts on the quality of primary education, as well. Also, expansion of completion rates in primary education may create larger demand for secondary education that will not be possible to meet, since lack of resources may lead to less investment in the expansion of secondary schools.

Qualified teachers at other levels of education may decide to migrate to primary education decreasing the quality of secondary education. Without good secondary education, it is possible that low quality students tend to look for less demanding post-secondary studies, for example, pedagogy and teacher preparation programs. Consequently, the supply of teachers may be affected. Even though primary education may offer better wages, neglecting secondary education reform may bring future shortage of qualified workers even to attend the primary education.

The impact of the reform in terms of improving equality of revenues and wages of teachers, and even a slight positive effect on supply of teachers was observed. There are additional indirect gains with the reform. First, it facilitated the social control over the use

of resources exclusively for primary education; accountability is more efficient. The existence of a unique fund facilitates the identification of the revenue sources, the amount of monies and dates of entrance, the total expenditures, and the revenues of the financial applications. Second, not every state and municipal administrations possess, individually, the financial capacity for covering the full costs of quality education. The conjunction of state and municipal administration efforts to cover the demand for education through the FUNDEF fund strengthened the collaboration and use of resources in education without weakening school management autonomy. With resources linked to particular responsibilities, like educating a specific number of students, responsibility between municipal and state administrations within states is clear. Equal distribution of costs and expenses are possible because the federal government is able to execute its complementary role of providing minimum resources necessary in those places where needs and poverty are greater.

The federal government assumes a strong regulatory role in the system. It defines the minimum quality, i.e. minimum revenues per pupil spent annually, despite the fact that the delivery systems is completely decentralized and have the responsibility to implement the reform. It also intervenes in teacher policies and labor markets setting the expected minimum wage for teachers in primary education. Even though the focus of the analysis is on the finance of the system, the complex relations of all these features of the education may be mentioned if we are to understand how money may affect the quality of education. FUNDEF is a successful example of a first step toward improving education quality in the system.

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APPENDIX

APPENDIX A: Description of Terms

Basic education – Organized predominantly in annual grades, but may occur in cycles, semester periods, etc. Divided in to early childhood education (pre-school - for children until three years of age, and kindergarten– for children until six years of age), primary education (for children above seven years of age), and secondary education (for children above fifteen years of age).

Primary education – Composed of a minimum of eight years of compulsory education. Free in all public schools for all Brazilian citizens, independent of age.

Public education – Education provided by public institutions. Public primary education is provided by state and municipal school networks⁵³ and financed by state and municipal taxes and inter and intra-governmental transfers.

National educational system – The aggregate educational system. All schools, institutions and governmental structures related to education. It includes the Ministry of Education and state and municipal secretaries of education, public foundations, private and public schools in the Brazilian territory.

School network – Schools under a specific educational system administration. For example, state school network is all schools in the system under the finance and management of the state government. Municipal school network is all schools in specific municipality under the finance and management of the municipal government. Municipal

⁵³ There are still some primary schools under the administration of federal government. They are residual from the centralized system and correspond mainly to frontiers' schools.

and state school networks follow the state educational legislation, and the national educational legislation. Municipal school networks also follow specific municipal educational legislation that cannot contradict the state and national legislation.

APPENDIX B: Structure of the Brazilian System

Figure 7: Structure of the Educational System

Graduate	Doctorate	
	Master	

Higher Education (Duration from 3 to 6 years)	6th
	5th
	4th
	3rd
	2nd
	1st

Selective Processes		
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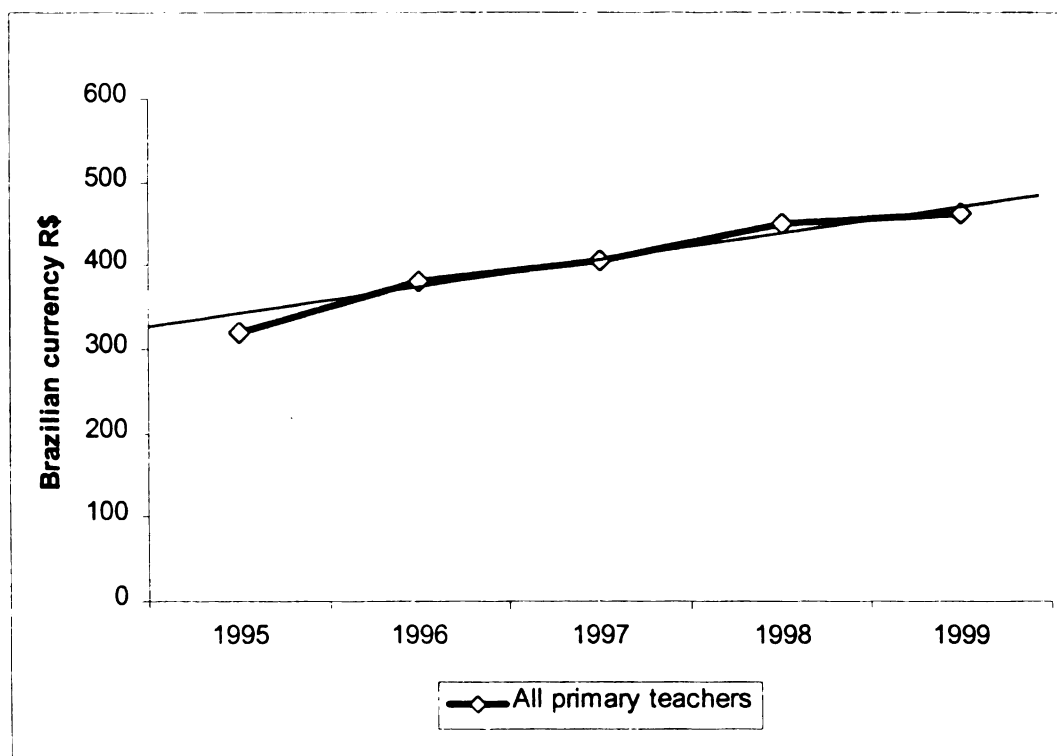
Basic Education	18	Secondary Education	4th year
	17		3rd year
	16		2nd year
	15		1st year
	14	Primary Education	8th grade
	13		7th grade
	12		6th grade
	11		5th grade
	10		4th grade
	9		3rd grade
	8		2nd grade
	7		1st grade
	4 - 6	Child Education	Kindergarten
	0 - 3		Pre-school

Source: Adapted from Gomes, 1998.

APPENDIX C: Interpretation of Parameters under the Difference-in-differences (DD) and Difference-in-difference-in-differences (DDD) Frameworks

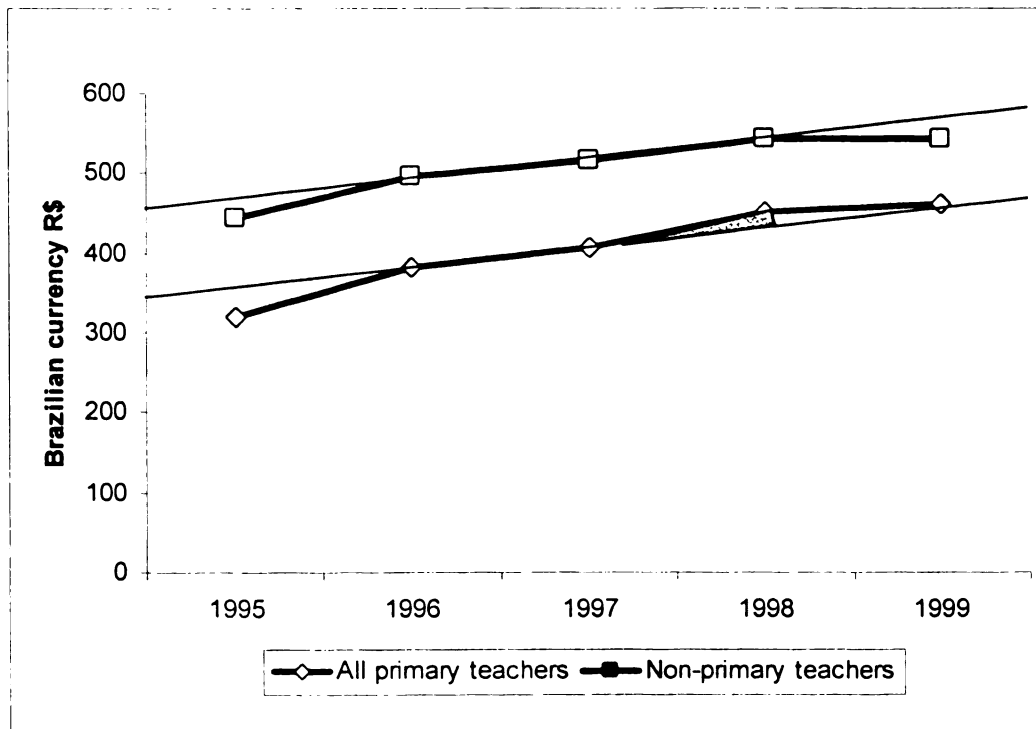
The example below is a representation of the methodology applied in the analysis of independently pooled cross section data used in this study. For every year, we have a random sample on hourly wages, education, experience, and so on, from the population of workers and non-workers in Brazil. Since the sample is independently pooled cross section, we allow the intercept to differ across years to capture differences in the population distributions over time. The question of interest is whether the teacher wages have increased with the FUNDEF implementation after controlling for human capital individual characteristics and others. Figure 8 below shows a positive increase in average teacher wages over time in Brazil.

Figure 8: Teacher Wages Trend, Brazil 1995-1999



However, it is not possible to affirm that this increase on wages was due to the reform since the growth seems to be a trend that might have happened with other workers too. For that reason, we include the control group of other workers to observe if the changes are particular to teacher wages, which ought to be affected by the reform. Therefore, the question of interest become whether *relative* teacher wages have changed before and after the reform implementation. The change on wages due to the reform is represented in the shaded area below, corresponding to a change in the slope of the trend line (dashed line).

Figure 9: Teacher Wage Gap Trend, Brazil 1995-1999



The estimation equation is be represented by the model:

$$\ln wage = \beta_0 + \beta_1 y98 + \beta_2 primtch + \alpha_1 y98 * primtch + e \quad (1)$$

The parameter of interest is α_1 that captures (A) the difference between primary teacher *lnwage* before and after the reform ($P_{98}-P_{96}$) relative to the same difference between non-teacher *lnwage* before and after ($O_{98}-O_{96}$), or rewriting the equation, (B) the relative difference between primary teacher and non-teachers *lnwage* between 1996 and 1998 (See Figure below).

Figure 10: Difference-in-differences Estimation Specification

	Before FUNDEF (1996)	After FUNDEF (1998)	After-Before
Treatment Group (Primary teacher)	P_{96}	P_{98}	$P_{98}-P_{96}$
Control Group (Other workers)	O_{96}	O_{98}	$O_{98}-O_{96}$
(A) Difference-in-differences estimation	$\alpha_1 = (P_{98} - P_{96}) - (O_{98}-O_{96})$		
(B) Difference-in-differences estimation	$\alpha_1 = (P_{98} - O_{98}) - (P_{96} -O_{96})$		

In the equation (1), the specification assumes the reform is the unique source of variation on teacher wages. However, it is likely that municipal and state networks of schooling responded differently to the gains or losses in revenues brought with FUNDEF. In order to capture these differentiated reform effects, I estimated the difference-in-difference-in-difference framework.

The estimation equation is be represented by the model:

$$\ln wage = \beta_0 + \beta_1 y98 + \beta_2 primtch + \beta_3 municipal + \alpha_1 y98 * primtch + \alpha_2 y98 * municipal + \gamma_1 y98 * primtch * municipal + e \quad (2)$$

The parameter of interest is γ_1 that captures (A) the difference between primary teacher *lnwage* in municipal schools before and after the reform ($P_{98}-P_{96}$) relative to the same difference between non-teacher *lnwage* before and after ($O_{98}-O_{96}$) who work for

municipal administration, compared to the same difference for teachers and workers in other administrations, or rewriting the equation, (B) the relative difference between primary teacher and non-teachers *lnwage* between 1996 and 1998 in municipal administrations compared to the same difference for workers (teachers and non-teachers) in other administrations (Figure 11).

Figure 11: Difference-in-difference-in-differences Specification

		Before FUNDEF (1996)	After FUNDEF (1998)	After-Before
Municipal (M)	Treatment Group (Primary teacher)	P _{M96}	P _{M98}	(P ₉₈ -P ₉₆) _M
	Control Group (Other workers)	O _{M96}	O _{M98}	(O ₉₈ -O ₉₆) _A
	Difference-in-difference		[(P ₉₈ - O ₉₈) - (P ₉₆ -O ₉₆)] _M	
Other administrations (A)	Treatment Group (Primary teacher)	P _{A96}	P _{A98}	(P ₉₈ -P ₉₆) _M
	Control Group (Other workers)	O _{A96}	O _{A98}	(O ₉₈ -O ₉₆) _A
	Difference-in-difference		[(P ₉₈ - O ₉₈) - (P ₉₆ -O ₉₆)] _A	
(A) Difference-in-difference-in-difference estimation		$\gamma_1 = [(P_{98}- P_{96})_M - (P_{98}- P_{96})_A] - [(O_{98}-O_{96})_M - (O_{96}-O_{96})_A]$		
(B) Difference-in-difference-in-difference estimation		$\gamma_1 = [(P_{98}- O_{98}) - (P_{96}-O_{96})]_M - [(P_{98}- O_{98}) - (P_{96}-O_{96})]_A$		

The equation (2) identifies relative changes in wages caused by the reform comparing the effect among the types of administration, municipal and other administrations.

APPENDIX D: Tables

Table 1A: FUNDEF Balance

States	Total Enrollment	Revenues Sources						FUNDEF Total	Per Pupil Average (in real)	Per Pupil (in dollars) (4)
		FPE*	FPM*	IPI-EXP*	Federal Transfers (2)	LC 87/96*	ICMS*			
AC	128650	56038	9706	7	0	707	11655	78112	607	304
AL	530316	68145	42175	355	1300	2822	63273	178070	336	168
AM	543515	45708	24615	1306	0	4194	155247	231071	425	213
AP	108368	55890	7125	110	0	2105	9513	74743	690	345
BA	2822720	153915	163974	13573	112330	14285	396113	854189	303	151
CE	1499510	120182	96025	2082	48202	6030	195529	468050	312	156
ES	533965	24571	32611	10945	0	11920	166924	246970	463	231
GO	1003255	46572	67952	1748	0	0	230900	347171	346	173
MA(2)	1338452	118238	75333	3466	130500	7040	52985	387561	290	145
MG	3468839	72967	240880	32616	0	50628	831643	1228734	354	177
MS	393004	21819	28154	964	0	10252	82564	143752	366	183
MT(2)	493594	37805	35140	2179	0	8912	123776	207811	421	211
PA(3)	1394025	100118	66408	12442	97502	27923	118541	432802	303	152
PB	691314	78445	59740	733	3164	0	80363	222444	322	161
PE	1511462	113029	93758	2456	10535	5318	249024	474119	314	157
PI	602203	70787	45822	434	21418	503	45099	184061	306	153
PR	1651437	47228	126877	23714	0	54313	438574	690707	418	209
RJ	1729001	25025	56319	12078	0	27841	948405	1069668	619	309
RN	544131	68436	45118	514	0	0	74297	188366	346	173
RO	275003	46121	15541	151	0	0	44906	106719	388	194
RR	62375	40635	5038	43	0	150	10344	56210	901	451
RS	1578410	38573	125550	44212	0	62971	614519	885825	561	281
SC	888794	20964	71380	23908	0	16082	291264	423597	477	238
SE	371886	68066	25491	336	0	0	52833	146726	395	197
SP	5710410	16381	243953	47598	0	9	3446204	3754144	657	329
TO	323127	71092	28255	20	0	0	24369	123735	383	191
Total	30535072	1638053	1838315	237989	424949	314004	8758861	13222041	433	216

Source: SIAFI/Secretaria do Tesouro Nacional

(2) Enrollment data defined by Portaria nº 319, de 16.04.98.

(3) In the state of Pará, the FUNDEF total includes the amount of R\$ 3.477.422,79 the federal complementary transfers from July to December of 1997.

(4) Exchange rate US\$1.00=R\$0.50.

* *Fundo de Participação do Estado (FPE)* - Share of Income and Property tax from rural areas collected at federal level; *Fundo de Participação dos Municípios (FPM)* - Share of Income and Property tax from rural areas collected at federal level; *Imposto sobre produtos para exportação (IPI-EXP)* - *Export Tax*; *LC86/97* - *Complementary Sale Tax*; *Imposto sobre Circulação de Mercadorias* - *ICMS* - *Sale tax collected at state level*.

Table 2A: Total Sample Size and Sub-Samples with Restrictions

Year	Original Sample			Sub-sample with Restrictions *			Sub-sample of Teachers						
	Total	Non-Teachers	Teachers	Total Sample	Non-Teachers	Teachers	Total Sample of Teachers	Pre-school	Primary	Secondary	Vocational	Others	Higher Education
1995	334,248 100.0	329,546 98.59	4,702 1.41	101,303 100.0	96,725 95.5	4,578 4.5	4,578 100.00	379 8.28	3,054 66.71	197 4.30	526 11.49	185 4.04	237 5.18
1996	331,228 100.0	326,504 98.57	4,724 1.43	99,563 100.0	94,980 95.4	4,583 4.6	4,583 100.00	385 8.40	2,869 62.60	204 4.45	648 14.14	261 5.69	216 4.71
1997	296,596 100.0	291,970 98.44	4,626 1.57	89,234 100.0	84,747 95.0	4,487 5.0	4,487 100.00	344 7.67	2,844 63.38	223 4.97	658 14.66	233 5.19	185 4.12
1998	344,949 100.0	339,940 98.55	5,009 1.45	104,781 100.0	99,932 95.4	4,849 4.6	4,849 100.00	400 8.25	3,009 62.05	269 5.55	682 14.06	231 4.76	258 5.32
1999	352,382 100.0	347,154 98.52	5,228 1.47	106,835 100.0	101,752 95.2	5,083 4.8	5,083 100.00	381 7.50	3,182 62.60	266 5.23	726 14.28	278 5.47	250 4.92
Total	1,659,403 100.0	1,635,114 98.54	24,289 1.47	501,716 100.0	478,136 95.3	23,580 4.7	23,580 100.00	1,889 8.01	14,958 63.44	1,159 4.92	3,240 13.74	1,188 5.04	1,146 4.86
Day shift	314,002	292,544	21,458	302,172	281,102	21,070	21,070	1,802	13,859	767	2,820	782	1,041

Source: PNAD/IBGE, several years.

* For the labor supply estimations, total sample includes non-workers (N=599,360)

Table 3A: Description of Variables, Means and Standard Deviations for Primary Teachers and Non-Primary Teachers, Brazil - 1995-

1999

Variable	1995		1996		1997		1998		1999	
	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers
lwage1	0.51	0.77	0.64	0.96	0.68	1.02	0.73	1.17	0.74	1.22
Natural logarithmic of wage rate	(0.93)	(0.76)	(0.92)	(0.75)	(0.92)	(0.73)	(0.91)	(0.64)	(0.90)	(0.64)
hourww1	42.52	29.12	42.68	29.23	42.29	29.51	42.57	29.69	42.35	28.93
Hours of work per week	(9.86)	(10.38)	(10.76)	(10.65)	(10.40)	(10.43)	(10.83)	(10.39)	(10.41)	(10.37)
education	8.55	12.87	8.72	12.94	9.00	13.03	8.95	13.21	9.14	13.27
Years of education	(4.18)	(2.59)	(4.17)	(2.56)	(4.14)	(2.45)	(4.18)	(2.28)	(4.13)	(2.23)
age	32.31	33.63	32.38	34.30	31.70	34.56	32.59	34.91	32.81	34.76
Age	(11.10)	(9.28)	(11.12)	(9.81)	(11.04)	(9.47)	(11.11)	(9.55)	(11.13)	(9.53)
tenure	5.07	8.19	5.07	8.73	4.86	8.72	5.04	9.00	5.11	8.80
Years of work experience in main occupation	(6.51)	(7.23)	(6.47)	(7.64)	(6.34)	(7.52)	(6.50)	(7.66)	(6.47)	(7.51)
female	0.36	0.92	0.37	0.91	0.40	0.93	0.37	0.92	0.38	0.91
Proportion of females	(0.48)	(0.27)	(0.48)	(0.28)	(0.49)	(0.26)	(0.48)	(0.28)	(0.48)	(0.29)
white	0.57	0.59	0.57	0.59	0.57	0.59	0.56	0.59	0.56	0.57
Proportion of whites	(0.50)	(0.49)	(0.50)	(0.49)	(0.50)	(0.49)	(0.50)	(0.49)	(0.50)	(0.49)
mixed	0.37	0.38	0.36	0.37	0.37	0.37	0.37	0.36	0.38	0.38
Proportion of mixed	(0.48)	(0.49)	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)	(0.49)
black	0.05	0.03	0.06	0.04	0.06	0.03	0.06	0.03	0.05	0.04
Proportion of blacks	(0.23)	(0.16)	(0.24)	(0.19)	(0.24)	(0.18)	(0.24)	(0.18)	(0.23)	(0.20)
yellow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Proportion of yellow	(0.06)	(0.05)	(0.06)	(0.05)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.03)
indigenous	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Proportion of indigenous	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.06)	(0.04)	(0.03)
union	0.25	0.33	0.23	0.34	0.22	0.33	0.22	0.33	0.22	0.35
Proportion of unionized workers	(0.43)	(0.47)	(0.42)	(0.47)	(0.42)	(0.47)	(0.42)	(0.47)	(0.41)	(0.48)

Table 3A (cont'd)

Variable	1995		1996		1997		1998		1999	
	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers
urban	0.93	0.85	0.92	0.86	0.93	0.86	0.91	0.86	0.92	0.86
Proportion of workers living in urban areas	(0.25)	(0.35)	(0.26)	(0.35)	(0.26)	(0.35)	(0.28)	(0.35)	(0.28)	(0.35)
federal	0.06	0.00	0.06	0.01	0.06	0.00	0.06	0.01	0.06	0.01
Proportion of workers in federal jobs	(0.24)	(0.07)	(0.23)	(0.10)	(0.23)	(0.06)	(0.24)	(0.08)	(0.23)	(0.09)
state	0.10	0.47	0.10	0.46	0.09	0.43	0.09	0.41	0.09	0.40
Proportion of workers in state jobs	(0.30)	(0.50)	(0.30)	(0.50)	(0.29)	(0.50)	(0.28)	(0.49)	(0.28)	(0.49)
municipal	0.08	0.36	0.08	0.35	0.08	0.37	0.08	0.40	0.09	0.41
Proportion of workers in municipal jobs	(0.27)	(0.48)	(0.27)	(0.48)	(0.27)	(0.48)	(0.28)	(0.49)	(0.28)	(0.49)
private	0.76	0.16	0.76	0.18	0.77	0.19	0.77	0.18	0.77	0.18
Proportion of workers in the private sector	(0.43)	(0.37)	(0.42)	(0.38)	(0.42)	(0.39)	(0.42)	(0.38)	(0.42)	(0.39)
Number of Cases	58362	2820	57967	2667	51581	2665	60110	2787	60293	2920

Table 4A: Estimates of the reform effect on primary teachers' wages (Dependent variable: Natural Logarithm of Wage rates)

lwage1	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.
educ1yr	-0.081 (0.237)	0.082 (0.010)***	0.082 (0.010)***	0.082 (0.010)***	0.084 (0.010)***	0.084 (0.010)***	0.082 (0.010)***	0.084 (0.010)***
educ2yr	-0.233 (0.259)	0.104 (0.007)***	0.102 (0.007)***	0.103 (0.007)***	0.108 (0.007)***	0.106 (0.007)***	0.106 (0.007)***	0.106 (0.007)***
educ3yr	0.166 (0.202)	0.157 (0.007)***	0.155 (0.007)***	0.156 (0.007)***	0.163 (0.007)***	0.159 (0.006)***	0.159 (0.006)***	0.159 (0.006)***
educ4yr	-0.147 (0.187)	0.226 (0.006)***	0.222 (0.006)***	0.224 (0.006)***	0.230 (0.006)***	0.225 (0.005)***	0.227 (0.006)***	0.225 (0.005)***
educ5yr	-0.034 (0.191)	0.281 (0.006)***	0.277 (0.006)***	0.280 (0.006)***	0.285 (0.006)***	0.279 (0.006)***	0.284 (0.006)***	0.279 (0.006)***
educ6yr	0.035 (0.196)	0.347 (0.007)***	0.342 (0.007)***	0.345 (0.007)***	0.349 (0.007)***	0.342 (0.006)***	0.348 (0.007)***	0.342 (0.006)***
educ7yr	0.058 (0.190)	0.392 (0.006)***	0.387 (0.006)***	0.390 (0.006)***	0.392 (0.006)***	0.385 (0.006)***	0.393 (0.006)***	0.385 (0.006)***
educ8yr	0.040 (0.185)	0.488 (0.006)***	0.483 (0.006)***	0.485 (0.006)***	0.485 (0.006)***	0.477 (0.006)***	0.487 (0.006)***	0.477 (0.006)***
educ9yr	0.131 (0.186)	0.563 (0.007)***	0.559 (0.007)***	0.560 (0.007)***	0.554 (0.007)***	0.544 (0.007)***	0.559 (0.007)***	0.544 (0.007)***
educ10yr	0.270 (0.185)	0.642 (0.007)***	0.638 (0.007)***	0.638 (0.007)***	0.628 (0.007)***	0.619 (0.007)***	0.637 (0.007)***	0.619 (0.007)***
educ11yr	0.459 (0.182)**	0.879 (0.006)***	0.873 (0.006)***	0.874 (0.006)***	0.862 (0.006)***	0.849 (0.006)***	0.871 (0.006)***	0.849 (0.006)***
educ12yr	0.567 (0.183)***	1.128 (0.010)***	1.124 (0.010)***	1.123 (0.010)***	1.098 (0.010)***	1.085 (0.010)***	1.113 (0.010)***	1.085 (0.010)***
educ13yr	0.683 (0.183)***	1.286 (0.011)***	1.280 (0.011)***	1.280 (0.011)***	1.246 (0.011)***	1.228 (0.011)***	1.268 (0.011)***	1.228 (0.011)***
educ14yr	0.752 (0.183)***	1.377 (0.010)***	1.371 (0.010)***	1.371 (0.010)***	1.339 (0.010)***	1.320 (0.010)***	1.358 (0.010)***	1.320 (0.010)***
educ15yr	0.869 (0.183)***	1.717 (0.007)***	1.712 (0.007)***	1.710 (0.007)***	1.669 (0.007)***	1.648 (0.007)***	1.694 (0.007)***	1.648 (0.007)***
age	0.221 (0.057)***	0.208 (0.009)***	0.209 (0.009)***	0.209 (0.009)***	0.219 (0.009)***	0.224 (0.009)***	0.214 (0.009)***	0.224 (0.009)***
age2	-0.008 (0.002)***	-0.006 (0.000)***	-0.006 (0.000)***	-0.006 (0.000)***	-0.007 (0.000)***	-0.007 (0.000)***	-0.006 (0.000)***	-0.007 (0.000)***
age3	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***
age4	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***
tenure	0.016 (0.002)***	0.032 (0.001)***	0.033 (0.001)***	0.032 (0.001)***	0.030 (0.001)***	0.030 (0.001)***	0.030 (0.001)***	0.030 (0.001)***
tenure2	0.000 (0.000)	0.000 (0.000)***	-0.001 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***	0.000 (0.000)***
female	-0.113 (0.016)***	-0.299 (0.002)***	-0.290 (0.002)***	-0.301 (0.002)***	-0.291 (0.002)***	-0.289 (0.002)***	-0.307 (0.002)***	-0.289 (0.002)***
white	0.060 (0.010)***	0.105 (0.003)***	0.104 (0.003)***	0.105 (0.003)***	0.104 (0.003)***	0.104 (0.003)***	0.106 (0.003)***	0.104 (0.003)***
black	-0.008 (0.024)	-0.044 (0.005)***	-0.044 (0.005)***	-0.044 (0.005)***	-0.046 (0.005)***	-0.047 (0.005)***	-0.045 (0.005)***	-0.047 (0.005)***
yellow	-0.051 (0.081)	0.173 (0.022)***	0.170 (0.022)***	0.174 (0.022)***	0.175 (0.021)***	0.175 (0.021)***	0.179 (0.022)***	0.175 (0.021)***
indigenous	0.178 (0.120)	0.054 (0.029)*	0.052 (0.029)*	0.056 (0.029)*	0.053 (0.029)*	0.052 (0.029)*	0.057 (0.029)*	0.052 (0.029)*
union	0.150 (0.010)***	0.189 (0.003)***	0.187 (0.003)***	0.190 (0.003)***	0.181 (0.003)***	0.179 (0.003)***	0.189 (0.003)***	0.179 (0.003)***
urban1	0.130 (0.014)***	0.089 (0.004)***	0.081 (0.004)***	0.091 (0.004)***	0.097 (0.004)***	0.091 (0.004)***	0.095 (0.004)***	0.091 (0.004)***
municipal	-0.172 (0.014)***		-0.145 (0.009)***			-0.115 (0.009)***		
state	-0.117 (0.014)***			0.006 (0.009)		0.038 (0.009)***		0.462 (0.014)***
federal	0.356 (0.074)***				0.342 (0.011)***	0.347 (0.011)***		0.153 (0.012)***
private							-0.045 (0.006)***	0.115 (0.009)***
privmth		-0.134 (0.012)***	-0.102 (0.012)***	-0.131 (0.012)***	-0.095 (0.012)***	-0.071 (0.013)***	-0.140 (0.013)***	-0.071 (0.013)***
y95	-0.156 (0.014)***	-0.120 (0.004)***	-0.116 (0.004)***	-0.124 (0.004)***	-0.125 (0.004)***	-0.127 (0.004)***	-0.102 (0.008)***	-0.168 (0.013)***
y97	0.056 (0.014)***	0.037 (0.004)***	0.036 (0.004)***	0.034 (0.004)***	0.038 (0.004)***	0.032 (0.004)***	0.058 (0.008)***	0.057 (0.013)***
y98	0.189 (0.014)***	0.067 (0.004)***	0.063 (0.004)***	0.061 (0.004)***	0.066 (0.004)***	0.053 (0.004)***	0.121 (0.008)***	0.120 (0.012)***
y99	0.242 (0.013)***	0.053 (0.004)***	0.046 (0.004)***	0.047 (0.004)***	0.054 (0.004)***	0.037 (0.004)***	0.120 (0.008)***	0.140 (0.012)***
y95prim		-0.037 (0.016)**	-0.063 (0.018)***	0.022 (0.020)	-0.033 (0.016)**	0.207 (0.030)***	-0.116 (0.018)***	0.042 (0.024)*
y97prim		0.005 (0.016)	-0.022 (0.018)	0.063 (0.019)***	0.006 (0.016)	0.208 (0.028)***	-0.076 (0.018)***	0.032 (0.023)
y98prim		0.092 (0.016)***	0.023 (0.019)	0.156 (0.018)***	0.096 (0.016)***	0.175 (0.030)***	0.013 (0.017)	0.160 (0.021)***
y99prim		0.157 (0.016)***	0.069 (0.018)***	0.239 (0.018)***	0.157 (0.015)***	0.223 (0.026)***	0.068 (0.017)***	0.221 (0.021)***
y95mun			-0.052 (0.013)***			-0.041 (0.013)***		
y97mun			0.018 (0.013)			0.024 (0.013)*		
y98mun			0.054 (0.012)***			0.067 (0.013)***		
y99mun			0.089 (0.012)***			0.103 (0.012)***		

Table 4A (cont'd)

lwage ^l	(I)		(II)		(III)		(IV)		(V)		(VI)		(VII)		(VIII)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
y95sta							0.037	(0.012)***			0.048	(0.012)***			0.089	(0.017)***
y97sta							0.032	(0.013)**			0.044	(0.013)***			0.020	(0.017)
y98sta							0.063	(0.012)***			0.081	(0.013)***			0.014	(0.017)
y99sta							0.071	(0.013)***			0.094	(0.013)***			-0.009	(0.016)
y95fed									0.059	(0.016)***	0.062	(0.016)***			0.103	(0.020)***
y97fed									-0.001	(0.016)	0.005	(0.016)			-0.019	(0.020)
y98fed									0.025	(0.015)	0.035	(0.015)**			-0.032	(0.019)*
y99fed									0.033	(0.016)**	0.048	(0.016)***			-0.055	(0.019)***
y95priv													-0.025	(0.009)***	0.041	(0.013)***
y97priv													-0.027	(0.009)***	-0.024	(0.013)*
y98priv													-0.069	(0.009)***	-0.067	(0.013)***
y99priv													-0.084	(0.009)***	-0.103	(0.012)***
y95primun					0.114	(0.025)***					-0.166	(0.034)***				
y97primun					0.064	(0.024)***					-0.176	(0.032)***				
y98primun					0.146	(0.023)***					-0.015	(0.032)				
y99primun					0.161	(0.022)***					-0.002	(0.028)				
y95prista							-0.153	(0.024)***			-0.394	(0.032)***			-0.228	(0.027)***
y97prista							-0.158	(0.024)***			-0.357	(0.031)***			-0.181	(0.027)***
y98prista							-0.202	(0.023)***			-0.273	(0.032)***			-0.257	(0.025)***
y99prista							-0.263	(0.022)***			-0.300	(0.029)***			-0.297	(0.024)***
y95prifed									0.089	(0.237)	-0.175	(0.238)			-0.010	(0.238)
y97prifed									-0.005	(0.181)	-0.220	(0.182)			-0.044	(0.181)
y98prifed									-0.036	(0.149)	-0.137	(0.149)			-0.122	(0.148)
y99prifed									0.264	(0.175)	0.173	(0.176)			0.175	(0.175)
y95prpriv													0.383	(0.030)***	0.166	(0.034)***
y97prpriv													0.345	(0.028)***	0.176	(0.032)***
y98prpriv													0.221	(0.030)***	0.015	(0.032)
y99prpriv													0.215	(0.026)***	0.002	(0.028)
Rondonia	-0.533	(0.046)***	-0.280	(0.014)***	-0.271	(0.014)***	-0.281	(0.014)***	-0.247	(0.014)***	-0.242	(0.014)***	-0.280	(0.014)***	-0.242	(0.014)***
Acre	-0.635	(0.058)***	-0.350	(0.023)***	-0.340	(0.023)***	-0.357	(0.023)***	-0.304	(0.023)***	-0.307	(0.023)***	-0.358	(0.023)***	-0.307	(0.023)***
Amazonas	-0.348	(0.040)***	-0.345	(0.012)***	-0.333	(0.012)***	-0.345	(0.012)***	-0.304	(0.011)***	-0.293	(0.011)***	-0.343	(0.012)***	-0.293	(0.011)***
Roraima	-0.250	(0.079)***	-0.120	(0.023)***	-0.108	(0.023)***	-0.126	(0.023)***	-0.121	(0.024)***	-0.123	(0.023)***	-0.137	(0.023)***	-0.123	(0.023)***
Para	-0.757	(0.036)***	-0.521	(0.009)***	-0.510	(0.009)***	-0.521	(0.009)***	-0.482	(0.009)***	-0.471	(0.009)***	-0.518	(0.009)***	-0.471	(0.009)***
Amapa	-0.181	(0.056)***	-0.187	(0.023)***	-0.173	(0.023)***	-0.189	(0.023)***	-0.176	(0.023)***	-0.176	(0.023)***	-0.431	(0.013)***	-0.494	(0.013)***
Tocantins	-0.654	(0.039)***	-0.490	(0.013)***	-0.474	(0.013)***	-0.491	(0.013)***	-0.441	(0.013)***	-0.431	(0.013)***	-0.687	(0.015)***	-0.625	(0.014)***
Maranhao	-0.809	(0.042)***	-0.687	(0.015)***	-0.669	(0.015)***	-0.689	(0.015)***	-0.640	(0.015)***	-0.625	(0.014)***	-0.765	(0.014)***	-0.706	(0.013)***
Piaui	-0.970	(0.038)***	-0.763	(0.014)***	-0.747	(0.014)***	-0.764	(0.014)***	-0.717	(0.013)***	-0.706	(0.013)***	-0.765	(0.014)***	-0.706	(0.013)***
Ceara	-0.891	(0.034)***	-0.622	(0.008)***	-0.612	(0.008)***	-0.622	(0.008)***	-0.574	(0.008)***	-0.560	(0.008)***	-0.614	(0.008)***	-0.560	(0.008)***
RGNorte	-1.086	(0.046)***	-0.721	(0.012)***	-0.707	(0.012)***	-0.721	(0.012)***	-0.683	(0.012)***	-0.671	(0.012)***	-0.721	(0.012)***	-0.671	(0.012)***
Paraiba	-0.955	(0.042)***	-0.666	(0.012)***	-0.646	(0.012)***	-0.667	(0.012)***	-0.633	(0.012)***	-0.616	(0.012)***	-0.671	(0.012)***	-0.616	(0.012)***
Pernambuco	-0.830	(0.032)***	-0.612	(0.008)***	-0.601	(0.008)***	-0.611	(0.008)***	-0.566	(0.008)***	-0.553	(0.008)***	-0.605	(0.008)***	-0.553	(0.008)***
Alagoas	-0.886	(0.044)***	-0.656	(0.013)***	-0.638	(0.013)***	-0.656	(0.013)***	-0.602	(0.013)***	-0.587	(0.013)***	-0.654	(0.013)***	-0.587	(0.013)***
Sergipe	-0.682	(0.045)***	-0.589	(0.012)***	-0.572	(0.012)***	-0.589	(0.012)***	-0.541	(0.012)***	-0.527	(0.012)***	-0.589	(0.012)***	-0.527	(0.012)***
Bahia	-0.754	(0.031)***	-0.543	(0.007)***	-0.532	(0.007)***	-0.543	(0.007)***	-0.493	(0.007)***	-0.481	(0.007)***	-0.536	(0.007)***	-0.481	(0.007)***
Minas	-0.381	(0.030)***	-0.405	(0.007)***	-0.396	(0.007)***	-0.402	(0.007)***	-0.349	(0.007)***	-0.335	(0.007)***	-0.393	(0.007)***	-0.335	(0.007)***

Table 4A (cont'd)

lwage1	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.	Coef. Std.Err.
Espirito	-0.376 (0.041)***	-0.389 (0.011)***	-0.375 (0.011)***	-0.386 (0.011)***	-0.332 (0.010)***	-0.315 (0.010)***	-0.380 (0.010)***	-0.315 (0.010)***
Rio	-0.436 (0.031)***	-0.347 (0.007)***	-0.339 (0.007)***	-0.344 (0.007)***	-0.302 (0.007)***	-0.287 (0.007)***	-0.334 (0.007)***	-0.287 (0.007)***
SaoPaulo	-0.226 (0.030)***	-0.095 (0.007)***	-0.088 (0.007)***	-0.092 (0.007)***	-0.030 (0.007)***	-0.016 (0.007)**	-0.079 (0.007)***	-0.016 (0.007)**
Parana	-0.343 (0.032)***	-0.267 (0.007)***	-0.256 (0.007)***	-0.265 (0.007)***	-0.209 (0.007)***	-0.193 (0.007)***	-0.254 (0.007)***	-0.193 (0.007)***
SantaCat	-0.516 (0.037)***	-0.236 (0.009)***	-0.227 (0.009)***	-0.233 (0.009)***	-0.174 (0.008)***	-0.159 (0.008)***	-0.222 (0.008)***	-0.159 (0.008)***
RGSul	-0.458 (0.031)***	-0.302 (0.007)***	-0.294 (0.007)***	-0.299 (0.007)***	-0.249 (0.007)***	-0.234 (0.007)***	-0.287 (0.007)***	-0.234 (0.007)***
MGsul	-0.587 (0.039)***	-0.463 (0.011)***	-0.449 (0.011)***	-0.462 (0.011)***	-0.420 (0.010)***	-0.406 (0.010)***	-0.458 (0.010)***	-0.406 (0.010)***
MGrosso	-0.478 (0.037)***	-0.336 (0.010)***	-0.323 (0.010)***	-0.334 (0.010)***	-0.283 (0.010)***	-0.269 (0.010)***	-0.329 (0.010)***	-0.269 (0.010)***
Goiás	-0.652 (0.033)***	-0.470 (0.008)***	-0.459 (0.008)***	-0.469 (0.008)***	-0.418 (0.008)***	-0.406 (0.008)***	-0.463 (0.008)***	-0.406 (0.008)***
constant	-1.474 (0.521)***	-2.351 (0.076)***	-2.363 (0.076)***	-2.357 (0.076)***	-2.521 (0.076)***	-2.556 (0.075)***	-2.363 (0.076)***	-2.671 (0.076)***
N Obs	13,859	302,172	302,172	302,172	302,172	302,172	302,172	302,172
R-squared	0.541	0.576	0.578	0.577	0.584	0.586	0.578	0.586
Root MSE	0.493	0.597	0.596	0.596	0.591	0.590	0.595	0.590

Table 5A: Estimates of the Reform Effect on Primary Teachers' Wages

(Dependent Variable: Natural Logarithm of Wage Rates)

lwage1	All Sample (I)		North Region (II)	
	Coef.	Std. Err.	Coef.	Std.Err.
educ1yr	0.083	0.010***	0.137	0.037***
educ2yr	0.106	0.007***	0.110	0.028***
educ3yr	0.160	0.006***	0.138	0.025***
educ4yr	0.227	0.005***	0.177	0.021***
educ5yr	0.281	0.006***	0.241	0.021***
educ6yr	0.344	0.006***	0.289	0.025***
educ7yr	0.387	0.006***	0.331	0.023***
educ8yr	0.479	0.006***	0.422	0.021***
educ9yr	0.547	0.007***	0.488	0.026***
educ10yr	0.622	0.007***	0.578	0.025***
educ11yr	0.853	0.006***	0.823	0.020***
educ12yr	1.087	0.010***	1.105	0.038***
educ13yr	1.233	0.011***	1.262	0.040***
educ14yr	1.321	0.010***	1.321	0.046***
educ15yr	1.652	0.007***	1.677	0.025***
age	0.224	0.009***	0.192	0.038***
age2	-0.007	0.000***	-0.005	0.002***
age3	0.000	0.000***	0.000	0.000
age4	0.000	0.000***	0.000	0.000
tenure	0.030	0.001***	0.023	0.002***
tenure2	0.000	0.000***	0.000	0.000***
female	-0.288	0.002***	-0.242	0.010***
white	0.104	0.003***	0.085	0.010***
black	-0.047	0.005***	-0.048	0.025*
yellow	0.174	0.021***	0.118	0.095
indigenous	0.051	0.029*	0.072	0.090
union	0.179	0.003***	0.181	0.012***
urban1	0.090	0.004***	-0.042	0.024*
federal	0.376	0.005***	0.490	0.019***
state	0.065	0.004***	0.152	0.014***
municipal	-0.072	0.004***	0.029	0.014**
primtch	-0.090	0.012***	-0.020	0.048
Para	-0.471	0.009***	-0.276	0.022***
primtch*Para	-0.077	0.064	-0.233	0.079***
y95	-0.121	0.004***	-0.104	0.014***
y97	0.039	0.004***	0.024	0.015*
y98	0.068	0.003***	0.033	0.014**
y99	0.057	0.003***	0.045	0.014***
y95*primtch	-0.042	0.016**	-0.111	0.063*
y97*primtch	0.006	0.016	-0.138	0.064**
y98*primtch	0.101	0.016***	-0.001	0.063
y99*primtch	0.162	0.016***	0.077	0.061

Table 5A (cont'd)

lwage1	All Sample (I)		North Region (II)	
	Coef.	Std. Err.	Coef.	Std.Err.
y95*primtch*Para	0.167	0.086 *	0.219	0.105**
y97*primtch*Para	0.080	0.083	0.241	0.104**
y98*primtch*Para	-0.027	0.089	0.102	0.108
y99*primtch*Para	0.086	0.084	0.192	0.102 *
Rondonia	-0.242	0.014***	-0.053	0.025**
Acre	-0.307	0.023***	-0.141	0.031***
Amazonas	-0.295	0.011***	-0.105	0.023***
Roraima	-0.125	0.023***	0.041	0.031
Amapa	-0.172	0.022***		***
Tocantins	-0.433	0.013***	-0.277	0.025***
Maranhao	-0.624	0.014***		***
Piaui	-0.706	0.013***		***
Ceara	-0.560	0.008***		***
RGNorte	-0.672	0.012***		***
Paraiba	-0.616	0.012***		***
Pernambuco	-0.553	0.008***		***
Alagoas	-0.587	0.013***		***
Sergipe	-0.528	0.012***		***
Bahia	-0.480	0.007***		***
Minas	-0.338	0.007***		***
Espirito	-0.317	0.010***		***
Rio	-0.288	0.007***		***
SaoPaulo	-0.018	0.007***		***
Parana	-0.195	0.007***		***
SantaCat	-0.161	0.008***		***
RGSul	-0.237	0.007***		***
MGSul	-0.407	0.010***		***
MGrosso	-0.272	0.010***		***
Goias	-0.408	0.008***		***
constant	-2.563	0.075***	-2.491	0.308***
Prob	302,172		20,691	
R-squared	0.585		0.561	
Root MSE	0.591		0.616	

Table 6A: Estimates of the reform effect on primary teachers' wages (Dependent variable: Natural Logarithm of Wage rates)

lwage1	(I)		(II)		(III)		(IV)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
educ1yr	0.064	0.023***	0.066	0.023***	-0.121	0.249	-0.125	0.243
educ2yr	0.087	0.018***	0.085	0.018***	-0.280	0.232	-0.286	0.231
educ3yr	0.158	0.016***	0.155	0.016***	0.085	0.208	0.083	0.206
educ4yr	0.233	0.013***	0.226	0.013***	-0.162	0.192	-0.154	0.190
educ5yr	0.297	0.015***	0.289	0.015***	-0.153	0.195	-0.154	0.194
educ6yr	0.361	0.019***	0.352	0.019***	0.009	0.198	0.008	0.197
educ7yr	0.413	0.018***	0.403	0.018***	0.022	0.195	0.025	0.194
educ8yr	0.539	0.014***	0.525	0.014***	0.061	0.190	0.059	0.189
educ9yr	0.646	0.019***	0.633	0.019***	0.153	0.192	0.149	0.191
educ10yr	0.681	0.017***	0.666	0.017***	0.236	0.190	0.228	0.188
educ11yr	0.949	0.013***	0.933	0.013***	0.470	0.188**	0.459	0.186**
educ12yr	1.122	0.018***	1.110	0.018***	0.585	0.188***	0.574	0.187***
educ13yr	1.228	0.021***	1.214	0.021***	0.683	0.189***	0.671	0.188***
educ14yr	1.332	0.018***	1.322	0.018***	0.760	0.189***	0.750	0.187***
educ15yr	1.637	0.014***	1.624	0.014***	0.867	0.188***	0.857	0.187***
age	0.149	0.025***	0.143	0.025***	0.155	0.059***	0.162	0.059***
age2	-0.004	0.001***	-0.004	0.001***	-0.005	0.002**	-0.006	0.002**
age3	0.000	0.000***	0.000	0.000***	0.000	0.000**	0.000	0.000**
age4	0.000	0.000***	0.000	0.000**	0.000	0.000*	0.000	0.000*
tenure	0.014	0.001***	0.013	0.001***	0.012	0.002***	0.013	0.002***
tenure2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
female	-0.305	0.006***	-0.304	0.006***	-0.081	0.014***	-0.081	0.014***
white	0.089	0.006***	0.090	0.006***	0.042	0.010***	0.041	0.010***
black	-0.031	0.011***	-0.029	0.011***	0.002	0.024	0.002	0.024
yellow	0.131	0.043***	0.127	0.043***	0.004	0.062	-0.001	0.063
indigenous	0.116	0.068*	0.121	0.068*	0.163	0.109	0.159	0.108
union	0.156	0.006***	0.156	0.006***	0.117	0.009***	0.118	0.009***
urban1	0.103	0.008***	0.113	0.008***	0.149	0.014***	0.150	0.014***
municipal	-0.149	0.005***	-0.162	0.012***	-0.061	0.010***	-0.109	0.021***
primtch	-0.129	0.014***	-0.125	0.014***	-0.080	0.025***	-0.077	0.024***
y95	-0.128	0.009***	-0.091	0.012***	-0.155	0.031***	-0.143	0.033***
y97	0.057	0.009***	0.066	0.012***	0.045	0.030	0.035	0.034
y98	0.113	0.009***	0.118	0.012***	0.160	0.029***	0.134	0.032***
y99	0.125	0.009***	0.119	0.012***	0.176	0.028***	0.133	0.032***
y95*primtch	-0.032	0.018*	-0.120	0.021***	-0.006	0.035	-0.013	0.036
y97*primtch	-0.008	0.018	-0.081	0.021***	0.010	0.034	0.015	0.037
y98*primtch	0.087	0.018***	-0.025	0.021	0.051	0.032	0.035	0.035
y99*primtch	0.131	0.018***	-0.002	0.021	0.092	0.032***	0.065	0.035*
y95*municipal			-0.084	0.017***			-0.038	0.055
y97*municipal			-0.018	0.017			0.025	0.049
y98*municipal			-0.009	0.016			0.069	0.046
y99*municipal			0.014	0.016			0.124	0.043***

Table 6A (cont'd)

l wage1	(I)		(II)		(III)		(IV)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
y95*primtch*municipal			0.203	0.026***			0.025	0.056
y97*primtch*municipal			0.157	0.026***			-0.013	0.049
y98*primtch*municipal			0.227	0.024***			0.023	0.045
y99*primtch*municipal			0.261	0.023***			0.023	0.042
Rondonia	-0.397	0.028***	-0.393	0.028***	-0.571	0.040***	-0.571	0.040***
Acre	-0.459	0.033***	-0.458	0.033***	-0.708	0.052***	-0.710	0.052***
Amazonas	-0.488	0.023***	-0.483	0.023***	-0.399	0.040***	-0.401	0.040***
Roraima	-0.241	0.036***	-0.233	0.036***	-0.317	0.087***	-0.310	0.088***
Para	-0.651	0.019***	-0.648	0.019***	-0.784	0.034***	-0.786	0.034***
Amapa	-0.279	0.039***	-0.270	0.039***	-0.196	0.056***	-0.196	0.056***
Tocantins	-0.609	0.021***	-0.604	0.021***	-0.716	0.035***	-0.721	0.035***
Maranhao	-0.794	0.024***	-0.795	0.024***	-0.900	0.039***	-0.903	0.039***
Piaui	-0.923	0.023***	-0.918	0.023***	-1.074	0.035***	-1.075	0.035***
Ceara	-0.794	0.017***	-0.794	0.017***	-0.963	0.032***	-0.965	0.031***
RGNorte	-0.970	0.024***	-0.964	0.024***	-1.170	0.042***	-1.174	0.042***
Paraiba	-0.867	0.021***	-0.863	0.021***	-1.045	0.037***	-1.046	0.037***
Pernambuco	-0.722	0.016***	-0.720	0.016***	-0.851	0.029***	-0.853	0.029***
Alagoas	-0.824	0.024***	-0.822	0.024***	-0.998	0.043***	-1.001	0.042***
Sergipe	-0.694	0.022***	-0.689	0.022***	-0.770	0.038***	-0.774	0.038***
Bahia	-0.682	0.015***	-0.683	0.015***	-0.840	0.028***	-0.844	0.027***
Minas	-0.504	0.014***	-0.499	0.014***	-0.479	0.027***	-0.481	0.026***
Espirito	-0.418	0.021***	-0.411	0.021***	-0.479	0.036***	-0.480	0.036***
Rio	-0.525	0.016***	-0.524	0.016***	-0.499	0.029***	-0.500	0.029***
SaoPaulo	-0.314	0.014***	-0.306	0.014***	-0.323	0.027***	-0.326	0.026***
Parana	-0.457	0.016***	-0.455	0.016***	-0.429	0.028***	-0.426	0.028***
SantaCat	-0.406	0.019***	-0.399	0.019***	-0.606	0.034***	-0.606	0.033***
RGSul	-0.430	0.016***	-0.426	0.015***	-0.583	0.028***	-0.583	0.027***
MGSul	-0.672	0.021***	-0.668	0.021***	-0.704	0.035***	-0.702	0.035***
MGrosso	-0.473	0.020***	-0.467	0.019***	-0.566	0.034***	-0.567	0.034***
Goiias	-0.664	0.017***	-0.659	0.017***	-0.793	0.029***	-0.793	0.029***
Constant	-1.413	0.213***	-1.358	0.213***	-0.818	0.546	-0.843	0.545
N of Observations	61895		61895		14576		14576	
R-Squared	0.587		0.589		0.563		0.565	
Root MSE	0.602		0.600		0.484		0.483	

Table 7A: Estimates of the reform effect on primary teachers' wages by level of education (Dependent variable: Natural Logarithm of Wage rates)

lwage1	Primary teachers (I)		All teachers (II)		All teachers (III)		All workers (IV)		All workers (V)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
ed9to11	0.434	0.022***	0.430	0.018***	0.441	0.065***	0.485	0.003***	0.472	0.006***
ed12to14	0.597	0.026***	0.640	0.022***	0.653	0.081***	0.838	0.006***	0.831	0.016***
ed15	0.826	0.024***	0.884	0.020***	0.935	0.062***	1.287	0.005***	1.302	0.010***
age	0.288	0.057***	0.302	0.049***	0.279	0.049***	0.230	0.010***	0.228	0.010***
age2	-0.010	0.002***	-0.011	0.002***	-0.010	0.002***	-0.007	0.000***	-0.007	0.000***
age3	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000***
age4	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000***
tenure	0.016	0.002***	0.018	0.002***	0.018	0.002***	0.031	0.001***	0.031	0.001***
tenure2	0.000	0.000*	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000***
female	-0.117	0.016***	-0.173	0.013***	-0.168	0.013***	-0.269	0.002***	-0.271	0.002***
white	0.063	0.010***	0.082	0.009***	0.080	0.009***	0.126	0.003***	0.125	0.003***
black	-0.009	0.024	-0.040	0.022*	-0.038	0.022*	-0.055	0.005***	-0.054	0.005***
yellow	-0.049	0.083	0.071	0.064	0.062	0.063	0.206	0.022***	0.193	0.022***
indigenous	0.152	0.114	0.118	0.093	0.106	0.094	0.046	0.030	0.046	0.030
union	0.154	0.010***	0.160	0.009***	0.158	0.009***	0.198	0.003***	0.200	0.003***
urban1	0.146	0.014***	0.142	0.013***	0.153	0.013***	0.130	0.004***	0.139	0.004***
federal	0.355	0.075***	0.213	0.042***	0.182	0.042***	0.397	0.006***	0.385	0.006***
state	-0.117	0.014***	-0.164	0.011***	-0.176	0.012***	0.087	0.004***	0.089	0.004***
municipal	-0.176	0.014***	-0.201	0.012***	-0.211	0.012***	-0.077	0.004***	-0.088	0.004***
prmtch			-0.110	0.021***	-0.079	0.070	-0.077	0.012***	0.157	0.044***
y95	-0.157	0.014***	-0.191	0.026***	-0.234	0.092**	-0.127	0.004***	-0.140	0.004***
y97	0.058	0.014***	0.029	0.026	0.028	0.079	0.042	0.004***	0.043	0.005***
y98	0.193	0.014***	0.094	0.025***	0.138	0.086	0.071	0.004***	0.065	0.004***
y99	0.247	0.013***	0.100	0.025***	0.094	0.078	0.064	0.004***	0.066	0.004***
y95prim			0.035	0.030	0.000	0.109	-0.033	0.016**	-0.090	0.062
y97prim			0.026	0.029	0.043	0.099	0.010	0.016	0.021	0.063
y98prim			0.093	0.028***	0.157	0.106	0.103	0.016***	0.207	0.062***
y99prim			0.141	0.028***	0.340	0.096***	0.167	0.016***	0.353	0.060***
pr9to11					0.003	0.079			-0.048	0.046
pr12to14					0.026	0.096			-0.178	0.057***
pr15					-0.079	0.076			-0.564	0.049***
y95ed9to11					-0.020	0.104			0.027	0.008***
y95ed12to14					0.139	0.128			0.039	0.023*
y95ed15					0.081	0.099			0.042	0.014***
y97ed9to11					-0.090	0.091			-0.003	0.009
y97ed12to14					0.068	0.116			-0.005	0.022
y97ed15					0.045	0.086			-0.004	0.014
y98ed9to11					-0.192	0.098*			-0.001	0.008
y98ed12to14					0.035	0.117			0.000	0.022
y98ed15					0.023	0.093			0.064	0.014***
y99ed9to11					-0.042	0.090			-0.021	0.008***
y99ed12to14					0.023	0.109			0.018	0.021
y99ed15					0.033	0.085			0.046	0.014***

Table 7A (cont'd)

lwage1	Primary teachers (I)		All teachers (II)		All teachers (III)		All workers (IV)		All workers (V)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
y95pri9to11					0.114	0.121			0.057	0.066
y95pri12to14					-0.100	0.147			-0.043	0.079
y95pri15					0.008	0.117			0.043	0.069
y97pri9to11					0.051	0.111			-0.030	0.067
y97pri12to14					-0.126	0.137			-0.065	0.080
y97pri15					-0.015	0.108			0.046	0.070
y98pri9to11					0.114	0.117			-0.064	0.066
y98pri12to14					-0.179	0.138			-0.123	0.079
y98pri15					-0.173	0.113			-0.173	0.068**
y99pri9to11					-0.108	0.108			-0.116	0.063*
y99pri12to14					-0.359	0.129***			-0.344	0.075***
y99pri15					-0.255	0.104**			-0.233	0.066***
Rondonia	-0.541	0.046***	-0.449	0.039***	-0.448	0.039***	-0.257	0.014***	-0.258	0.014***
Acre	-0.662	0.059***	-0.584	0.052***	-0.582	0.053***	-0.334	0.023***	-0.334	0.023***
Amazonas	-0.364	0.040***	-0.303	0.038***	-0.310	0.038***	-0.298	0.012***	-0.300	0.012***
Roraima	-0.270	0.080***	-0.235	0.072***	-0.227	0.072***	-0.141	0.024***	-0.144	0.024***
Para	-0.772	0.037***	-0.674	0.033***	-0.683	0.033***	-0.482	0.009***	-0.486	0.009***
Amapa	-0.189	0.056***	-0.124	0.052**	-0.128	0.052**	-0.191	0.023***	-0.194	0.022***
Tocantins	-0.669	0.040***	-0.614	0.037***	-0.619	0.036***	-0.450	0.013***	-0.459	0.013***
Maranhao	-0.836	0.042***	-0.816	0.039***	-0.817	0.038***	-0.629	0.015***	-0.640	0.015***
Piaui	-0.993	0.038***	-0.963	0.035***	-0.969	0.035***	-0.741	0.014***	-0.751	0.014***
Ceara	-0.910	0.034***	-0.869	0.030***	-0.865	0.030***	-0.588	0.008***	-0.591	0.008***
RGNorte	-1.093	0.046***	-1.026	0.041***	-1.028	0.040***	-0.704	0.012***	-0.704	0.012***
Paraiba	-0.970	0.042***	-0.930	0.037***	-0.930	0.037***	-0.656	0.012***	-0.660	0.012***
Pernambuco	-0.835	0.033***	-0.785	0.029***	-0.790	0.028***	-0.571	0.008***	-0.571	0.008***
Alagoas	-0.900	0.045***	-0.887	0.041***	-0.894	0.040***	-0.623	0.013***	-0.626	0.013***
Sergipe	-0.693	0.045***	-0.709	0.037***	-0.699	0.037***	-0.558	0.012***	-0.561	0.012***
Bahia	-0.759	0.031***	-0.711	0.028***	-0.722	0.028***	-0.494	0.007***	-0.500	0.007***
Minas	-0.388	0.030***	-0.380	0.027***	-0.375	0.027***	-0.348	0.007***	-0.347	0.007***
Espirito	-0.382	0.042***	-0.343	0.037***	-0.337	0.037***	-0.323	0.011***	-0.323	0.011***
Rio	-0.436	0.031***	-0.437	0.028***	-0.441	0.028***	-0.281	0.007***	-0.280	0.007***
SaoPaulo	-0.244	0.030***	-0.243	0.026***	-0.241	0.026***	-0.024	0.007***	-0.022	0.007***
Parana	-0.355	0.032***	-0.360	0.028***	-0.358	0.028***	-0.210	0.007***	-0.208	0.007***
SantaCat	-0.529	0.037***	-0.502	0.032***	-0.502	0.032***	-0.175	0.009***	-0.172	0.009***
RGsul	-0.460	0.031***	-0.454	0.028***	-0.452	0.028***	-0.239	0.007***	-0.235	0.007***
MGSul	-0.610	0.040***	-0.581	0.036***	-0.573	0.036***	-0.433	0.011***	-0.429	0.011***
MGrosso	-0.493	0.037***	-0.462	0.033***	-0.460	0.033***	-0.286	0.010***	-0.285	0.010***
Goiias	-0.656	0.033***	-0.628	0.030***	-0.632	0.029***	-0.424	0.008***	-0.426	0.008***
_cons	-2.119	0.490***	-2.206	0.420***	-2.017	0.420***	-2.413	0.077***	-2.399	0.077***
N Obs	13,859		20,030		20,030		302,172		302,172	
R-squared	0.534		0.525		0.530		0.565		0.568	
Root MSE	0.497		0.537		0.535		0.605		0.602	

Table 8A: Estimates of the reform effect on primary teachers' wages by tenure group (Dependent variable: Natural Logarithm of Wage rates)

lwage1	(I)		(II)		(III)		(IV)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
educ1yr	0.088	0.010***	0.088	0.010***	-0.167	0.179	-0.108	0.248
educ2yr	0.110	0.007***	0.110	0.007***	-0.280	0.169*	-0.277	0.232
educ3yr	0.165	0.007***	0.165	0.007***	0.063	0.154	0.095	0.208
educ4yr	0.232	0.006***	0.231	0.006***	-0.131	0.137	-0.151	0.192
educ5yr	0.289	0.006***	0.289	0.006***	-0.166	0.140	-0.135	0.196
educ6yr	0.354	0.007***	0.355	0.007***	0.030	0.144	0.029	0.198
educ7yr	0.397	0.006***	0.397	0.006***	-0.019	0.139	0.020	0.195
educ8yr	0.489	0.006***	0.489	0.006***	0.059	0.134	0.077	0.190
educ9yr	0.558	0.007***	0.558	0.007***	0.112	0.136	0.167	0.192
educ10yr	0.632	0.007***	0.630	0.007***	0.229	0.134*	0.250	0.190
educ11yr	0.865	0.006***	0.864	0.006***	0.456	0.132***	0.494	0.188***
educ12yr	1.099	0.010***	1.097	0.010***	0.593	0.132***	0.602	0.189***
educ13yr	1.244	0.011***	1.240	0.011***	0.728	0.133***	0.699	0.189***
educ14yr	1.335	0.010***	1.336	0.010***	0.796	0.132***	0.782	0.189***
educ15yr	1.668	0.007***	1.668	0.007***	0.917	0.132***	0.906	0.188***
age	0.196	0.009***	0.191	0.009***	0.163	0.050***	0.126	0.060**
age2	-0.006	0.000***	-0.006	0.000***	-0.006	0.002***	-0.004	0.002*
age3	0.000	0.000***	0.000	0.000***	0.000	0.000**	0.000	0.000*
age4	0.000	0.000***	0.000	0.000***	0.000	0.000**	0.000	0.000*
female	-0.293	0.002***	-0.293	0.002***	-0.169	0.013***	-0.101	0.014***
white	0.104	0.003***	0.104	0.003***	0.077	0.009***	0.042	0.010***
black	-0.047	0.005***	-0.047	0.005***	-0.040	0.022*	0.000	0.025
yellow	0.178	0.022***	0.177	0.022***	0.068	0.064	-0.015	0.064
indigenous	0.059	0.029**	0.060	0.029**	0.132	0.099	0.154	0.110
union	0.185	0.003***	0.186	0.003***	0.160	0.009***	0.126	0.009***
urban1	0.090	0.004***	0.090	0.004***	0.122	0.013***	0.141	0.014***
federal	0.413	0.005***	0.410	0.005***	0.220	0.042***		
state	0.094	0.004***	0.096	0.004***	-0.150	0.011***	0.078	0.010***
municipal	-0.069	0.004***	-0.073	0.004***	-0.191	0.012***		
tenure0	-0.267	0.003***	-0.258	0.007***	-0.041	0.056	-0.145	0.074*
tenure1	-0.206	0.004***	-0.196	0.008***	-0.235	0.068***	-0.186	0.104*
tenure2a	-0.156	0.004***	-0.148	0.009***	-0.002	0.069	-0.055	0.102
tenure3	-0.127	0.004***	-0.107	0.010***	-0.004	0.070	-0.033	0.087
tenure4	-0.100	0.005***	-0.085	0.012***	-0.135	0.078*	-0.157	0.102
primtch	-0.085	0.012***	-0.177	0.015***	-0.096	0.027***	-0.111	0.029***
y95	-0.122	0.004***	-0.136	0.016***	-0.185	0.105*	-0.064	0.092
y97	0.039	0.004***	0.036	0.016**	-0.084	0.088	0.208	0.138
y98	0.068	0.003***	0.059	0.008***	0.216	0.096**	0.284	0.120**
y99	0.056	0.003***	0.043	0.015***	0.189	0.097*	0.325	0.133**
y95prim	-0.044	0.016***	-0.041	0.021*	0.015	0.039	-0.024	0.044
y97prim	0.008	0.016	0.010	0.021	-0.014	0.038	0.006	0.041
y98prim	0.102	0.016***	0.086	0.020***	0.024	0.036	0.031	0.039
y99prim	0.167	0.015***	0.156	0.020***	0.103	0.036***	0.093	0.039**

Table 8A (cont'd)

lwage1	(I)		(II)		(III)		(IV)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
y95tenure0			0.014	0.017	-0.150	0.125		
y97tenure0			-0.004	0.018	-0.065	0.112	-0.243	0.167
y98tenure0			-0.002	0.011	-0.312	0.118***	-0.048	0.150
y99tenure0			-0.010	0.016	-0.219	0.120*	-0.020	0.169
y95tenure1			0.007	0.018	0.149	0.135	0.134	0.168
y97tenure1			0.010	0.018	0.193	0.123	-0.239	0.200
y98tenure1					-0.068	0.127	-0.258	0.179
y99tenure1			-0.011	0.017	-0.052	0.128	-0.090	0.182
y95tenure2			0.010	0.019	0.067	0.139	-0.074	0.158
y97tenure2			-0.003	0.019	0.161	0.126		
y98tenure2			0.001	0.013	-0.283	0.129**	-0.196	0.183
y99tenure2			0.014	0.018	-0.185	0.126	-0.194	0.178
y95tenure3			-0.005	0.020	-0.071	0.140	-0.212	0.144
y97tenure3			-0.027	0.021			-0.339	0.180*
y98tenure3			-0.008	0.015	-0.099	0.138	-0.313	0.169*
y99tenure3			-0.002	0.019	-0.158	0.132	-0.204	0.172
y95tenure4							-0.061	0.164
y97tenure4					0.138	0.129	-0.217	0.178
y98tenure4			-0.006	0.018				
y99tenure4								
y95tenure5			0.024	0.017	0.019	0.110	-0.070	0.100
y97tenure5			0.013	0.017	0.157	0.094*	-0.155	0.143
y98tenure5			0.029	0.010***	-0.065	0.100	-0.123	0.125
y99tenure5			0.042	0.016***	-0.048	0.102	-0.161	0.137
primtenure0			0.481	0.037***	0.042	0.066	0.147	0.084*
primtenure1			0.198	0.045***	0.049	0.079	-0.008	0.116
primtenure2			0.133	0.042***	-0.162	0.078**	-0.074	0.109
primtenure3			0.129	0.043***	-0.086	0.080	-0.069	0.097
primtenure4			0.090	0.046**	0.030	0.087	0.048	0.111
y95prim*tenure0			-0.116	0.053**	0.053	0.091	-0.193	0.115*
y95prim*tenure1			0.042	0.062	-0.073	0.107	-0.151	0.160
y95prim*tenure2			0.069	0.058	0.018	0.111	0.044	0.146
y95prim*tenure3			-0.048	0.058	0.020	0.112	0.100	0.131
y95prim*tenure4			0.048	0.063	0.049	0.124	0.035	0.155
y97prim*tenure0			-0.127	0.049**	0.110	0.089	-0.024	0.113
y97prim*tenure1			0.104	0.062*	0.071	0.108	0.241	0.165
y97prim*tenure2			0.076	0.059	0.046	0.110	-0.129	0.154
y97prim*tenure3			0.000	0.062	0.129	0.109	0.137	0.136
y97prim*tenure4			-0.056	0.064	-0.044	0.115	0.034	0.134
y98prim*tenure0			-0.157	0.051***	0.125	0.090	-0.133	0.110
y98prim*tenure1			0.121	0.060**	0.106	0.104	0.269	0.152*
y98prim*tenure2			0.119	0.056**	0.297	0.104***	0.168	0.152
y98prim*tenure3			0.092	0.062	0.074	0.118	0.213	0.138
y98prim*tenure4			0.124	0.067*	0.052	0.117	0.010	0.140

Table 8A (cont'd)

lwage1	(I)		(II)		(III)		(IV)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
y99prim*tenure0			-0.158	0.051***	-0.004	0.091	-0.234	0.123*
y99prim*tenure1			0.024	0.060	0.046	0.104	0.066	0.143
y99prim*tenure2			0.063	0.055	0.178	0.099*	0.078	0.134
y99prim*tenure3			0.109	0.057*	0.136	0.109	0.100	0.127
y99prim*tenure4			0.088	0.062	-0.009	0.116	-0.105	0.150
Rondonia	-0.247	0.014***	-0.246	0.014***	-0.438	0.038***	-0.566	0.040***
Acre	-0.303	0.023***	-0.302	0.023***	-0.542	0.051***	-0.687	0.052***
Amazonas	-0.299	0.011***	-0.297	0.011***	-0.288	0.038***	-0.385	0.040***
Roraima	-0.143	0.024***	-0.142	0.024***	-0.232	0.074***	-0.332	0.090***
Para	-0.469	0.009***	-0.467	0.009***	-0.647	0.033***	-0.749	0.035***
Amapa	-0.179	0.022***	-0.179	0.022***	-0.109	0.052**	-0.173	0.057***
Tocantins	-0.434	0.013***	-0.434	0.013***	-0.597	0.036***	-0.697	0.036***
Maranhao	-0.620	0.015***	-0.621	0.015***	-0.787	0.038***	-0.870	0.040***
Piaui	-0.696	0.014***	-0.695	0.013***	-0.916	0.035***	-1.030	0.036***
Ceara	-0.552	0.008***	-0.551	0.008***	-0.832	0.029***	-0.905	0.032***
RGNorte	-0.664	0.012***	-0.662	0.012***	-1.003	0.041***	-1.127	0.043***
Paraiba	-0.609	0.012***	-0.605	0.012***	-0.906	0.037***	-1.010	0.038***
Pernambuco	-0.548	0.008***	-0.547	0.008***	-0.767	0.028***	-0.820	0.029***
Alagoas	-0.580	0.013***	-0.577	0.013***	-0.853	0.040***	-0.955	0.043***
Sergipe	-0.521	0.012***	-0.518	0.012***	-0.685	0.037***	-0.745	0.039***
Bahia	-0.477	0.007***	-0.476	0.007***	-0.700	0.027***	-0.800	0.028***
Minas	-0.335	0.007***	-0.333	0.007***	-0.360	0.027***	-0.449	0.027***
Espirito	-0.315	0.011***	-0.313	0.010***	-0.331	0.036***	-0.449	0.037***
Rio	-0.288	0.007***	-0.286	0.007***	-0.426	0.028***	-0.460	0.029***
SaoPaulo	-0.021	0.007***	-0.019	0.007***	-0.220	0.026***	-0.287	0.027***
Parana	-0.196	0.007***	-0.193	0.007***	-0.339	0.028***	-0.385	0.029***
SantaCat	-0.160	0.008***	-0.159	0.008***	-0.488	0.032***	-0.573	0.034***
RGSul	-0.234	0.007***	-0.232	0.007***	-0.437	0.027***	-0.559	0.028***
MGSul	-0.406	0.010***	-0.405	0.010***	-0.553	0.036***	-0.681	0.036***
MGrosso	-0.272	0.010***	-0.272	0.010***	-0.445	0.033***	-0.546	0.034***
Goiás	-0.404	0.008***	-0.403	0.008***	-0.615	0.029***	-0.763	0.030***
constant	-2.059	0.076***	-2.019	0.076***	-0.735	0.447	-0.503	0.557
N of Observations	302,172		302,172		20,030	***	14,790	
R-Squared	0.582		0.583		0.532	***	0.562	
Root MSE	0.592		0.592		0.534	***	0.493	

Table 9A: Estimates of the Reform Effect on Primary Teachers' Wages by Age Group

lwage1	(I)		(II)		(III)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
educ1yr	0.077	0.010***	-0.162	0.181	-0.097	0.252
educ2yr	0.101	0.007***	-0.296	0.177*	-0.296	0.241
educ3yr	0.153	0.007***	0.090	0.155	0.107	0.209
educ4yr	0.221	0.006***	-0.129	0.137	-0.145	0.193
educ5yr	0.267	0.006***	-0.176	0.141	-0.143	0.196
educ6yr	0.320	0.007***	0.011	0.145	0.011	0.199
educ7yr	0.361	0.006***	-0.030	0.140	0.027	0.196
educ8yr	0.470	0.006***	0.047	0.134	0.076	0.191
educ9yr	0.514	0.007***	0.071	0.137	0.146	0.193
educ10yr	0.608	0.007***	0.209	0.135	0.232	0.191
educ11yr	0.862	0.006***	0.459	0.132***	0.485	0.189**
educ12yr	1.099	0.010***	0.599	0.133***	0.600	0.189***
educ13yr	1.246	0.011***	0.738	0.133***	0.699	0.190***
educ14yr	1.340	0.010***	0.803	0.133***	0.779	0.190***
educ15yr	1.660	0.007***	0.923	0.132***	0.884	0.189***
tenure	0.034	0.001***	0.020	0.002***	0.015	0.002***
tenure2	-0.001	0.000***	0.000	0.000***	0.000	0.000
female	-0.285	0.002***	-0.172	0.013***	-0.081	0.014***
white	0.103	0.003***	0.079	0.009***	0.043	0.010***
black	-0.044	0.005***	-0.034	0.022	0.006	0.024
yellow	0.169	0.021***	0.061	0.063	0.008	0.064
indigenous	0.061	0.029**	0.148	0.100	0.157	0.111
union	0.187	0.003***	0.156	0.009***	0.120	0.009***
urban1	0.091	0.004***	0.129	0.013***	0.153	0.014***
federal	0.366	0.006***	0.200	0.042***		
state	0.066	0.004***	-0.166	0.011***	0.062	0.010***
municipal	-0.074	0.004***	-0.198	0.012***		
primtch	-0.209	0.072***	-0.284	0.147*	-0.177	0.160
agecat1	-0.394	0.016***	-0.511	0.140***	-0.430	0.161***
agecat2	-0.098	0.016***	-0.298	0.136**	-0.297	0.150**
agecat3	0.027	0.016*	-0.199	0.138	-0.148	0.152
agecat4	0.056	0.017***	-0.143	0.141	-0.037	0.156
y95	-0.127	0.020***	-0.162	0.193	0.003	0.242
y97	0.072	0.022***	-0.181	0.197	-0.156	0.184
y98	0.073	0.020***	-0.013	0.167	0.058	0.194
y99	0.116	0.020***	0.040	0.161	0.090	0.179
y95prim	-0.087	0.116	-0.052	0.219	-0.246	0.264
y97prim	0.097	0.098	0.302	0.215	0.198	0.204
y98prim	0.079	0.102	0.161	0.192	0.053	0.216
y99prim	0.147	0.096	0.229	0.181	0.174	0.198
primagecat1	0.443	0.076***	0.286	0.155*	0.183	0.176
primagecat2	0.140	0.074*	0.180	0.151	0.159	0.164
primagecat3	-0.054	0.075	0.110	0.153	0.042	0.167
primagecat4	-0.046	0.078	0.150	0.157	0.028	0.171

Table 9A (cont'd)

lwage1	(I)		(II)		(III)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
y95agecat1	-0.001	0.021	0.023	0.202	-0.094	0.258
y95agecat2	0.001	0.021	-0.021	0.198	-0.116	0.248
y95agecat3	0.011	0.022	-0.066	0.200	-0.219	0.249
y95agecat4	0.014	0.023	-0.017	0.204	-0.210	0.252
y97agecat1	-0.038	0.023 *	0.205	0.205	0.272	0.204
y97agecat2	-0.041	0.023 *	0.255	0.202	0.279	0.191
y97agecat3	-0.036	0.023	0.164	0.203	0.155	0.192
y97agecat4	-0.024	0.025	0.219	0.207	0.112	0.197
y98agecat1	-0.019	0.021	0.062	0.177	0.182	0.214
y98agecat2	-0.003	0.021	0.130	0.172	0.139	0.199
y98agecat3	0.003	0.021	0.101	0.174	0.049	0.201
y98agecat4	0.022	0.023	0.136	0.178	0.078	0.206
y99agecat1	-0.079	0.021 ***	0.063	0.171	0.249	0.203
y99agecat2	-0.063	0.021 ***	0.093	0.166	0.170	0.184
y99agecat3	-0.049	0.021 **	0.032	0.168	0.052	0.186
y99agecat4	-0.026	0.023	0.026	0.172	-0.089	0.190
y95primage~1	0.049	0.121	0.021	0.229	0.142	0.281
y95primage~2	0.016	0.119	0.049	0.224	0.171	0.270
y95primage~3	0.080	0.120	0.174	0.226	0.350	0.272
y95primage~4	0.071	0.124	0.088	0.232	0.305	0.276
y97primage~1	-0.105	0.104	-0.306	0.225	-0.287	0.226
y97primage~2	-0.062	0.101	-0.304	0.220	-0.248	0.211
y97primage~3	-0.073	0.102	-0.223	0.222	-0.133	0.213
y97primage~4	-0.097	0.107	-0.311	0.227	-0.128	0.219
y98primage~1	0.093	0.108	0.023	0.203	-0.007	0.237
y98primage~2	0.026	0.105	-0.093	0.197	-0.035	0.222
y98primage~3	0.051	0.106	-0.045	0.199	0.073	0.224
y98primage~4	-0.053	0.109	-0.181	0.204	-0.080	0.230
y99primage~1	0.041	0.102	-0.115	0.193	-0.179	0.223
y99primage~2	0.019	0.099	-0.128	0.187	-0.172	0.204
y99primage~3	0.055	0.100	-0.040	0.189	-0.038	0.207
y99primage~4	-0.030	0.104	-0.075	0.195	0.040	0.212
Rondonia	-0.249	0.014 ***	-0.439	0.038 ***	-0.568	0.040 ***
Acre	-0.315	0.023 ***	-0.547	0.051 ***	-0.705	0.051 ***
Amazonas	-0.291	0.011 ***	-0.279	0.038 ***	-0.392	0.040 ***
Roraima	-0.125	0.024 ***	-0.211	0.072 ***	-0.316	0.088 ***
Para	-0.471	0.009 ***	-0.652	0.033 ***	-0.776	0.034 ***
Amapa	-0.179	0.022 ***	-0.110	0.052 **	-0.185	0.056 ***
Tocantins	-0.441	0.013 ***	-0.590	0.036 ***	-0.708	0.036 ***
Maranhao	-0.631	0.015 ***	-0.784	0.039 ***	-0.894	0.040 ***
Piaui	-0.711	0.014 ***	-0.931	0.035 ***	-1.067	0.036 ***
Ceara	-0.561	0.008 ***	-0.843	0.030 ***	-0.960	0.032 ***
RGNorte	-0.672	0.012 ***	-1.014	0.040 ***	-1.165	0.042 ***
Paraiba	-0.617	0.012 ***	-0.913	0.037 ***	-1.037	0.038 ***
Pernambuco	-0.555	0.008 ***	-0.777	0.028 ***	-0.849	0.029 ***

Table 9A (cont'd)

lwage1	(I)		(II)		(III)	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Alagoas	-0.591	0.013***	-0.871	0.040***	-0.995	0.042***
Sergipe	-0.529	0.012***	-0.688	0.037***	-0.767	0.038***
Bahia	-0.485	0.007***	-0.705	0.028***	-0.836	0.028***
Minas	-0.341	0.007***	-0.367	0.027***	-0.475	0.027***
Espirito	-0.323	0.011***	-0.342	0.036***	-0.475	0.036***
Rio	-0.287	0.007***	-0.436	0.028***	-0.496	0.029***
SaoPaulo	-0.025	0.007***	-0.221	0.026***	-0.318	0.027***
Parana	-0.201	0.007***	-0.343	0.028***	-0.421	0.029***
SantaCat	-0.171	0.008***	-0.494	0.032***	-0.607	0.034***
RGSul	-0.238	0.007***	-0.450	0.028***	-0.582	0.028***
MGSul	-0.412	0.010***	-0.553	0.036***	-0.695	0.035***
MGrosso	-0.282	0.010***	-0.445	0.033***	-0.560	0.034***
Goiias	-0.414	0.008***	-0.619	0.029***	-0.786	0.030***
constant	0.271	0.017***	1.269	0.187***	1.019	0.238***
N	302,172		20,030		14,576	
R-squared	0.579		0.532		0.563	
Root	0.595		0.534		0.484	

Table 10A: The reform effect on primary teachers' wages - Brazil (Dependent variable: Natural Logarithm of Wage rates)

lwage	Brazil											
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
constant	-2.560	(0.075)***	-2.563	(0.075)***	-2.357	(0.076)***	-2.362	(0.076)***	-2.556	(0.075)***		
federal	0.376	(0.005)***	0.376	(0.005)***					0.351	(0.012)***		
state	0.064	(0.004)***	0.065	(0.004)***	0.022	(0.009)**			0.064	(0.009)***		
municipal	-0.072	(0.004)***	-0.072	(0.004)***					-0.120	(0.010)***		
primitch	-0.044	(0.006)***	-0.093	(0.012)***	-0.074	(0.016)***	-0.128	(0.015)***	0.141	(0.026)***		
primitchfed									-0.317	(0.130)***		
primitchsta					-0.135	(0.025)***			-0.344	(0.032)***		
primitchmun							0.082	(0.026)***	-0.164	(0.034)***		
y95	-0.123	(0.003)***	-0.121	(0.004)***	-0.123	(0.004)***	-0.117	(0.004)***	-0.124	(0.004)***		
y97	0.039	(0.004)***	0.039	(0.004)***	0.036	(0.004)***	0.035	(0.004)***	0.035	(0.004)***		
y98	0.073	(0.003)***	0.068	(0.003)***	0.063	(0.004)***	0.062	(0.004)***	0.056	(0.004)***		
y99	0.065	(0.003)***	0.057	(0.003)***	0.049	(0.004)***	0.045	(0.004)***	0.040	(0.004)***		
y95*primitch			-0.037	(0.016)**	-0.035	(0.023)	-0.037	(0.020)*	-0.004	(0.038)		
y97*primitch			0.008	(0.016)	0.007	(0.022)	0.004	(0.020)	-0.003	(0.036)		
y98*primitch			0.100	(0.016)***	0.099	(0.021)***	0.049	(0.020)**	-0.036	(0.038)		
y99*primitch			0.165	(0.015)***	0.183	(0.020)***	0.095	(0.020)***	0.012	(0.035)		
y95*federal									0.059	(0.016)***		
y97*federal									0.002	(0.016)		
y98*federal									0.032	(0.015)**		
y99*federal									0.045	(0.016)***		
y95*state					0.022	(0.013)*			0.022	(0.013)*		
y97*state					0.016	(0.013)			0.018	(0.013)		
y98*state					0.047	(0.013)***			0.055	(0.013)***		
y99*state					0.056	(0.013)***			0.069	(0.013)***		
y95*municipal							-0.042	(0.014)***	-0.036	(0.014)***		
y97*municipal							0.028	(0.014)**	0.030	(0.014)**		
y98*municipal							0.064	(0.013)***	0.072	(0.013)***		
y99*municipal							0.099	(0.013)***	0.109	(0.013)***		
y95*primitch*federal									0.141	(0.271)		
y97*primitch*federal									0.097	(0.223)		
y98*primitch*federal									0.180	(0.198)		
y99*primitch*federal									0.489	(0.219)**		
y95*primitch*state					-0.018	(0.034)			-0.051	(0.045)		
y97*primitch*state					-0.023	(0.034)			-0.014	(0.044)		
y98*primitch*state					-0.067	(0.034)**			0.070	(0.046)		
y99*primitch*state					-0.128	(0.033)***			0.044	(0.043)		
y95*primitch*municipal							0.033	(0.036)	-0.002	(0.048)		
y96*primitch*municipal							-0.018	(0.036)	-0.012	(0.046)		
y97*primitch*municipal							0.065	(0.034)*	0.149	(0.046)***		
y98*primitch*municipal							0.080	(0.034)**	0.162	(0.044)***		
N of Observations	302,172		302,172		302,172		302,172		302,172			

Note: All equations include year dummy variables (educ1yr, educ2yr, educ3yr, educ4yr, educ5yr, educ6yr, educ7yr, educ8yr, educ9yr, educ10yr, educ11yr, educ12yr, educ13yr, educ14yr, educ15yr), age variables (age, age2, age3, age4), tenure and tenure squared, female, race variables (white, black, yellow, indigenous), union, urban1, state dummy variables (Rondônia, Acre, Amazonas, Roraima, Pará, Amapá, Tocantins, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Mato Grosso do Sul, Mato Grosso, Goiás) and a constant. (R-squares vary from 58.4 to 58.9 percent).

Table 11A: The reform effect on primary teachers' wages – North Region (Dependent variable: Natural Logarithm of Wage rates)

lwage	North									
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
constant	-2.485	(0.307)***	-2.491	(0.307)***	-2.385	(0.312)***	-2.404	(0.312)***	-2.463	(0.307)***
federal	0.490	(0.019)***	0.491	(0.019)***					0.423	(0.038)***
state	0.152	(0.014)***	0.153	(0.014)***	0.032	(0.032)			0.132	(0.033)***
municipal	0.029	(0.014)**	0.028	(0.014)*			-0.107	(0.034)***	-0.045	(0.034)
prmtch	-0.078	(0.018)***	-0.097	(0.040)**	-0.046	(0.063)	-0.100	(0.048)**	0.106	(0.134)
prmtchfed									-0.133	(0.190)
prmtchststa					-0.105	(0.086)			-0.252	(0.145)*
prmtchmun							0.056	(0.094)	-0.104	(0.156)
y95	-0.107	(0.014)***	-0.104	(0.014)***	-0.100	(0.016)***	-0.092	(0.015)***	-0.120	(0.017)***
y97	0.020	(0.014)	0.024	(0.015)*	0.023	(0.016)	0.024	(0.016)	0.020	(0.018)
y98	0.035	(0.014)**	0.033	(0.014)**	0.017	(0.015)	0.019	(0.015)	0.004	(0.017)
y99	0.054	(0.013)***	0.045	(0.014)***	0.025	(0.015)*	0.016	(0.015)	0.003	(0.017)
y95*prmtch			-0.040	(0.052)	0.026	(0.086)	-0.076	(0.063)	0.114	(0.170)
y97*prmtch			-0.058	(0.053)	-0.055	(0.082)	-0.097	(0.064)	-0.071	(0.166)
y98*prmtch			0.031	(0.053)	-0.028	(0.082)	0.035	(0.066)	0.055	(0.163)
y99*prmtch			0.141	(0.051)***	0.137	(0.078)*	0.089	(0.063)	0.024	(0.157)
y95*federal									0.122	(0.050)**
y97*federal									0.016	(0.052)
y98*federal									0.095	(0.050)*
y99*federal									0.126	(0.050)**
y95*state					0.022	(0.042)			0.031	(0.043)
y97*state					0.006	(0.043)			0.011	(0.044)
y98*state					0.063	(0.043)			0.074	(0.044)*
y99*state					0.046	(0.041)			0.081	(0.042)*
y95*municipal							-0.038	(0.050)	-0.010	(0.050)
y97*municipal							0.014	(0.048)	0.022	(0.048)
y98*municipal							0.082	(0.045)*	0.099	(0.045)**
y99*municipal							0.154	(0.044)***	0.177	(0.045)***
y95*prmtch*federal									-0.095	(0.277)
y97*prmtch*federal									-0.225	(0.351)
y98*prmtch*federal									-0.308	(0.287)
y99*prmtch*federal									-0.018	(0.249)
y95*prmtch*state					-0.138	(0.115)			-0.213	(0.186)
y97*prmtch*state					-0.038	(0.113)			-0.013	(0.182)
y98*prmtch*state					0.025	(0.116)			-0.037	(0.181)
y99*prmtch*state					-0.077	(0.110)			0.048	(0.174)
y95*prmtch*municipal							0.114	(0.129)	-0.097	(0.203)
y96*prmtch*municipal							0.071	(0.124)	0.034	(0.195)
y97*prmtch*municipal							-0.130	(0.125)	-0.156	(0.193)
y98*prmtch*municipal							-0.004	(0.120)	0.052	(0.185)
N of Observations	20,691		20,691		20,691		20,691		20,691	

Note: All equations include year dummy variables (educ1yr, educ2yr, educ3yr, educ4yr, educ5yr, educ6yr, educ7yr, educ8yr, educ9yr, educ10yr, educ11yr, educ12yr, educ13yr, educ14yr, educ15yr), age variables (age, age2, age3, age4), tenure and tenure squared, female, race variables (white, black, yellow, indigenous), union, urban1, state dummy variables (Rondônia, Acre, Amazonas, Roraima, Pará, Amapá, Tocantins, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Mato Grosso do Sul, Mato Grosso, Goiás) and a constant. (R-squares vary from 54.4 to 56.2 percent).

Table 12A: The reform effect on primary teachers' wages – Northeast Region (Dependent variable: Natural Logarithm of Wage rates)

lwage	Northeast									
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
constant	-2.608	(0.162)***	-2.603	(0.162)***	-2.364	(0.165)***	-2.350	(0.165)***	-2.591	(0.162)***
federal	0.467	(0.011)***	0.468	(0.011)***					0.465	(0.024)***
state	0.103	(0.008)***	0.104	(0.008)***	0.043	(0.018)**			0.097	(0.018)***
municipal	-0.057	(0.008)***	-0.058	(0.008)***			-0.190	(0.019)***	-0.138	(0.019)***
prmtch	-0.051	(0.010)***	-0.152	(0.020)***	-0.197	(0.026)***	-0.146	(0.026)***	0.033	(0.040)
prmtchfed									0.384	(0.291)
prmtchsta					-0.026	(0.044)			-0.238	(0.053)***
prmtchmun							-0.009	(0.044)	-0.167	(0.053)***
y95	-0.129	(0.007)***	-0.127	(0.007)***	-0.128	(0.008)***	-0.121	(0.008)***	-0.133	(0.009)***
y97	0.048	(0.007)***	0.046	(0.008)***	0.036	(0.008)***	0.034	(0.008)***	0.034	(0.009)***
y98	0.100	(0.007)***	0.089	(0.007)***	0.090	(0.008)***	0.081	(0.008)***	0.071	(0.008)***
y99	0.091	(0.007)***	0.072	(0.007)***	0.066	(0.008)***	0.051	(0.008)***	0.047	(0.008)***
y95*prmtch			-0.023	(0.028)	-0.026	(0.037)	-0.001	(0.037)	0.035	(0.059)
y97*prmtch			0.035	(0.028)	0.067	(0.034)*	0.026	(0.037)	0.050	(0.055)
y98*prmtch			0.183	(0.027)***	0.217	(0.033)***	0.049	(0.037)	-0.008	(0.062)
y99*prmtch			0.286	(0.026)***	0.334	(0.032)***	0.137	(0.037)***	0.082	(0.055)
y95*federal									0.162	(0.032)***
y97*federal									0.029	(0.034)
y98*federal									-0.040	(0.030)
y99*federal									-0.070	(0.032)**
y95*state					-0.003	(0.024)			0.003	(0.024)
y97*state					0.033	(0.026)			0.038	(0.026)
y98*state					0.038	(0.025)			0.059	(0.025)**
y99*state					0.055	(0.026)**			0.081	(0.026)***
y95*municipal							-0.049	(0.026)*	-0.039	(0.026)
y97*municipal							0.061	(0.026)**	0.065	(0.026)**
y98*municipal							0.120	(0.024)***	0.133	(0.024)***
y99*municipal							0.185	(0.024)***	0.195	(0.024)***
y95*prmtch*federal									-0.892	(0.957)
y97*prmtch*federal									-0.405	(0.301)
y98*prmtch*federal									-0.405	(0.358)
y99*prmtch*federal									-0.138	(0.361)
y95*prmtch*state					0.023	(0.062)			-0.043	(0.077)
y97*prmtch*state					-0.106	(0.063)*			-0.095	(0.075)
y98*prmtch*state					-0.166	(0.060)***			0.057	(0.079)
y99*prmtch*state					-0.253	(0.062)***			-0.005	(0.075)
y95*prmtch*municipal							0.003	(0.062)	-0.035	(0.077)
y96*prmtch*municipal							-0.011	(0.060)	-0.039	(0.072)
y97*prmtch*municipal							0.179	(0.058)***	0.236	(0.076)***
y98*prmtch*municipal							0.156	(0.057)***	0.209	(0.069)***
N of Observation	75,501		75,501		75,501		75,501		75,501	

Note: All equations include year dummy variables (educ1yr, educ2yr, educ3yr, educ4yr, educ5yr, educ6yr, educ7yr, educ8yr, educ9yr, educ10yr, educ11yr, educ12yr, educ13yr, educ14yr, educ15yr), age variables (age, age2, age3, age4), tenure and tenure squared, female, race variables (white, black, yellow, indigenous), union, urban, state dummy variables (Roraima, Acre, Amazonas, Roraima, Pará, Amapá, Tocantins, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Mato Grosso do Sul, Mato Grosso, Goiás) and a constant. (R-squares vary from 55.1 to 56.5 percent).

Table 13A: The reform effect on primary teachers' wages – Southeast Region (Dependent variable: Natural Logarithm of Wage rates)

lwage					Southeast							
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
constant	-3.169	(0.119)***	-3.172	(0.119)***	-3.110	(0.119)***	-3.095	(0.119)***	-3.170	(0.119)***		
federal	0.266	(0.010)***	0.266	(0.010)***					0.254	(0.021)***		
state	-0.006	(0.007)	-0.005	(0.007)	-0.005	(0.016)			0.007	(0.017)		
municipal	-0.095	(0.007)***	-0.096	(0.007)***			-0.142	(0.016)***	-0.126	(0.016)***		
prmtch	0.019	(0.010)*	-0.024	(0.021)	0.064	(0.030)**	-0.102	(0.025)***	0.200	(0.048)***		
prmtchfed									-0.462	(0.351)		
prmtchst					-0.227	(0.044)***			-0.362	(0.058)***		
prmtchmun							0.217	(0.047)***	-0.069	(0.062)		
y95	-0.122	(0.005)***	-0.121	(0.006)***	-0.122	(0.006)***	-0.118	(0.006)***	-0.121	(0.006)***		
y97	0.038	(0.006)***	0.037	(0.006)***	0.037	(0.006)***	0.035	(0.006)***	0.036	(0.006)***		
y98	0.068	(0.005)***	0.064	(0.006)***	0.063	(0.006)***	0.061	(0.006)***	0.059	(0.006)***		
y99	0.064	(0.005)***	0.060	(0.006)***	0.055	(0.006)***	0.056	(0.006)***	0.052	(0.006)***		
y95*prmtch			-0.031	(0.028)	-0.035	(0.041)	-0.037	(0.033)	-0.056	(0.065)		
y97*prmtch			0.036	(0.029)	-0.024	(0.042)	0.051	(0.035)	-0.041	(0.066)		
y98*prmtch			0.092	(0.029)***	0.002	(0.040)	0.093	(0.035)***	-0.068	(0.068)		
y99*prmtch			0.118	(0.027)***	0.037	(0.039)	0.115	(0.033)***	-0.045	(0.063)		
y95*federal									0.015	(0.028)		
y97*federal									-0.009	(0.030)		
y98*federal									0.011	(0.029)		
y99*federal									0.071	(0.029)**		
y95*state					0.022	(0.022)			0.021	(0.022)		
y97*state					-0.003	(0.023)			-0.002	(0.023)		
y98*state					0.024	(0.023)			0.026	(0.023)		
y99*state					0.049	(0.023)**			0.052	(0.023)**		
y95*municipal							-0.032	(0.022)	-0.029	(0.022)		
y97*municipal							0.022	(0.023)	0.022	(0.023)		
y98*municipal							0.045	(0.022)**	0.048	(0.022)**		
y99*municipal							0.027	(0.021)	0.033	(0.021)		
y95*prmtch*federal									0.145	(0.372)		
y97*prmtch*federal									(dropped)	***		
y98*prmtch*federal									-0.453	(0.688)		
y99*prmtch*federal									0.204	(0.354)		
y95*prmtch*state					-0.011	(0.059)			0.009	(0.078)		
y97*prmtch*state					0.093	(0.061)			0.110	(0.080)		
y98*prmtch*state					0.099	(0.060)*			0.171	(0.081)**		
y99*prmtch*state					0.068	(0.058)			0.152	(0.076)**		
y95*prmtch*municipal							0.041	(0.065)	0.060	(0.086)		
y96*prmtch*municipal							-0.088	(0.066)	0.003	(0.087)		
y97*prmtch*municipal							-0.085	(0.063)	0.074	(0.085)		
y98*prmtch*municipal							-0.053	(0.061)	0.104	(0.081)		
N of Observation	116,020		116,020		116,020		116,020		116,020			

Note: All equations include year dummy variables (educ1yr, educ2yr, educ3yr, educ4yr, educ5yr, educ6yr, educ7yr, educ8yr, educ9yr, educ10yr, educ11yr, educ12yr, educ13yr, educ14yr, educ15yr), age variables (age2, age3, age4), tenure and tenure squared, female, race variables (white, black, yellow, indigenous), union, urban1, state dummy variables (Rondônia, Acre, Amazonas, Roraima, Pará, Amapá, Tocantins, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Mato Grosso do Sul, Mato Grosso, Goiás) and a constant. (R-squares vary from 56.3 to 56.8 percent).

Table 14A: The reform effect on primary teachers' wages – South Region (Dependent variable: Natural Logarithm of Wage rates)

lwage	South									
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std.	Coef.	Std.	Coef.	Std. Err.
constant	-2.879	(0.164) ***	-2.880	(0.164) ***	-2.825	(0.165) ***	-2.808	(0.165) ***	-2.884	(0.163) ***
federal	0.285	(0.013) ***	0.285	(0.013) ***					0.256	(0.028) ***
state	0.015	(0.011)	0.015	(0.011)	0.003	(0.024)			0.027	(0.024)
municipal	-0.058	(0.009) ***	-0.058	(0.009) ***			-0.104	(0.021) ***	-0.086	(0.021) ***
prmtch	-0.128	(0.014) ***	-0.130	(0.029) ***	-0.009	(0.034)	-0.254	(0.041) ***	0.310	(0.060) ***
prmtchfed									0.083	(0.105)
prmtchst					-0.384	(0.058) ***			-0.696	(0.076) ***
prmtchmun							0.247	(0.058) ***	-0.299	(0.073) ***
y95	-0.117	(0.008) ***	-0.114	(0.008) ***	-0.116	(0.008) ***	-0.110	(0.008) ***	-0.111	(0.008) ***
y97	0.044	(0.008) ***	0.043	(0.008) ***	0.043	(0.008) ***	0.043	(0.008) ***	0.037	(0.009) ***
y98	0.063	(0.007) ***	0.063	(0.008) ***	0.056	(0.008) ***	0.062	(0.008) ***	0.055	(0.008) ***
y99	0.043	(0.007) ***	0.041	(0.008) ***	0.037	(0.008) ***	0.035	(0.008) ***	0.030	(0.008) ***
y95*prmtch			-0.079	(0.039) **	-0.076	(0.048)	-0.103	(0.056) *	-0.091	(0.106)
y97*prmtch			0.008	(0.040)	-0.029	(0.050)	0.021	(0.057)	-0.061	(0.101)
y98*prmtch			0.021	(0.039)	-0.003	(0.047)	0.031	(0.056)	-0.102	(0.094)
y99*prmtch			0.059	(0.040)	0.059	(0.049)	0.058	(0.054)	-0.060	(0.086)
y95*federal									-0.024	(0.039)
y97*federal									0.053	(0.039)
y98*federal									0.064	(0.040)
y99*federal									0.076	(0.039) *
y95*state					0.032	(0.032)			0.025	(0.032)
y97*state					0.032	(0.034)			0.039	(0.034)
y98*state					0.086	(0.033) **			0.086	(0.033) **
y99*state					0.056	(0.034) *			0.062	(0.034) *
y95*municipal							-0.060	(0.029) **	-0.059	(0.029) **
y97*municipal							0.018	(0.031)	0.027	(0.031)
y98*municipal							-0.011	(0.029)	-0.002	(0.029)
y99*municipal							0.057	(0.029) *	0.065	(0.029) **
y95*prmtch*federal										***
y97*prmtch*federal										***
y98*prmtch*federal										***
y99*prmtch*federal									-0.385	(0.374)
y95*prmtch*state					-0.019	(0.079)			-0.001	(0.123)
y97*prmtch*state					0.018	(0.082)			0.050	(0.119)
y98*prmtch*state					-0.014	(0.082)			0.086	(0.115)
y99*prmtch*state					-0.069	(0.081)			0.052	(0.107)
y95*prmtch*municipal							0.100	(0.080)	0.088	(0.120)
y96*prmtch*municipal							-0.059	(0.083)	0.022	(0.117)
y97*prmtch*municipal							-0.006	(0.081)	0.125	(0.110)
y98*prmtch*municipal							-0.037	(0.083)	0.082	(0.106)
N Observation	56,380		56,380		56,380		56,380		56,380	

Note: All equations include year dummy variables (educ1yr, educ2yr, educ3yr, educ4yr, educ5yr, educ6yr, educ7yr, educ8yr, educ9yr, educ10yr, educ11yr, educ12yr, educ13yr, educ14yr, educ15yr), age variables (age2, age3, age4), tenure and tenure squared, female, race variables (white, black, yellow, indigenous), union, urban1, state dummy variables (Rondônia, Acre, Amazonas, Roraima, Pará, Amapá, Tocantins, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito, Rio de Janeiro, São Paulo, São Paulo, Santa Catarina, Rio Grande do Sul, Mato Grosso do Sul, Mato Grosso, Goiás) and a constant. (R-squares vary from 55.1 to 54.8 percent).

Table 15A: The reform effect on primary teachers' wages – Center-West Region (Dependent variable: Natural Logarithm of Wage rates)

lwage	Center-West											
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
constant	-2.554	(0.221)***	-2.552	(0.221)***	-2.276	(0.225)***	-2.271	(0.224)***	-2.543	(0.220)		
federal	0.420	(0.014)***	0.420	(0.014)***					0.379	(0.026)		
state	0.143	(0.011)***	0.143	(0.011)***	0.024	(0.023)			0.122	(0.024)		
municipal	-0.071	(0.013)***	-0.071	(0.013)***			-0.150	(0.034)***	-0.102	(0.034)		
primtch	-0.043	(0.016)***	-0.009	(0.036)	0.037	(0.051)	-0.054	(0.043)	0.252	(0.077)		
primtchfed									-0.881	(0.190)		
primtchsta					-0.176	(0.073)**			-0.374	(0.092)		
primtchmun							0.124	(0.085)	-0.161	(0.104)		
y95	-0.131	(0.011)***	-0.131	(0.011)***	-0.140	(0.012)***	-0.130	(0.011)***	-0.148	(0.013)		
y97	0.029	(0.011)***	0.034	(0.011)***	0.022	(0.012)*	0.029	(0.012)**	0.035	(0.013)		
y98	0.057	(0.010)***	0.059	(0.010)***	0.040	(0.011)***	0.047	(0.011)***	0.040	(0.012)		
y99	0.043	(0.010)***	0.044	(0.010)***	0.022	(0.011)*	0.028	(0.011)**	0.016	(0.012)		
y95*primtch			-0.012	(0.049)	0.026	(0.073)	-0.002	(0.057)	0.082	(0.107)		
y97*primtch			-0.109	(0.047)**	-0.089	(0.070)	-0.098	(0.056)*	0.016	(0.113)		
y98*primtch			-0.039	(0.046)	-0.035	(0.068)	-0.050	(0.056)	-0.104	(0.103)		
y99*primtch			-0.006	(0.047)	0.020	(0.074)	0.001	(0.057)	-0.047	(0.112)		
y95*federal									0.047	(0.035)		
y97*federal									-0.010	(0.037)		
y98*federal									0.080	(0.035)		
y99*federal									0.114	(0.035)		
y95*state					0.073	(0.033)**			0.080	(0.033)		
y97*state					0.030	(0.034)			0.024	(0.035)		
y98*state					0.059	(0.032)*			0.065	(0.032)		
y99*state					0.079	(0.032)**			0.092	(0.032)		
y95*municipal							0.003	(0.045)	0.013	(0.045)		
y97*municipal							-0.033	(0.043)	-0.042	(0.043)		
y98*municipal							0.030	(0.044)	0.036	(0.044)		
y99*municipal							0.052	(0.043)	0.073	(0.043)		
y95*primtch*federal									0.484	(0.206)		
y97*primtch*federal									0.411	(0.210)		
y98*primtch*federal									0.953	(0.313)		
y99*primtch*federal									1.810	(0.887)		
y95*primtch*state					-0.091	(0.101)			-0.160	(0.127)		
y97*primtch*state					-0.047	(0.098)			-0.166	(0.131)		
y98*primtch*state					-0.056	(0.096)			0.012	(0.122)		
y99*primtch*state					-0.059	(0.100)			-0.003	(0.129)		
y95*primtch*municipal							-0.032	(0.118)	-0.105	(0.146)		
y96*primtch*municipal							-0.023	(0.109)	-0.118	(0.144)		
y97*primtch*municipal							-0.002	(0.111)	0.071	(0.138)		
y98*primtch*municipal							-0.039	(0.110)	0.041	(0.144)		
N Observation	33.580		33.580		33.580		33.580		33.580			

Note: All equations include year dummy variables (educ1yr, educ2yr, educ3yr, educ4yr, educ5yr, educ6yr, educ7yr, educ8yr, educ9yr, educ10yr, educ11yr, educ12yr, educ13yr, educ14yr, educ15yr), age variables (age, age2, age3, age4), tenure and tenure squared, female, race variables (white, black, yellow, indigenous), union, urban1, state dummy variables (Rondônia, Acre, Amazonas, Roraima, Pará, Amapá, Tocantins, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Mato Grosso do Sul, Mato Grosso, Goiás) and a constant. (R-squares vary from 62.9 to 63.1 percent).

Table 16A: Descriptive Statistics for Labor Force Participation Estimation

	Females					
	Total		Urban		Rural	
	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers
earningsl	394.20 (313.14)	371.64 (538.25)	419.16 (318.44)	387.02 (551.50)	226.54 (208.52)	225.55 (307.64)
lnwage1	1.01 (0.73)	0.46 (0.94)	1.09 (0.69)	0.50 (0.94)	0.44 (0.76)	0.12 (0.97)
hourww1	29.05 (10.51)	20.33 (22.13)	29.36 (10.65)	21.09 (22.22)	24.03 (12.05)	14.77 (20.33)
education	13.07 (2.40)	7.91 (4.20)	13.40 (2.12)	8.23 (4.18)	11.00 (2.65)	6.71 (4.54)
ed0to8	0.06 (0.24)	0.64 (0.48)	0.03 (0.17)	0.62 (0.49)	0.19 (0.39)	0.73 (0.44)
ed9to11	0.49 (0.50)	0.25 (0.43)	0.48 (0.50)	0.26 (0.44)	0.58 (0.49)	0.13 (0.34)
ed12to14	0.12 (0.32)	0.03 (0.17)	0.12 (0.33)	0.03 (0.17)	0.14 (0.35)	0.06 (0.25)
ed15	0.34 (0.47)	0.08 (0.27)	0.37 (0.48)	0.09 (0.28)	0.09 (0.28)	0.07 (0.26)
age	33.65 (7.89)	32.78 (8.40)	33.90 (7.88)	32.88 (8.40)	29.48 (8.09)	32.03 (8.42)
white	0.59 (0.49)	0.54 (0.50)	0.60 (0.49)	0.55 (0.50)	0.56 (0.50)	0.50 (0.50)
black	0.03 (0.18)	0.06 (0.23)	0.04 (0.19)	0.06 (0.23)	0.02 (0.12)	0.05 (0.21)
yellow	0.002 (0.05)	0.004 (0.06)	0.002 (0.05)	0.004 (0.06)	0.001 (0.03)	0.001 (0.04)
mixed	0.38 (0.48)	0.40 (0.49)	0.36 (0.48)	0.39 (0.49)	0.42 (0.49)	0.45 (0.50)
indigenous	0.001 (0.03)	0.001 (0.04)	0.001 (0.03)	0.001 (0.04)	0.000 (0.02)	0.001 (0.04)
married	0.77 (0.42)	0.76 (0.43)	0.76 (0.43)	0.74 (0.44)	0.84 (0.37)	0.85 (0.35)
single	0.23 (0.42)	0.24 (0.43)	0.24 (0.43)	0.26 (0.44)	0.16 (0.37)	0.15 (0.35)
childl14	0.57 (0.50)	0.62 (0.48)	0.55 (0.50)	0.61 (0.49)	0.48 (0.50)	0.71 (0.45)
childm14	0.45 (0.50)	0.44 (0.50)	0.46 (0.50)	0.45 (0.50)	0.53 (0.50)	0.44 (0.50)
urban1	0.86 (0.34)	0.89 (0.31)	1.00 (0.00)	1.00 (0.00)	0.000 (0.00)	0.000 (0.00)
N of Observations	12409	331308	10712	294552	2181	39914

Table 16A (cont'd)

	Males					
	Total		Urban		Rural	
	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers	Primary Teachers	Non-Primary Teachers
earnings1	456.59 (394.84)	575.66 (762.21)	479.08 (400.59)	580.30 (765.67)	248.73 (205.17)	418.32 (452.49)
lnwage1	1.11 (0.73)	0.75 (0.91)	1.17 (0.72)	0.76 (0.91)	0.53 (0.69)	0.51 (0.84)
hourww1	30.70 (12.40)	38.51 (19.98)	30.98 (12.58)	38.60 (19.97)	29.30 (11.55)	38.82 (21.05)
education	13.41 (2.39)	7.97 (4.16)	13.73 (2.06)	8.10 (4.13)	11.02 (3.26)	7.09 (4.84)
ed0to8	0.06 (0.23)	0.65 (0.48)	0.03 (0.16)	0.64 (0.48)	0.28 (0.45)	0.71 (0.46)
ed9to11	0.40 (0.49)	0.24 (0.42)	0.38 (0.48)	0.25 (0.43)	0.47 (0.50)	0.10 (0.30)
ed12to14	0.15 (0.35)	0.03 (0.17)	0.16 (0.37)	0.03 (0.17)	0.10 (0.31)	0.07 (0.25)
ed15	0.40 (0.49)	0.08 (0.28)	0.44 (0.50)	0.08 (0.28)	0.15 (0.36)	0.12 (0.33)
age	31.54 (8.18)	32.50 (8.42)	31.69 (8.12)	32.48 (8.41)	28.82 (7.50)	30.93 (8.04)
white	0.53 (0.50)	0.52 (0.50)	0.53 (0.50)	0.51 (0.50)	0.47 (0.50)	0.49 (0.50)
black	0.04 (0.20)	0.07 (0.25)	0.04 (0.20)	0.06 (0.25)	0.03 (0.17)	0.05 (0.22)
yellow	0.004 (0.07)	0.003 (0.06)	0.003 (0.06)	0.003 (0.06)	0.000 (0.00)	0.005 (0.07)
mixed	0.42 (0.49)	0.41 (0.49)	0.42 (0.49)	0.42 (0.49)	0.50 (0.50)	0.45 (0.50)
indigenous	0.004 (0.07)	0.001 (0.04)	0.003 (0.06)	0.001 (0.04)	0.000 (0.00)	0.002 (0.04)
married	0.74 (0.44)	0.81 (0.39)	0.72 (0.45)	0.81 (0.40)	0.82 (0.38)	0.85 (0.35)
single	0.26 (0.44)	0.19 (0.39)	0.28 (0.45)	0.19 (0.40)	0.18 (0.38)	0.15 (0.35)
child114	0.45 (0.50)	0.54 (0.50)	0.42 (0.49)	0.54 (0.50)	0.59 (0.49)	0.60 (0.49)
childm14	0.49 (0.50)	0.45 (0.50)	0.50 (0.50)	0.45 (0.50)	0.44 (0.50)	0.46 (0.50)
urban1	0.84 (0.37)	0.91 (0.28)	1.00 (0.00)	1.00 (0.00)	0.000 (0.00)	0.000 (0.00)
N of Observations	1135	254508	891	211355	107	17384

