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Teachers' Incentives and Professional Development in Schools in Mexico

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Abstract

The quality of education is a determining factor in a nation's competitiveness. To compete globally, Mexico needs to raise its education standards. Several innovations to raise the quality of basic education at the federal and state levels have been developed: professional training of teachers, new "learning presence in schools," and improvement of working conditions and salaries of teachers. López-Acevedo examines teachers' incentives and their impact on students' learning achievement. She shows that early in their professional lives, teachers in basic public schools are better paid than in other comparable groups. She also finds that some incentives for teachers at the school level improve learning achievement. For instance, the enrollment of teachers in the *Carrera Magisterial* program has a positive effect on students' learning achievement. Furthermore, teachers' training is most effective when targeted toward increasing their practical experience and developing content-specific knowledge.

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MAIN ABBREVIATIONS & ACRONYMS

ANMEB	National Agreement for the Modernization of Basic Education (Acuerdo Nacional para la Modernización de la Educación Básica)
EEEP	The Primary Education Assessment Survey, second round 1997 (Encuesta de Evaluación de Educación Primaria, segundo levantamiento 1997)
ENIGH	National Household Survey of Income and Expenditures (Encuesta Nacional de Ingresos y Gastos de los Hogares)
ENEU	National Urban Employment Survey (Encuesta Nacional de Empleo Urbano)
INEGI	National Institute of Statistics, Geography, and Information Technology (Instituto Nacional de Estadística, Geografía e Informática)
SEP:	Ministry of Public Education (Secretaría de Educación Pública)
SNTE:	National Union of Education Workers (Sindicato Nacional de Trabajadores de la Educación)

1. INTRODUCTION

Although one of the major education policy goals of many Latin American countries, including Mexico, is to achieve universal basic education, and there has been tremendous progress toward this goal, school quality is still a major concern. School quality has not kept pace with enrollment increases, and an increasing number of children, especially poor children and those living in rural areas are being educated in low quality schools. As a result there is grade repetition and low academic achievement (OREALC 1998).

In spite of the relative growth in research literature on the differential effect of education inputs on student achievement, the results have been a matter of considerable debate. While in developed countries education inputs seem more important than socioeconomic origin to explain achievement, in developing countries the contrary seems to be the case –family background is more important than school and teacher characteristics in explaining achievement. In spite of some inconsistencies, the literature for developing countries indicates that education inputs have a significant effect on academic achievement (Lockheed and Verspoor 1991; Schmelkes and Tepepa 1999). Most of these studies focus mainly on material inputs and largely exclude education process indicators. Teaching methods, classroom and school management, and the involvement of the principal have generally not been researched (Martin 2000).

Undoubtedly, at the core of an effective learning process in school is a good teacher (Flyer and Rosen 1997; Ruiz 1999). How they teach and motivate students and what they teach them lies at the heart of the learning production process. Students learn better when they are taught by teachers who teach clearly; that is, teachers who can explain concepts

clearly, who have a good working knowledge of their subject matter, and who are able to answer students' questions intelligently (Galchus 1994).

In general, the literature reviewed finds that the factors, which have been identified in international studies regarding basic education teacher effectiveness, are for the most part absent from Mexican classrooms (Schmelkes 2000). Teachers do not make detailed lesson plans; higher order thinking is not stimulated; reading comprehension and writing abilities are not adequately taught; there is very little cooperative learning and individualized attention; time is not used optimally; and the teachers are very much left to their own devises and receive little academic support from their superiors (though support from fellow teachers seems to be more common). In Mexico teachers in many schools are also said to suffer from a lack of collegial work, school support for effective teaching, feedback, and accountability. These are key factors and their importance on school effectiveness has been underlined by local and international research. Part of the reason for this deficiency is that informal rules governing schools leave teachers very much on their own in the classroom. On the one hand, there is little control of what goes on inside. On the other hand, teachers get very little classroom support. They receive very little support from the principal, who is afraid to intrude into a space that is virtually considered to be the teacher's sacred domain. Supervisors rarely visit schools, and when they do they hardly ever visit classrooms or make pedagogical recommendations. In-service training opportunities are scarce, particularly in rural areas. Although most teachers say they read, what they read rarely relates to pedagogical issues (Schmelkes 1997; World Bank 2000).

Schmelkes' (1997) vivid description of classroom teaching practices and teacher quality in one state of Mexico, Puebla, is illustrative of the perception of observers regarding what often goes on in Mexican classrooms. She writes:

Teachers do not always master their subject matter. It cannot be assumed that a teaching certificate is a guarantee that the teacher has the required knowledge of all the primary school learning objectives. Teachers in general are not adequately trained in effective teaching practices. The predominant teaching model is centered on the teacher, geared towards the class as a whole, based solely on the textbook as a source of information and practice, and aided by the blackboard as the sole teaching aid. It is obvious from this study that teachers in general have few ideas on how to deal with a multi-grade situation and few seek to promote pupil participation. Still fewer are those who know how to handle special learning difficulties. Group work by pupils is very rare. The exploration of community resources as learning material and as a source of educational experience is almost completely absent. Pupils' learning experiences are monotonous, and mainly consist in reading from the textbook and copying in the notebook or doing exercises dictated by the teacher. Importance is hardly ever attached by teachers to reasoning, problem-solving, and the application of knowledge to everyday life situations.

In pursuing the long-term goal of improving students' learning achievement in Mexico, this paper examines teachers' incentives and professional development in schools in Mexico. Such incentives include non-monetary benefits offered to teachers such as extrinsic motivators and also monetary benefits. Direct monetary benefits include salary and allowance offered to teachers. Indirect monetary benefits include all other resources provided to teachers. Measures of professional support include training, teacher's guides, didactic material, instructional supervision, and monetary incentives. Non-monetary incentives refer to parents and students' perception of the teacher's work, choice of location for a teacher's and next assignment (type of post).

This paper is divided into the following sections: Section 2 briefly describes the current structure of the education system in Mexico. Section 3 describes the data used in the analysis. Section 4 examines whether teachers are underpaid in Mexico. Section 5 measures the impact of school factors on students' performance. Section 6 offers conclusions.

2. BACKGROUND

Within the Mexican education system, basic education is the government's highest priority. The basic education system consists of: (a) early childhood education (or pre-school), which is optional for children from 3 to 5 years old; (b) mandatory primary education, ideally for children aged 6 to 12, but due to late enrollment and grade repetition it is targeted at children aged 6 to 14; and (c) mandatory lower-secondary school education, consisting of a 3-year cycle, and intended for children aged 12 to 16.

The Mexican government is the predominant provider of basic educational services. It owns about 91 percent of primary and secondary schools, which account for 90 percent of the enrollment.[1] At university level, however, the private sector plays a much bigger role. It accounts for close to half of the enrollment (46 percent). The educational system in Mexico is now so extensive that there are over 483,000 schools (excluding pre-school) staffed by over a million teachers, of which 84.3 percent are from public schools. Teachers represent 2.8 percent of the full time labor force from which only 20.1 percent are private school teachers.

In 1999, the public school teacher's share was 42.82 percent of the total number of government personnel.[2] All teachers in public basic education are affiliated with the

[1] The share of public school enrollment is about 94 percent (primary), 93 percent (lower-secondary), and 78 percent (upper-secondary).
[2] Federal, state, plus autonomous school teachers.

National Union of Workers in Education (Sindicato Nacional de Trabajadores de la Educación, SNTE). All teachers in upper-secondary and tertiary education have a union of professors and administrative workers also affiliated with SNTE or are independent (autonomous or state Universities).

The Mexican educational system has become highly centralized in the hands of the Federal Government. This centralization is reflected by the growing share of federal schools in total enrollment, which rose from 64 percent in 1970 to 72 percent in 1990. In May 1992, however, the states, the federal government structures, and the SNTE signed the National Agreement for the Modernization of Basic Education (*Acuerdo Nacional para la Modernización de la Educación Básica*, ANMEB). This agreement was created in response to demand for a decentralized educational system. This agreement should allow states to have more participation. Previous attempts to decentralize the educational system have failed due to constraints on the state and federal government structures and to opposition from the SNTE. The ANMEB is part of a long process that yielded satisfactory results until May 1992, when the Federal Government, State Governors, federal agencies, and the SNTE signed the agreement (Secretaría de Educación Pública, SEP, 1998).

This program had three main objectives. The first was associated with the reorganization of the educational system, which consisted in the transfer of the Education Sector, formerly administered by the Federal Government, to the States. The transfer included 513,974 teachers, 116,054 administrative posts, 3,954,000 hourly-salaries, 1.8 million pre-school students, 9.2 million primary students, 2.4 million secondary students, and 22 million different materials.

The second objective was the reformulation of regional educational content, in which states received the authority and the right to propose changes. Proposals are

evaluated by the SEP and, if accepted, they are included in the Free Textbook system (*Sistema Nacional de Libro de Texto Gratuito*). In this respect, the role of the states is to propose content, while the federal government decides and puts the proposal into practice.

The last objective, the revaluation of teaching activities, consisted in launching the *Carrera Magisterial*, for teachers of basic education and members of the Union. Overall, the objective was to improve teachers' welfare through better salaries and housing policies.[3,4] In this context, the federal government modified its educational discourse, placing more emphasis on the quality of educative content instead of the previous focus on educational coverage.

The creation of the *Carrera Magisterial* in 1992 as part of the ANMEB was aimed at raising the quality of basic education through teachers' professional training, a new learning presence in schools, and by improving working conditions. One component of this program is the training of teachers; another is a merit payment system in which professional staff are voluntarily evaluated and rewarded with salary increases for their performance as classroom teachers, school directors-supervisors and administrators (*técnico-pedagógicas*). The evaluation is based on experience (10 points), professional skills (28 points), educational school level (15 points), and completion of accredited courses (17 points). In the case of teachers' performance in school, 30 points are given to student's learning achievement and professional performance.

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[3] The appendix reviews the educational decentralization process in Mexico.

[4] The ANMEB aimed at reorganizing the educational system through a process of administrative decentralization, as well as a revision of the basic educational program and the production of adequate textbooks. In accordance with this agreement, the Federal Government transferred the control and management of the basic education schools to the state governments. The 1992 agreement carried with it only a very limited idea of decentralization. Still, the Federal Government remains responsible for general policies and standards (normative and policy-making functions), teachers' formation and allocation, textbook production, evaluation and monitoring, and the provision of financial resources needed to ensure proper coverage and quality of the educational system. Moreover, Federal education transfers to the states remain earmarked for specific purposes. In 1998 the government passed the 1998 Law on Fiscal Coordination, which gave the states greater discretion in the use of Federal education and other transfers.

As with principals and supervisors, 30 points are given to school performance and professional achievement. Teachers in the third area (*tercera vertiente*) obtain 30 points for educational support. All the teachers in any one of the following modalities are considered as candidates for the program: initial education, basic education, indigenous schools, and lower-secondary education via television (*telesecundaria).* There are five levels of promotion ("A", "B", "C", "D", "E"). The salary rewards allocated to each represent a salary increase but do not represent a change in the type of post assigned to the teacher. The amount assigned to each of these levels is a considerable increase with respect to the number of hours worked in the initial post. According to the General Direction of Evaluation (SEP), 21 percent of a teacher's total salary at Level "A" comes from the *Carrera Magisterial* program. The *Carrera Magisterial* contributes 38, 51, 61, and 68 percent to a teacher at Level "B," "C," "D," or "E," respectively. The promotion ladder attaches considerable importance to seniority within this program, posts or teaching jobs in under-developed areas. Once teachers get the *Carrera Magisterial* benefit, it is extremely rare that they lose it. If teachers retire, they cannot be promoted within the *Carrera Magisterial* unless assigned to administrative tasks (*técnico-pedagógicas*).

3. DATA

This paper uses two sources of information. In section 4, we use the National Household Income and Expenditures Survey (Encuesta Nacional de Ingresos y Gastos de los Hogares, ENIGH) collected by the National Institute of Statistics, Geography, and Information (Instituto Nacional de Estadística, Geografía e Informática, INEGI) to examine if teachers are underpaid. The ENIGH survey is representative at the national level, in both urban and rural areas. The survey design was stratified, multistaged, and clustered. The final sampling unit is the household and all the members within the household were interviewed. In each stage, the selection probability was proportional to the size of the sampling unit. Thus, it is necessary to have the use of weights[5] in order to get suitable estimators. The ENIGH survey identifies important socioeconomic variables such as educational attainment, personal income, and number of hours worked per week by family member. Total income is aggregated into seven broad categories: i) labor earnings; ii) income from self-employment; iii) property income and rents; iv) monetary transfers; v) other current income; vi) monetary and non-monetary financial income; and vii) non-monetary income such as imputed rent, in-kind transfers, gifts, and auto-consumption.

In section 5, we use the Primary Education Assessment Survey, second round 1997 (*Encuesta de Evaluación de Educación Primaria* [EEEP], *segundo levantamiento* 1997) from the SEP to measure the effect of school factors on a student's performance.[6] The General Directorate for Evaluation (Dirección General de Evaluación -DGE) in SEP has collected important information on standardized students' tests in the 1997-2000 period; the

[5] The weights should be calculated according to the survey design and corresponds to the inverse of the probability inclusion.

[6] Until recently, the lack of public access to students' tests had weakened transparency and accountability of the educational system, and deprived SEP and other education stakeholders of information that could be analyzed to improve the system and shape policy at different levels.

1997 is used in this paper. The EEEP survey is representative by state level and by stratum (urban — public and private — schools, public rural schools, indigenous schools, and community schools). Students were given standardized achievement tests at the beginning of sixth grade that covered the subjects studied in the fifth grade. EEEP also collected information on schools, parents, teachers, supervisors, and socioeconomic and academic backgrounds. Non-categorical variables include students' scores, age, amenities or facilities in the house, the number of rooms in the house, the number of teachers' updating courses, didactic material available to the teacher, and school equipment. The survey design is a two-stage stratified probabilistic sampling, proportional to the size. The first stage involves randomly selecting the schools in each strata (CC=Cursos Comunitarios; EI=Indigeneous Education; RP=Rural Public; UP= Urban Public; UPV= Urban Private) and the second stage is the selection of students. The sample included 53,209 students and 3,645 schools (see Annex A). In matching students with their parents, close to 15 percent of the sample was lost because their parents did not respond to the questionnaire. Another 30 percent of the sample was also lost when matching students with their corresponding fifth grade teachers. Thus, sample weights were re-estimated accordingly.[7]

4. ARE TEACHERS' UNDERPAID?

Teacher salaries have often been highlighted as a very important issue in discussions on school improvement (Mitchell and Peters 1988; Komenan 1990; Cox 1993; Chapman 1993; Lankford and Wyckoff 1997; Liang 1999). The level and structure of teacher remuneration is said to affect their morale and their ability to focus on and devote

[7] Further, the distribution of the test scores of those students that were matched successfully suggests that there was no truncation in the final sample.

adequate time to teaching well. It could also determine the capacity of the education system to attract and retain good teachers (Popkewitz and Lind 1989; Psacharopoulos and Valenzuela 1996). This section explores if teachers are underpaid. Workers in the ENIGH were classified into four occupational groups: teachers in basic public schools (which includes teachers in primary public schools as well as teachers in secondary public schools), teachers in basic private schools (which includes teachers in primary private schools as well as teachers in secondary private schools), other government workers (which contains all the other occupational public groups, excepting teachers, with 12 years of formal schooling or more), and private sector workers (workers in the private sector, except for the agricultural group workers and the low-skilled group workers, with 12 years of formal schooling or more). These two latter groups were chosen in order to provide close comparison. Separate ordinary least squares regressions were computed for both groups of teachers and for the comparable groups. The analysis uses hourly labor earnings as the dependent variable and years of schooling, gender, region (urban-rural), experience (defined as age-years of schooling-6), and experience squared as explanatory variables. Estimates are presented in the following table.

Table 1. Determinants of Hourly Labor Earnings

	Teacher in basic Public schools		Teacher in basic Private schools		Other government Workers		Private sector Workers	
Years of schooling	0.058	*	0.030		0.128	*	0.168	*
	(3.464)		(0.998)		(9.245)		(13.518)	
Gender (Male=1)	0.083		0.397	*	0.038		0.230	*
	(1.191)		(2.249)		(0.546)		(3.564)	
Experience	0.033	*	0.113		0.083	*	0.049	*
	(2.705)		(1.312)		(5.039)		(5.483)	
Squared experience	-0.0004	*	-0.002		-0.002	*	-0.001	*
	(-1.976)		(-0.996)		(-3.708)		(-2.59)	
Region (Urban=1)	-0.1233		Dropped		0.051		0.452	*
	(-1.561)				(0.278)		(4.873)	
Constant	1.2715	*	0.709		-0.561	*	-1.543	*
	(3.831)		(0.812)		(-2.049)		(-7.349)	

Source: Author's estimates based on ENIGH survey.

* Significant at the 5 percent level.

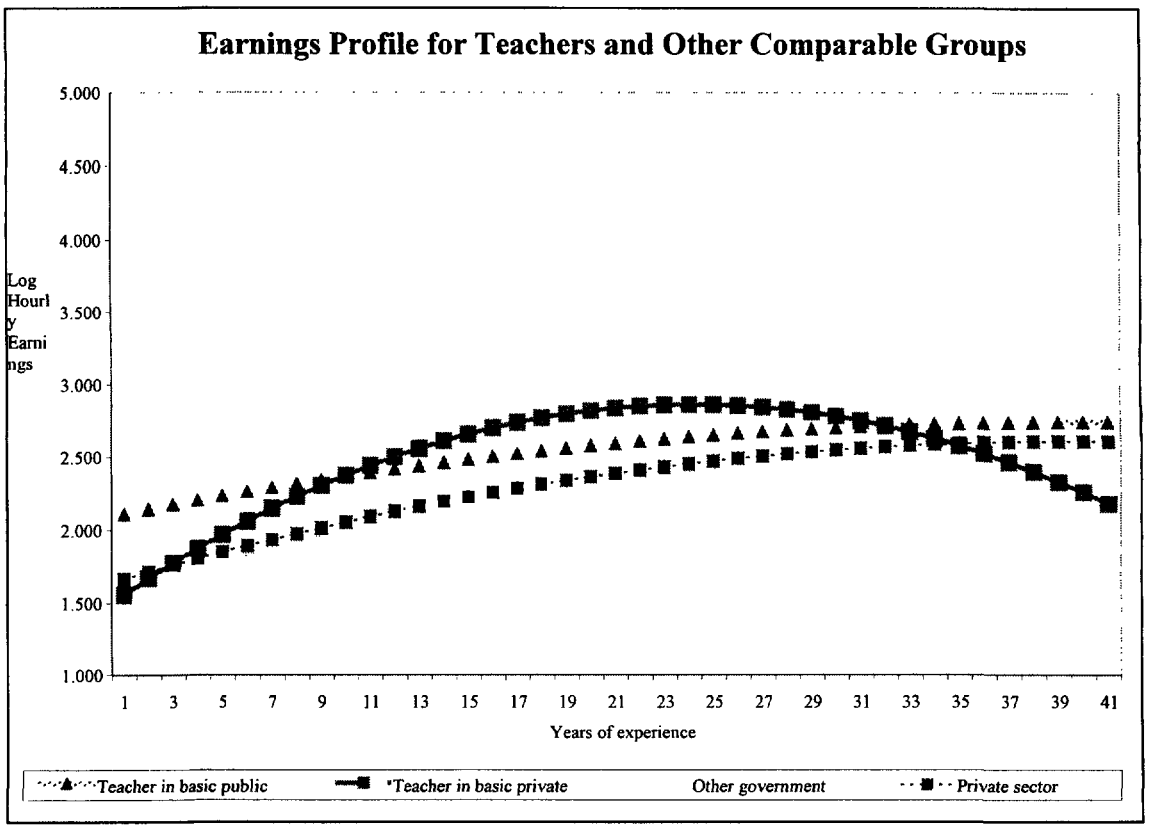
T-stat in parenthesis.

These results indicate how returns to different factors vary among all four occupational groups. Teachers in basic public schools have lower returns to years of schooling than other government workers or private sector workers—while basic public teachers have a return of 5.8 percent for an additional year of schooling, the private sector workers and the other government workers have returns of 16.8 percent and 12.8 percent, respectively. Differences between urban and rural areas might be a key issue from the social point of view. As one can see in the table above, the public sector does not face a regional discriminatory problem, because public employees in rural areas earn similar wages to those in urban areas. Nonetheless, a private sector worker in urban areas earns 45.2 percent more than a private sector worker in rural areas.

Another advantage of running separate regressions is that differences in the earning gradients can be estimated over the life cycle of teachers (public and private) versus the other occupational groups. Additionally, earnings variation over life cycle by occupational groups can be evaluated to analyze whether labor earnings dispersion is low or high. Figure 1 shows income profiles for teachers in basic public and private schools, other government

workers, and workers in the private sector. This graph assumes a constant level of schooling (15 years), male and urban workers.

Figure 1



Source: Author's estimates based on ENIGH 1996

Teachers in basic private schools face the most uncertainty about lifetime salary and job tenure. Nevertheless, they earn more than public school teachers and the other groups. Teachers' labor earnings in basic public school profiles are slightly flatter than the income profile for the private sector workers. At the initial stage of their professional life, teachers are paid about 79 percent more per hour than private sector workers, and about 77 percent more than other government workers. However, as can be seen in Figure 1, public teachers' earnings grow at a slower rate than in comparable occupations. Note that other government

workers' wages grow at a significantly higher rate than public teachers' salaries. Other government workers face significant risk throughout their professional life, possibly due to the uncertainty of obtaining retirement benefits and the lack of a civil service career in the public sector. Nevertheless, the public teachers' union has been effective in stabilizing teachers' jobs and salaries. Once a public school teacher enters the labor market, the union not only protects his or her position, but also protects his or her lifetime income.

5. THE EFFECT OF SCHOOL FACTORS ON STUDENTS' PERFORMANCE

Mexican education literature is rich in ethnographic studies of schools in various parts of the country (Tirado 1999; Martin 2000). In contrast, there are hardly any econometric studies that quantify the effects of school factors or teaching practices on student learning. There are some econometric studies, among others World Bank (1999) and World Bank (2000), but they are also limited to a few states. This section presents a national/urban/rural and public/private analysis of the EEEP measuring students' performance. The purpose here is to test certain hypotheses regarding the determinants of student learning. These hypotheses relate to the effects of school quality, particularly teachers' income, experience, training, teaching practices, and teachers' incentives at the school level. Issues regarding supervision, facilities, and specific students' characteristics and their parents' are also considered in the analysis.

Based on the EEEP, Table 2 shows the distribution of the Spanish and Mathematics test scores by school quintiles. The best 20 percent schools in the nation have a score of 57.7 on average in Mathematics (out of 100 points) and a relatively higher score in Spanish. The standard deviation is higher in this group compared to the rest of the learning achievement quintiles. The highest grade dispersions are concentrated at the tails of the

distribution.

Table 2. Fifth Grade Test Scores by Learning Achievement Quintile

Quintile	Mathematics		Spanish	
	Mean	SD	Mean	SD
1	40.7	2.9	46.5	2.7
2	45.6	0.8	51.5	1.0
3	48.4	0.7	54.5	0.7
4	51.5	1.0	57.8	1.3
5	57.7	4.2	65.5	5.0
Total	48.7	6.1	54.9	6.8

Source: Primary Education Assessment Survey, second round 1997.

Table 3 shows the distribution of test scores nationwide by stratum. Private urban schools perform relatively better than other types of schools. Public urban schools rank second while indigenous schools are at the bottom of the distribution. Nonetheless, the grade differences between indigenous schools and community schools are small, particularly in Spanish scores. The highest dispersion of test scores is found in the learning of Spanish scores in private urban schools.

Table 3. Test Scores by Stratum

Stratum	Mathematics		Spanish	
	Mean	SD	Mean	SD
Community School	47.3	5.7	52.0	5.2
Indigenous School	45.8	5.4	51.5	5.1
Public rural school	48.2	6.0	54.0	6.2
Public urban school	49.4	5.9	55.6	6.3
Private urban school	53.0	6.5	62.9	8.4
National	48.7	6.1	54.9	6.8

Source: Primary Education Assessment Survey, second round 1997

Table 4 shows classroom size by stratum, which can be taken as a measure of relative school productivity among stratum. Surprisingly, indigenous schools perform better in this indicator than community schools given that the scoring difference between them is not significant. However, classroom size does not differ significantly between private urban schools and public urban schools although variance is greater in the latter.

Table 4. Classroom Size by Stratum

Stratum	Mean	SD
Community School	23.0	1.2
Indigenous School	22.5	8.0
Public rural school	21.5	7.1
Public urban school	24.6	3.5
Private urban school	24.3	4.5
National	22.6	6.6

Source: Primary Education Assessment Survey, second round 1997.

Tables 5 and 6 below show the distribution of students by learning achievement quintiles. About 45 percent of students in private urban schools are enrolled in the top quintile of schools, compared to only 6.4 percent of the students from indigenous schools, which has the highest percent of students enrolled in the bottom quintile of Mexican schools. These results are more pronounced in Spanish, since 61.4 percent of the students in private urban schools are enrolled in the best 20 percent of schools, compared to only 4.0 percent of the students from indigenous schools, which also have the highest percent of students enrolled in the lowest 20 percent.

The distribution of students enrolled in public urban schools is evenly distributed across quintiles. The distribution of students in public rural schools is biased toward the lowest quintile.

Table 5. Fifth Grade Students Share by Mathematics Test Scores Quintiles within Stratum

Stratum	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Community School	26.0	23.4	20.2	18.2	12.2	100.0
Indigenous School	33.2	26.9	20.1	13.4	6.4	100.0
Public rural school	22.5	21.4	20.1	19.1	16.9	100.0
Public urban school	15.7	18.5	20.6	23.9	21.3	100.0
Private urban school	6.4	10.2	13.6	24.4	45.3	100.0

Source: Primary Education Assessment Survey, second round 1997.

Table 6. Fifth Grade Students Share by Spanish Scores Quintile within Stratum

Stratum	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Community School	30.7	30.5	17.7	15.2	5.9	100.0
Indigenous School	34.8	28.8	16.7	15.7	4.0	100.0
Public rural school	22.5	24.9	18.9	20.8	12.9	100.0
Public urban school	15.4	20.8	17.5	25.6	20.8	100.0
Private urban school	4.9	6.9	6.9	19.9	61.4	100.0

Source: Primary Education Assessment Survey, second round 1997.

Which primary school characteristics contribute the most to student learning in a multivariate model? How do these school variables have an effect on learning achievement? The models below attempt to answer these questions. In each model, the school, socioeconomic characteristics, and teachers' characteristics are the same.[8] This chosen estimation strategy allows us to measure the effect of these factors on learning achievement. The first model presented is the variance plus school fixed model. This model fully captures school effects through the use of a complete set of school dummies. The second model uses school variables (instead of dummies) to analyze the determinants of school factors on learning achievement. Denoting child and household level variables by X, school dummies by D, and school variables by W, the models are:

$$\text{Model 1 (with school dummies):} \qquad y_i = \beta' \mathbf{X_i} + \delta' \mathbf{D_i} + \varepsilon_i$$

$$\text{Model 2 (with school variables):} \qquad y_i = \beta' \mathbf{X_i} + \delta' \mathbf{W_i} + \varepsilon_i$$

The two models are estimated separately for the urban and rural areas as well as nationally. This attribute enables us to estimate the overall mean of achievement, and determine the deviations of the students' scores and of the school's averages around that

[8] Annex B has the full description of the variables used in the analysis.

mean. The second model fully captures the students' effects through adding students' socioeconomic variables to the empty model.

The third model uses school's level variables to analyze the determinants of school effects on learning achievement. The fourth model drops the dummy variables from the third model and is estimated by ordinary least squares.[9]

$$Y = X\beta + Z\alpha + d_1\gamma_1 + d_2\gamma_2 + \ldots + d_k\gamma_k + \varepsilon$$

where,

Y	Vector of individual student test scores, Mathematics or Spanish
X	Matrix of student's socioeconomic background variables
Z	Matrix of teacher's and school's variables
d_i	The dummy variables that indicate schools in the sample
ε	Vector of residual terms [$E(\varepsilon) = 0$ and $E(\varepsilon\varepsilon') = 0$].

[9] The last result is not shown here but available upon request.

(1) *Model 1 (fixed effects model). The model is described by the following equation,*

$$Y_{ij} = \gamma_{00} + d_1\gamma_1 + d_2\gamma_2 + ... + d_k\gamma_k + \varepsilon_{ij}$$

where,

Y_{ij} Vector of individual student test scores, mathematics.

γ_{00} Overall mean of achievement.

di The dummy variables that indicate schools in the sample.

γ_k The deviations of achievement of the "k" school around the overall average.

ε_{ij} The deviations of students' scores around the overall average.

Table 7 shows the estimates of the first model for public/private schools at national level, as well as for urban and rural areas. It can be seen in this table that the variation in mathematics test scores has an important school effect in urban/rural areas. At the national level, the total students' scores variance is 48.35, of which 51 percent of the variance component ratio is attributed to school-level effects.

Table 7. The Empty Model Public and Private Schools

	Public Schools			Public and Private Schools
	National	Urban	Rural	National
Total students' scores variance	48.35	56.26	46.67	48.99
Variance within the schools	23.82	24.67	23.15	24.08
Variance between the schools	24.54	31.59	23.52	24.90
Variance component ratio of school effect	0.51	0.56	0.50	0.51
Number of students	19,419	11,256	8,163	23,955
Number of schools	1,586	744	842	1,909

Source: Author's estimates using the Primary Education Assessment, second round 1997, SEP.

(2) Model 2 with school dummies and students' characteristics:

In order to have greater precision in the estimation of the students' effects on the learning achievement, several relevant variables were introduced at the student level, including student's gender, age, pre-school education, repetition of fifth grade, teacher's performance, student's attitude toward learning, household size, household's income, household utilities, number of books in house, number of rooms in house, parent's schooling level, parent's expectations of the student's educational achievement, and parent's opinion of educational services in the school. The variables were entered individually to test whether the coefficients remained robust and significant. The model is described by the following equation:

$$Y_{ij} = \gamma_{oo} + \beta_h X_{ij} + d_1\gamma_1 + d_2\gamma_2 + ... + d_k\gamma_k + \varepsilon_{ij}$$

where,

Y_{ij} Vector of individual student test scores, Mathematics.

γ_{00} Overall mean of achievement.

B_h Vector of parameters to estimate; 1, .., H .

X_{ij} Matrix of student's socioeconomic background variables.

d_k The dummy variables that indicate schools in the sample.

γ_k The deviations of achievement of the "k" school around the overall average conditioned on students' characteristics.

ε_{ij} The deviations of students scores around the overall average.

Table 8. Model 2. Students' Characteristics

	National			Urban			Rural		
	Coeff.	S.E.	Level of Sig.	Coeff.	S.E.	Level of Sig.	Coeff.	S.E.	Level of Sig.
Student's gender (male)	0.211	0.309	0.495	0.985	0.489	0.044	0.034	0.503	0.946
Student's age	-0.358	0.150	0.017	-0.484	0.179	0.007	-0.204	0.224	0.363
Pre-school education (yes)	-0.069	0.279	0.805	-0.046	0.455	0.919	-0.259	0.434	0.551
Repetition in 5th grade (yes)	-0.652	0.323	0.044	-0.204	0.370	0.581	-0.743	0.430	0.084
Blurred vision (yes)	-1.281	0.366	0.000	-1.301	0.560	0.020	-1.286	0.580	0.027
Teacher's performance	0.244	0.070	0.000	0.382	0.084	0.000	0.227	0.107	0.034
Student's attitude towards learning	-0.111	0.063	0.079	-0.105	0.076	0.166	-0.101	0.103	0.326
Household income	0.152	0.054	0.005	0.135	0.053	0.012	0.115	0.089	0.194
House services	0.023	0.017	0.188	0.023	0.022	0.296	-0.002	0.027	0.944
Father's schooling level	0.105	0.073	0.151	0.097	0.067	0.144	0.210	0.099	0.034
Mother's schooling level	0.121	0.065	0.062	0.127	0.065	0.052	0.081	0.111	0.466
Educational services in school	0.309	0.101	0.002	0.265	0.110	0.016	0.288	0.167	0.085
Constant	50.832	2.948	0.000	48.597	3.872	0.000	53.011	4.893	0.000
Total Variance	34.958			39.105			39.228		
Variance within the schools	23.408			23.479			22.563		
Variance among the schools	11.550			15.626			16.665		
Variance component ratio of school effect	0.330			0.400			0.425		
R-squared (explained variance)	0.277			0.305			0.159		
Students' R-squared (explained variance)	0.017			0.048			0.025		
Schools' R-squared (explained variance)	0.529			0.505			0.291		
Number of Students	13,439			7,721			5,718		
Number of Schools	1,553			740			813		

Source: Author's estimates using the Primary Education Assessment, second round 1997, SEP.

The advantage of this model is that it provides extensive information about the sources of variation that constitute the R-squared. At the national level, the student socioeconomic variables explain 27.7 percent of the total variation. This is understandable, because almost all explanatory variables are categorical. Notice that this set of socioeconomic student variables explains more than 52 percent of the variation among schools but only explains 1.7 percent of the students' variance. In urban areas, the explanatory power of the socioeconomic variables is similar to that of the national level. The introduction of these variables has several effects. It reduces in absolute terms the variance among schools (from 24.54 in model 1 to 11.55 in model 2) because individuals are less heterogeneous. The variance component ratio of school effect from model 1 to model 2 dropped by 18 percent percent, implying that the variance component ratio of

student effect increased by 69 percent. Thus, schools appear to be more similar (homogenous) taking into consideration students' characteristics, but the differences among schools (heterogeneity) remain relatively important. The explanatory power of the student variables is much lower for rural areas than for urban areas. These variables explain only 29.1 percent of the total school variance and 2.5 percent of the student variance.

This analysis also weighed student socioeconomic profile. Males and females achieve equally in mathematics. Age and grade repetition have a significantly negative impact on mathematics achievement. These students achieve lower grades than others. Repetition has been associated with low achievement and school dropout (Schmelkes 1997). Pre-primary school level is not significant for mathematics test scores, possibly because parents infrequently participate in their children's learning achievement. Additional work is needed to establish the links between initial education, parents' participation, and learning achievement. Nonetheless, the results show that the development of self-driven and studious students who seek information beyond textbooks is a key factor in increased learning achievement. How to develop good learning habits and motivation among students should be a challenge not only to teachers but also to parents.

Teacher's pedagogical behavior (efforts and performance in the classroom) is of great importance in grading learning achievement. The impact of this variable is much greater than the impact of other school factors, such as didactic material available to the teacher. Students learn better when they are taught by teachers who teach clearly (that is, explain concepts clearly), who have a thorough knowledge of the subject matter, and who are able to handle students' questions and doubts intelligently (Ruiz 1999; Santos 1999; Schmelkes 1997, 2000).

Students in households with higher per capita income or family assets achieve higher scores. In addition, there is a strong positive relationship between a mother's schooling level and children's learning achievement in urban areas and, conversely, a father's schooling level and student achievement in rural areas. This finding is consistent with Tirado (1990). It was also found that the quality of educational services has a considerable positive impact on learning achievement.

(3) Model 3(with student's socioeconomic index, and school and dummy variables).

Conditioned on the socioeconomic student's profile, the model below estimates the impact of school variables on student achievement scores. Accordingly, model 3 is described by the following equation:

$$Y_{ij} = \gamma_{oo} + \beta\ I_i + \alpha_m Z_j + d_1\gamma_1 + d_2\gamma_2 + ... + d_k\gamma_k + \varepsilon_{ij}$$

where,

Y_{ij} Vector of individual student test scores, mathematics.

γ_{00} Overall mean of achievement.

B Parameter to estimate

α_m Vector of parameters to estimate; 1, ..., M.

I_i Vector of student's socioeconomic index.

Z_j Matrix of schools variables.

d_k The dummy variables that indicate schools in the sample.

ε_{ij} The deviations of students' scores around the overall average.

Table 9 presents an estimation of model 3 at the national level. Table B.1 presents the estimations for rural and urban areas. As in model 2, the variables were entered individually to test whether the coefficients remained robust.

Table 9. Determinants of Mathematics Achievement Scores in Fifth Grade at National Level

	Public and Private Schools			Public Schools		
	Coeff.	Level of Sig.	Elasticity	Coeff.	Level of Sig.	Elasticity
Student Socioeconomic Variables	0.485	0.000		0.485	0.000	
Teacher's gender (male)	-0.675	0.023	-0.0072	-0.916	0.015	-0.0103
Teacher's age	0.190	0.095	0.0183	0.280	0.070	0.0270
Attendance to updating courses (yes)	-0.931	0.074	-0.0171	0.416	0.476	0.0077
Teacher's residence within the community (yes)	-0.052	0.890	-0.0004	-0.102	0.801	-0.0008
Teacher's years of residence in the community	0.240	0.027	0.0261	0.135	0.261	0.0148
Teacher's schooling level	0.139	0.294	0.0103	0.219	0.183	0.0163
Teacher's pedagogical behavior	0.053	0.034	0.0052	0.194	0.015	0.0041
Teacher's interest in students' learning	0.288	0.023	0.0098	0.092	0.003	0.0031
Number of updating courses	0.028	0.584	0.0030	0.021	0.709	0.0023
Type of post. Short term (yes)	-1.210	0.030	-0.0013	-1.177	0.014	-0.0013
More than one post (yes)	-0.004	0.990	0.0000	0.304	0.395	0.0014
Teacher's income	0.135	0.225	0.0097	0.094	0.475	0.0069
Didactic material available to the teacher	0.011	0.608	0.0033	-0.004	0.878	-0.0011
Number of supervisor visits	5.523	0.000	0.0754	5.484	0.000	0.0780
Teacher's enrollment in Carrera Magisterial (yes)				1.436	0.003	0.0187
Carrera Magisterial level				-0.413	0.056	-0.0072
Correction for possible self-selection bias in Carrera Magisterial				1.674	0.182	
Constant	45.854	0.000		44.873	0.000	
R^2			0.388			0.377
Number of Students			14847			13,767
Number of Schools			1718			1602

Source: Author's estimates using the Primary Education Assessment, second round 1997, SEP.

In general, students with teachers who have more years of experience (using age as a proxy) achieve higher scores in mathematics. It is clear that teacher experience and seniority improve student achievement growth rates, suggesting that teacher proficiency is enhanced by practical experience and training. The marginal productivity of time spent in formal education of teachers on teacher effectiveness is statistically insignificant. However, the potential of training to contribute to the improvement of teaching effectiveness appears

to be high. The following findings show: the importance of teachers' experience and practice; teacher ability to deal with children's questions and doubts intelligently (implying the importance of teachers' subject matter knowledge), and teacher effectiveness in monitoring students' performance or difficulties and talking to students.

Female teachers increase learning achievement. Interestingly, training (measured by the number of courses taken by the teacher) has not influenced student achievement. Moreover, each one of these courses separately failed to have an impact on learning achievement. Thus, investment in primary school teachers seems most effective when targeted toward increasing practical experience and developing content-specific knowledge.

Teacher's years of residence in the community increases students' achievement, possibly because of the teacher's involvement with the community. Type of post (short term) has a negative impact on learning achievement. Teacher's years of schooling failed to demonstrate significant effects on student learning, which is expected since there is little variance in the level of schooling. A teacher's income has no significant effect on learning achievement, but many studies have found that teacher's salary is a poor predictor of a student's achievement (Figlio 1997; Martin 2000).

Frontline educators feel that problems relating to school infrastructure and facilities negatively affect teaching effectiveness and student learning achievement (World Bank 1999 and 2000). Their foremost recommendation for raising school quality is to address this inadequacy. To what extent this recommendation will actually lead to student learning achievement is questionable. Some studies in other countries show that improvement in school infrastructure can have a significant positive impact on student learning. However, the EEEP data do not appear to support this hypothesis.

Teacher's pedagogical efforts show a positive and significant marginal effect on learning achievement. Pedagogical effort and teacher answers to student questions are highly correlated with greater learning achievement. Other work or secondary activity does not affect a student's test scores, possibly because only a small proportion of fifth grade teachers have a secondary occupation. A large number of public school teachers, however, have two or more posts. As part of ANMEB, teachers have at least two posts, one at the primary school level and another at the lower-secondary school level. Didactic materials available to the teacher failed to demonstrate a significant effect on learning achievement.

An additional important variable to explain learning achievement in public schools was school supervision by the principal and supervisor. The frequency of school visits by supervisors has a significant and positive correlation with student learning. Students in schools with a high degree of supervision on the part of the school principal achieve better scores. Thus, differences in school organization and management could be important for student achievement. It is also consistent with the PARE experience, which indicates that the quality of supervisors and the frequency of their school visits had significant and positive effects on student test scores (World Bank 1998). The type of post assigned to the teacher (short term) has a negative impact on learning achievement (mathematics test scores), particularly in urban areas.

Additionally, the impacts of each explanatory variable in elasticity terms were computed in order to compare the quantitative effects among all explanatory variables. As can be seen in Table 9, variables with the highest elasticity values include supervision, teacher's enrollment in the *Carrera Magisterial*, and teacher's interest in students' learning.

It is possible that there is a *Carrera Magisterial* self-selection problem. The relationship observed between a student's learning and his or her teacher being in a *Carrera*

Magisterial may occur because of the self-selection problem. That is, teachers who join the *Carrera Magisterial* are likely to see themselves as highly effective teachers and are likely to be so, and so they have a high probability of being rewarded. In order to avoid a *possible* self-selection problem, the standard Heckman's Methodology was applied to the *Carrera Magisterial* self-selection problem. The probit equation for computing the Mill's ratio was specified as follows:

Defining $v_j=1$ if the jth teacher is in Carrera Magisterial and $v_j=0$ otherwise. Geographical variables as state and stratum, as well as classroom size, teacher's characteristics, and school's characteristics explain this probability. "Teacher's opinion about *Carrera Magisterial* program" is proposed as the trigger variable for measuring the differences in the application of this program, which might affect the probability of participation. The probit estimation results are shown in A.3. Selectivity bias turned out to be significant only in urban areas.

Results from the multivariate regression model show that at the national level and particularly in rural areas, enrollment in the *Carrera Magisterial* has a positive impact on learning achievement. Note that being in the *Carrera Magisterial* program increases a student's achievement in mathematics by 1.87 percent (3.31 percent in rural areas—see Table B.1). However, the level in *Carrera Magisterial* is negatively correlated with learning achievement. Ultimately, the program may have good components that promote better teaching practices, but there is a pervasive incentive affecting teacher promotion. Results show that a large share of teachers in basic education is relatively old and work in administrative tasks.

Furthermore, the EEEP data show that 62.8 percent of the teachers in the sample are enrolled in the *Carrera Magisterial*. In addition, there is no significant difference in test

score distribution between students with a teacher in the *Carrera Magisterial* and students without such a teacher.

Table 10. Teachers' Share in *Carrera Magisterial* in Fifth Grade

Carrera Magisterial	Number of Teachers	Share
Yes	2420	62.8
Not	1139	29.6
No answer	292	7.6
Total	3851	100.0

Source: Primary Education Assessment Survey, second round. 1997
Non-weighted data.

Tables 11 and 12 present the distribution of test scores for those students who have a teacher enrolled in Carrera Magisterial and those with a teacher not enrolled in Carrera Magisterial, nationally and by stratum. Since there is no significant difference, one might infer that there is no selection bias with teachers in Carrera Magisterial getting the best students and other teachers getting worse students.

Table 11. Test Scores of Students with a Teacher in *Carrera Magisterial*

	Number of students in the sample			Test Scores					
				Mathematics			Spanish		
	Number	Share	Share of students with Identified Teachers	Mean	Median	SD	Mean	Median	SD
In *Carrera Magisterial*	19029	35.8	70.9	49.0	48.6	6.1	55.1	54.4	6.3
Not in *Carrera Magisterial*	7804	14.7	29.1	48.5	47.8	6.5	55.1	54.1	7.4
Not Identified*	26376	49.6		48.6	48.1	6.0	54.8	54.1	6.8
Total	53209	100.0	100.0						

Source: Primary Education Assessment Survey, second round 1997.
* "Not Identified" refers to those teachers who could not be matched to their respective students.

Table 12. Test Scores by Teacher's *Carrera Magisterial* Status by stratum

Stratum		Teacher is enrolled in *Carrera Magisterial*	Teacher is not enrolled In *Carrera Magisterial*	Teacher not identified
Community School	Mean			47.3
	Median			47.2
	SD			5.7
Indigenous School	Mean	45.6	45.7	46.0
	Median	45.5	45.5	46.3
	SD	5.4	5.6	5.3
Public rural school	Mean	48.4	47.9	48.1
	Median	47.8	47.8	47.8
	SD	6.2	6.2	5.8
Public urban school	Mean	49.7	49.9	49.0
	Median	49.2	49.2	49.2
	SD	5.9	6.9	5.6

Source: Primary Education Assessment Survey, second round 1997.
* "Teacher not identified" refers to those teachers who could not be matched to their respective students.

Students in rural schools with a teacher in the Carrera Magisterial achieve slightly better scores than their peers (Table 12). In public urban schools, there is no significant difference, but in the case of indigenous schools there is a significant difference. Few teachers in private urban schools report being enrolled in the Carrera Magisterial. This could be a result of a sampling error, or because a teacher works at both public and private schools.

5. CONCLUSIONS

Several interesting findings arose in this paper. First, real salaries and labor earnings for teachers in basic public education are significantly above those from other occupations and groups. Secondly, teachers in basic public schools face a lower risk and uncertainty of having their standard of living reduced (measured as labor income). In other words, once teachers enter the labor market as public school teachers the union not only protects their position but also protects their flow of income throughout their lifetime. Thus, salary increases for public school teachers is not likely to be a crucial factor on recruiting and retaining better teachers in the public schools.

The second part of this paper analyzes the determinants of students' learning achievement. Using multivariate analyses the results show that student socioeconomic variables explain 27.7 percent of the total scores' variation. Whereas this set of variables explains more than 52 percent of the variation among schools, it explains only 1.7 percent of the student-level variation. On the one hand, for urban areas, the power of explanation for these variables is similar to the power for national level areas. On the other hand, the predictive power of these variables is much lower for rural areas. The school level variation in the outcome scores reflects the socioeconomic student variables to a great extent. However, some of the remaining within-school variation might be explained by other explanatory variables. Another remarkable result is that although the inclusion of student variables significantly reduces the variance component ratio of schools, this ratio remains relatively important.

On the part of the school, the models estimated consistently showed that teacher's and supervisor's variables are important in explaining students' learning achievement. It was found that a teacher's type of post (short term) has a negative impact on learning

achievement. Therefore, a review of the rules for defining this kind of post needs to be done in order to provide the right signals to the short-term teachers. Teacher's years of schooling and income failed to demonstrate significant effects on student learning. On the contrary, teacher's pedagogical efforts show a positive and significant marginal effect on learning achievement. Pedagogical effort and teacher answers to student questions are highly correlated with greater learning achievement. Didactic materials available to the teachers and school facilities failed to demonstrate a significant effect on learning achievement. Students in schools with a high degree of supervision on the part of the school principal achieve better scores.

Indicators of organizational and management differences among schools need to be implemented in order to evaluate how the organization of these schools (with a high degree of supervision) affects student achievement. Teacher training, as measured by the number of courses taken by the teacher, does not have a significant impact on student achievement. Moreover, each one of these courses separately failed to have an impact on learning achievement. Thus, investment in primary school teachers seems most effective when it is targeted to increasing practical experience and developing content-specific knowledge.

Finally, teacher enrollment in the *Carrera Magisterial* program had a positive relation with learning achievement. The bottom line here is that this incentive program might have some good aspects that could possibly promote better teaching practices. However, a complete assessment of Carrera Magisterial should not be made only on the basis of whether it helps to pay the good teachers better and to retain them, but also on whether it pushes bad teachers to improve. Testing this assessment will require a data panel of teachers, linking teachers' pay to the rate of growth (not the level) in their students' grades in standardized tests.

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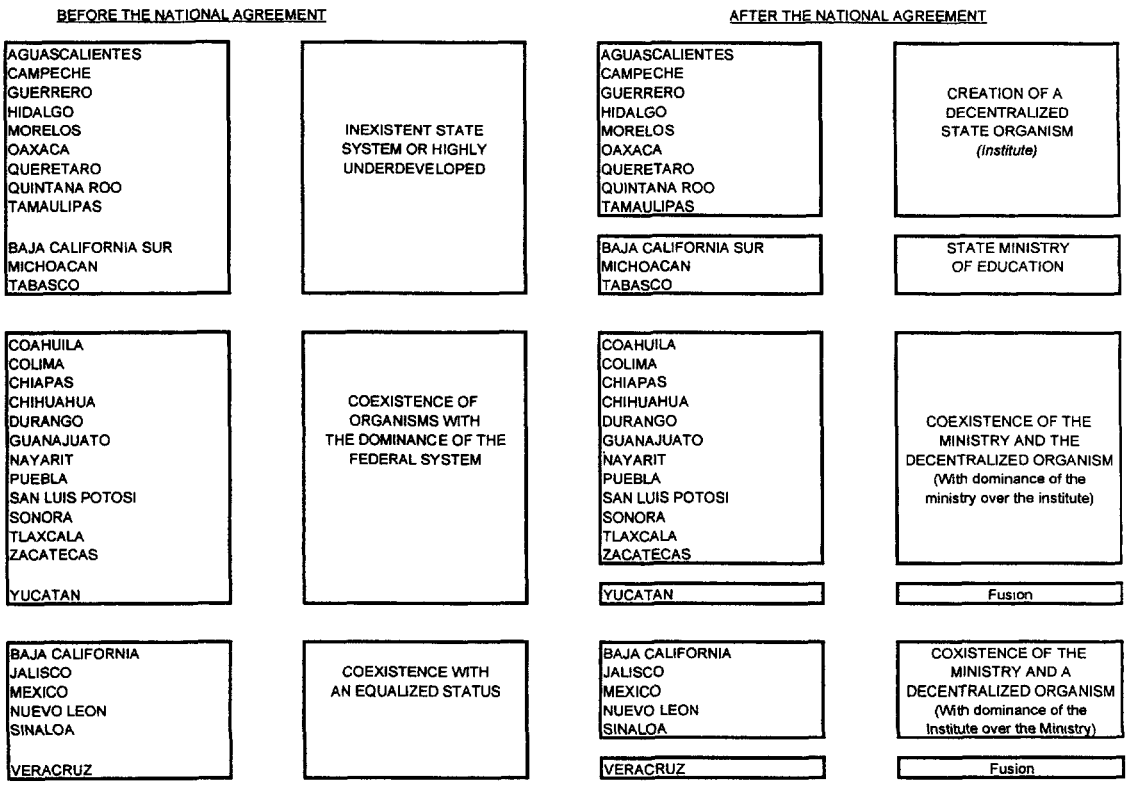
APPENDIX
The National Agreement for the Modernization of Basic Education

The decentralization process intended to create a state agency that would receive all the federal resources. In previous attempts to decentralize the educational system, the Federal Government, through the SEP, established state delegations that were in charge of some administrative functions. These units were in charge of the reception of the federal educational system. Gradually the delegations gained new responsibilities and administrative power that facilitated the negotiation of the ANMEB with the states and the SNTE. These delegations created a new political setting where state union leaders and teachers started to gain power and, as a result of political negotiations, many new parties were allowed to enter. This participation and the internal struggles in the SNTE weakened the rigid structure that had opposed the previous decentralization programs. Each state had a different situation before and after the agreement, as we can see in the next table:



This table shows that the states responded in different ways to the decentralization process, making it either easier or harder, depending on their abilities to absorb their new functions and responsibilities. The coexistence of different agencies makes the process harder because sometimes teachers belong to different sections of the SNTE, and each section struggles to control the teaching posts in the new state educational agencies. Another problem was the standardization of social benefits, because the differences

between the states and federal levels made it almost impossible for the government to cover these differences. The delegation and reception of responsibilities were as follows:
Responsibilities of the Federal Government after the ANMEB

- Operative: Provide educational services in the Federal District.
- Normative: Elaborate the legal framework that rules the basic educational system.
- Administrative: Transfer of the basic educational system to the states and setting up the agreements.
- Financial: Provide compensatory expenditures (the latter through federal agencies such as CONAFE) to the most underdeveloped regions to eliminate inequities between states and regions.
- Evaluative: Establish the evaluation procedures for the national educational system.
- Formulative: Plan the educational system, authorize, and periodically review the free textbooks.
- Financial: Allocate fiscal resources among the states through federal transfers.
- Precautionary: Supervise the proper use of the resources allocated to the states in cooperation with state agencies.

Responsibilities of the State Governments after the ANMEB

- Operative: Directly provide the educational service.
- Normative: Guarantee labor rights and social benefits to the transferred workers. To issue state educational laws.
- Administrative: Create public organisms for receiving the transferred system and integrate both systems into a single agency. Establish agreements.
- Financial: Allocate increasing resources in real terms to basic education.
- Evaluative: Design a state evaluation system.
- Formulative: Propose regional contents for the programs in basic education.

Responsibilities for Municipalities after ANMEB

- Operative: Promote and provide educational services within territories.
- Administrative: Establish agreements to coordinate or unify educational services.
- Financial: Provide resources for school maintenance and equipment.

TAX COLLECTION AND DISTRIBUTION OF FUNDS

In order to maintain the states' new responsibilities concerning the administration of the educational system, it was necessary to complement the ANMEB with a transfer of resources that could make those objectives feasible. Despite its strategic importance, the transfer of resources has not always been clear and has had different impacts on each state.

Certain states complain because they contribute more to the federal government than they receive from it. Furthermore, the levels of government also include municipalities, which have different attributes and obligations, making it difficult to establish rights on the use and collection of taxes.

In Mexico, the tax collection scheme follows these rules:

The federal government is solely responsible for the collection of the following taxes:
ISR (Tax on rents); Tax on assets; IVA (Tax on consumption); IEPS (Special taxes on production and services), and taxes on exports and imports.
The States are responsible for the collection of:
Taxes on the use of vehicles; Taxes on patrimonial transference (inheritances); Taxes on notaries and judicial business; Taxes on Transactions not subject to IVA; Taxes on public shows; and, Taxes on payrolls.
Municipalities are responsible for the collection of:
Prevail (a property tax) and Taxes on public services (garbage collection, sewage, water, etc.).

The Law of Fiscal Coordination, in which the Ministry of Finance and Public Credit (SHCP) establishes the attributions of each Ministry of the Federal Government, rules the collection of these taxes. This law also determines the allocation criteria for the Federal Taxes, establishing that 20 percent of the Participatory Fund (created by the collection of federal taxes) goes to the States under the name of Federal Participation to States. This participation is the main source of income for the States from which they fund their own expenditure including expenditures on education. Thus, State Expenditures on Education are financed by the resources that each State receives from the federal taxes in form of Federal Participation and by the other funds, apart from the Federal Participation, that States can raise.

EDUCATIONAL FINANCING

State Expenditures

The decentralization process meant that both levels of government (state and federal) had to be responsible for the educational financing. This meant that states had to increase the use of their own resources because their expenditure was much smaller than the Federal expenditures. However, the proportions that the two levels of government had to contribute for financing education were undefined. As a result state governments have increased state expenditures on education to different degrees. Another problem is that states do not have a clear and consistent classification of the funds they use on education. There is also insufficient information about state spending at each level. Although some states have increased their expenditures on education, most expenditures go on the payroll, and there are still many states that have not increased their own participation, depending to a greater extent on the federal transfers and participation. If decentralization increases, states would be able to spend more money on specific programs to increase the quality and coverage of education, depending to a lesser extent on the Federal Government.

Federal Expenditure

The organization and administration of federal expenditures on education has changed recently, as a result of the 1998 reforms in the Law of Fiscal Coordination. In this reform, Ramo 33 was created to complement the new official policy for a new federalism. Starting from the assumption that the State Government is more efficient in the provision of

some services (including educational services and the importance of improving the provision of these services), the SHCP organized a new scheme on how to finance these sectors.

Before the reform, the Federal Government channeled the resources for education to the states through Ramo 25 (Contributions to Basic Education) and Ramo 26 (Previsions for Salaries). Ramo 11 is the channel to transfer funds for the maintenance of the SEP and has not been changed. With the creation of Ramo 33 in 1998, federal expenditure on education became part of a package of resources intended for education, health services, and infrastructure.

Reform and Allocation Criteria

The 1998 reform established new funds under Ramo 33 that worked as institutional transfer channels. These funds are:

Basic Education Contributions Fund; Health Service Fund; Social Infrastructure Fund; Fund for the Strengthening of the Municipalities; and Multiple Contributions Fund.

The Basic Education Contribution Fund (Ramo 33) now includes Ramo 25 and Ramo 26. Since the resources are labeled, they cannot be used for any other purposes than education. This is one of the main features of the reform: it gives the states more power to supervise the use of resources. According to the Project of Expenditures Budget of the SHCP, at present, the states' legislatures have the responsibility of supervising the pertinence, efficiency and transparency of the use of education resources. The Basic Education Contributions Fund, (FAEB) is negotiated annually by each state with the SEP.

The basis for these negotiations has two criteria:

- Irreducible Expenditure: This part is based on the number of students, teachers, and schools that each state has at the beginning of an academic year. According to this number, the SEP allocates a certain amount that can maintain the functions of the whole state educational system including some resources for general services, materials, and personnel services.
- New necessities: Toward the end of the academic year, each state negotiates more funding with the SEP in order to cover the new necessities created by an increased demand for educational services or by the increased offer of teachers for the following academic year. Here, states can ask for more resources if they want to implement a specific program. Only states that satisfy SEP criteria for the creation of new locations will receive the necessary increment of resources. These criteria are established in the Booklet of Detailed Programming (*Manual de Programación Detallada*) for the pre-school, primary, and lower-secondary levels.

After receiving each state's proposal, the SEP analyzes the increment viability in federal transfers for education, then sends its Expenditure Budget Proposal to the SHCP, which is the last opportunity for government denial or approval.

There are some resources that might be used for education but are not part of Ramo 33. These resources are classified under different items and most are still administered by the federal government:

1. The Fund for the Administrator Committee of the Federal Program of Schools Construction (CAPFCE).
2. The National Council for Educational Promotion (CONAFE).

3. Compensatory Resources under programs such as PARE, PRODEI, etc.
4. Resources from other agencies such as SEDESOL and DIF.

In the case of the CAPFCE, a new process of decentralization has been taking place since 1998. The committee has been transferring funds to states and municipalities so that they can be responsible for the construction, rehabilitation, and maintenance of schools in pre-school and lower-secondary. State governments are already responsible for primary schools, and the idea is that they will eventually be responsible for all levels of education.

The decentralization process is far from complete, since there are states with two organisms taking care of the educational system with duplicity of functions. This situation implies a fiscal cost that is beyond the scope of this study, but which future research should analyze. To facilitate the administration and provision of the services as well as the gathering of educational statistics and the integration of policies, it would be preferable to have a single agency to direct the educational system. Just one agency in each state could make the educational supervision an easier task as long as the functions of this organism are well defined. The efficiency of this organism largely depends on an adequate use of resources. The latest reforms in the allocation of funds tend to prevent their misallocation, which themselves are not sufficient.

It is also important for states to be able to raise funds from other sources (private investments or savings) generated from the correct administration of funds. If states are largely dependant on resources transferred by the federal government, it is harder for them to allocate resources to areas or programs, which are different to the payroll. States must avoid this situation so as to be able to fund specific projects to improve the quality of educational services, developed by them, according to their particular needs. To this extent, the states would become really autonomous—otherwise decentralization would be merely administrative.

ANNEX A

1. THE EEEP DATA

The Primary Education Assessment Survey, second round 1997 (*Evaluación de Educación Primaria, segundo levantamiento* 1997), from the SEP is representative of state level and by stratum (urban {public and private} schools; public rural schools; indigenous schools, and community schools). Tables A.1 and A.2 show the sample sizes by state and stratum.

Table A.1 Number of Students by State and Stratum, Second Round 1997.

State	Community Schools	Indigenous Schools	Public rural school	Public urban school	Private urban school	Total
AGUASCALIENTES	4		452	746	120	1,322
BAJA CALIFORNIA		74	432	842	84	1,432
BAJA CALIFORNIA SUR	4		386	792	78	1,260
CAMPECHE	9	166	487	707	89	1,458
CHIAPAS	49	125	379	391	92	1,036
CHIHUAHUA	12	37	379	907	100	1,435
COAHUILA	14		718	2,155	732	3,619
COLIMA			444	653	124	1,221
DISTRITO FEDERAL				3,756	676	4,432
DURANGO	31	197	489	485	88	1,290
EDO. MEXICO	16	99	433	878	62	1,488
GUANAJUATO	20		483	613	51	1,167
GUERRERO	59	105	643	447	76	1,330
HIDALGO	44	143	488	489	91	1,255
JALISCO	42	289	388	797	108	1,624
MICHOACAN	69	399	384	558	95	1,505
MORELOS	15	48	420	927	64	1,474
NAYARIT	6	14	441	679	81	1,221
NUEVO LEON	6		411	939	104	1,460
OAXACA	34	448	709	516	64	1,771
PUEBLA	20	401	432	473	96	1,422
QUERETARO	18	52	504	500	138	1,212
QUINTANA ROO	5	45	385	809	85	1,329
SAN LUIS POTOSI	35	444	464	497	90	1,530
SINALOA	20	16	415	643	103	1,197
SONORA	2	412	345	773	477	2,009
TABASCO	20	409	544	484	71	1,528
TAMAULIPAS	12		394	787	73	1,266
TLAXCALA	6		533	604	79	1,222
VERACRUZ	45	800	1,867	2,083	66	4,861
YUCATÁN	10	400	409	830	74	1,723
ZACATECAS	11		484	517	98	1,110
Total	638	5123	15742	27277	4429	53,209

Source: Primary Education Assessment Survey, second round SEP, 1997

Table A.2 Number of Schools by State and Stratum, Second Round, 1997.

State	Community Schools	Indigenous Schools	Public rural school	Public urban school	Private urban school	Total
AGUASCALIENTES	2		25	29	7	63
BAJA CALIFORNIA		4	24	38	5	71
BAJA CALIFORNIA SUR	2		46	32	5	85
CAMPECHE	4	24	50	29	4	111
CHIAPAS	21	14	31	18	4	88
CHIHUAHUA	6	3	60	37	5	111
COAHUILA	6		82	89	32	209
COLIMA			32	28	5	65
DISTRITO FEDERAL				157	36	193
DURANGO	18	42	59	21	3	143
EDO. MEXICO	6	4	31	37	6	84
GUANAJUATO	11		28	26	3	68
GUERRERO	23	8	41	27	4	103
HIDALGO	17	15	41	20	5	98
JALISCO	16	34	48	35	8	141
MICHOACAN	35	27	36	23	4	125
MORELOS	4	2	24	39	5	74
NAYARIT	3	3	37	27	4	74
NUEVO LEON	3		57	41	5	106
OAXACA	16	37	50	22	4	129
PUEBLA	8	33	30	19	6	96
QUERETARO	7	7	31	20	5	70
QUINTANA ROO	2	9	28	35	4	78
SAN LUIS POTOSI	21	51	45	21	5	143
SINALOA	14	2	42	26	4	88
SONORA	2	73	38	34	23	170
TABASCO	8	37	39	20	3	107
TAMAULIPAS	8		38	32	4	82
TLAXCALA	3		26	25	3	57
VERACRUZ	20	81	201	113	4	419
YUCATÁN	5	44	30	36	4	119
ZACATECAS	6		44	21	4	75
Total	297	554	1,394	1,177	223	3,645

Source: Primary Education Assessment Survey, second round. SEP, 1997

Table A.3 Carrera Magisterial Self Selection Problem

Carrera Magisterial self-selection problem. The probit equation results are as follows,

Probit estimates — Number of obs = 22040; Wald chi2(37) = 2669.65; Prob > chi2 = 0.0000; Log likelihood = -11540.659; Pseudo R2 = 0.3724

carmag	Coef.	Robust Std. Err.	z	P>|z|	dF/dX
State	All relevant dummies were significant				
Stratum 2	-.7613951	.0597008	-12.754	0.000	.3706374
Stratum 3	-.1237808	.0312558	-3.960	0.000	.3876072
Classroom size	.0130532	.002017	6.472	0.000	.0017506
Teacher gender (Male=1)	-.446673	.0293384	-15.225	0.000	-.1419307
Teacher age	.19615	.011233	17.462	0.000	.0479354
Teacher's Schooling	.1297847	.0122191	10.621	0.000	.0313395
Codependents	.1178115	.0105022	11.218	0.000	.0291940
Experience in 5^{th} grade	.1043082	.0086326	12.083	0.000	.0431934
Supervisor's visits	.1187639	.0119659	9.925	0.000	.0087112
Teacher's opinion of C.M. (The Trigger Variable)	.1361276	.0190356	7.151	0.000	.0485315
Constant	-1.328442	.1141722	-11.635	0.000	

ANNEX B

VARIABLES' DEFINITIONS

NAME	DEFINITION IN THE QUESTIONNAIRE	VARIABLE DESCRIPTION	SCALE
Mathematics achievement	Score obtained in the math exam, which covers 5th grade topics.	The exam scores are re-scaled using the Rash model.	0-100
Spanish achievement	Score obtained in the Spanish exam, which covers 5th grade topics.	The exam has six parts, reading comprehension, use of graphics, writing, language interpretation, literature, and writing expression. The grade is given by the percents of correct answers.	0-100
Student's gender (male)	Male student	Dummy	
Student's age	Student's age	Continuous	10-13 years old
Repetition in fifth grade (yes)	Whether the student repeated 5th grade	Dummy	
Pre-school education (yes)	Whether the student attended preschool	Dummy	
Blurred vision (yes)	Does the student see what is on the blackboard?	Dummy	
Student's attitude towards learning	Quantitative Indicator of the student's attitude towards learning in 5th grade. This index was constructed through principal component analysis.	Continuous. This index includes variables such as time spent on homework, frequency of research tasks and homework, and, the use of additional books for assignments.	0-100
Household size	Number of family members	Categorical	1-5
Household income	Family income flows	Categorical	1-7
House utilities	Services in house.	Categorical. Categories were constructed using availability indicators of water, drainage, electricity, telephone, and combinations of these.	
Father's schooling level	Student's father schooling level	Categorical	0-6

Mother's schooling level	Student's mother schooling level	Categorical	0-6
Household head economic sector	Student's household head economic sector	A set of dummies variables. Economic sectors are defined as Professional Services, Agriculture, Manufacturing, Commerce, Handicraft Sector, and Public Service Sector.	
Parents involvement in the student's homework	Who helps the student do his or her homework?	Categorical	0-3
Parents meet with the teacher (yes)	Meeting with the teacher to talk about the student's learning performance	Dummy	
Parents meet with the Director (yes)	Meeting with the Director to talk about the student's learning performance	Dummy	
Number of books in house	Number of books in house	Categorical	1-6
Amenities or facilities in house	House amenities or facilities, which include radio, washing machine, refrigerator, gas stove, and television. It is assumed that the impact of each one is the same.	Continuous	0-5
Number of rooms in house	Number of rooms in house	Continuous	1-5
Parent's expectations of the student's educational level achievement	Index of parent's expectations of the student's educational level achievement.	Categorical. This index includes 3 values: low, medium and high expectations.	1-3
Parent's opinion of educational services in school	Index of parent's opinion of educational services in school	Categorical. This index includes 3 values: Non-Favorable, Neutral, and Favorable	1-3
Family's standard of living	Family's standard of living index.	Categorical. This index includes 3 values: low, medium, adequate standard of living.	1-3
Teacher's age	Teacher's age	Categorical	1-8
Teacher's gender (male)	Teachers gender	Dummy	
Teacher's residence within the community (yes)	Place of Residence (within or outside the community)	Dummy	
Teacher's years of residence in the community	Year of residence in the community	Categorical	1-6
Teacher's schooling level	Teacher's schooling	Categorical. This variable includes	1-5

		5 values: Lower-secondary, Preparatory level of teachers training, 3 years (*Normal Básica* 3 años), Preparatory level of teachers training, 4 years (*Normal Básica* 4 años), Tertiary level of teachers training (*Normal Superior)*, and Bachelor degree.	
Attendance to updating courses (yes)	Attendance to updating courses	Dummy	
Number of updating courses	Number of updating courses taken by the teacher	Continuous	0-5
Teacher's experience as primary teacher	Teacher's experience as primary teacher	Categorical	1-5
Type of post. Short term (yes)	Type of post	Dummy	
More than one post (yes)	More than one post	Dummy	
Teacher's income	Teacher's income	Categorical	1-5
Secondary Occupation (yes)	Another activity	Dummy	
Classroom size	Number of students in the classroom in fifth grade.	Categorical	1-6
Didactic material available to the teacher	Didactic material includes Maps; Biology Tools; Blackboard Geometry Tools; Spanish Dictionary; Reference Books and several reading material, and so forth. It is assumed that each didactic material has the same impact on the learning process.	Continuous	0-7
Teacher's performance index.	Quantitative indicator of teacher's performance in 5^{th} grade. This index was constructed through principal component analysis.	Continuous. This index includes variables such as teacher's pedagogical behavior; teacher's interest in students' learning, teacher's adaptability given the learning results, teacher fosters students to self-learning, number of meetings with parents of low achievement children, teacher's ability to plan.	0-100
Teacher's pedagogical behavior	If the student gives the wrong answer, What is the teacher's pedagogical behavior?	Categorical	0-3

Teacher's interest in students' learning.	How frequently does the teacher have talks with his or her students about learning improvements and difficulties.	Categorical	0-2
Number of supervisor's visits (as answered by the teacher)	Number of supervisor's visits	Categorical	1-4
Number of supervisor's visits (as answered by the Director)	Number of supervisor's visits	Categorical	0-5
Teacher's enrollment in *Carrera Magisterial* (yes)	Enrolled in *Carrera Magisterial*	Dummy	
Teacher's years of enrollment in *Carrera Magisterial*	Years in *Carrera Magisterial*	Categorical	1-5
Carrera Magisterial Level	Level in which the teacher is enrolled in *Carrera Magisterial*	Categorical	1-4
Director's income	Director's income	Categorical	1-5
Director's age	Director's age	Categorical	1-8
Director's experience	Director's experience	Categorical	
School equipment	The schools have maps, computers, scientific models, television, videocassette recorder, and digital projector. It is assumed that every teaching tool has the same impact on the learning process.	Continuous	1-7

Table B.1 Determinants of Mathematics Achievement Scores in Fifth Grade in Urban and Rural Areas

	Urban Areas			Rural Areas		
	Coeff.	**Level of Sig.**	**Elasticity**	**Coeff.**	**Level of Sig.**	**Elasticity**
Student Socioeconomic Variables	0.497	0.000		0.472	0.000	
Teacher's gender (male)	-0.375	0.310	-0.003	0.754	0.568	0.0100
Teacher's age	0.350	0.055	0.036	-0.818	0.148	-0.0759
Attendance to updating courses (yes)	0.522	0.401	0.009	-0.933	0.520	-0.0177
Teacher's residence within the community (yes)	-0.714	0.065	-0.008	1.740	0.129	0.0099
Teacher's years of residence in the community (yes)	0.019	0.876	0.002	0.573	0.084	0.0622
Teacher's schooling level	0.256	0.117	0.019	-0.483	0.246	-0.0365
Teacher's pedagogical behavior	0.238	0.001	0.005	0.018	0.048	0.0004
Teacher's interest in students' learning	0.451	0.035	0.015	0.509	0.032	0.0173
Number of updating courses	0.020	0.698	0.002	0.086	0.043	0.0093
Type of post. Short term (yes)	-1.218	0.141	-0.001	5.766	0.040	0.0072
More than one post (yes)	-0.046	0.895	0.000	4.153	0.026	0.0130
Teacher's income	0.059	0.655	0.004	-0.332	0.277	-0.0235
Didactic material available to the teacher	0.013	0.575	0.004	-0.224	0.003	-0.0626
Number of supervisor's visits (as answered by the Director)	5.237	0.000	0.045	dropped		
Teacher's enrollment in Carrera Magisterial (yes)	0.032	0.947	0.000	2.797	0.005	0.0331
Carrera Magisterial level	-0.302	0.186	-0.006	-0.450	0.400	-0.0068
Correction of self-selection bias in Carrera Magisterial	-0.420	0.764		-1.295	0.600	
Constant	48.219	0.000		56.266	0.000	

Source: Author's estimates based on The Primary Education Assessment Survey, second round, SEP 1997.
Note: Figures in bold are significant at 5 percent.

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