



Global Development Network

Strengthening
Institutions
to Improve
Public Expenditure
Accountability

Policy Alternatives in Primary School Management and Grade Structure in Peru: A Cost-Effectiveness Exercise

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March, 2013

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This Research Paper has been prepared as part of the research which was conducted under the GDN Global Research Project “Strengthening Institutions to Improve Public Expenditure Accountability”, implemented in partnership with Results for Development Institute (R4D), USA with the aim of building and strengthening institutional capacity for public expenditure analysis across developing and transitional countries. The Global Research Project is fully funded by the Department for International Development (DFID), UK. The views expressed in this publication are those of the author(s) alone.

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OVERVIEW

This paper uses a Cost-Effectiveness Analysis (CE or CEA) approach to explore some policy recommendations to improve learning performance of primary students and increase sector efficiency. The team has selected policies linked with the supply side and mostly related to the school or productive units in this sector at the level of primary basic education. Researchers selected two scenarios or topics: the first compares the CE and cost efficiency of three types of schools (size), and the second compares the CE of two school management models. The research compares the public-private¹ partnership schools, “Faith and Joy” (F&A) or *Fe y Alegria* in Spanish, with regular official public schools; due to the predominance of F&A schools in urban areas, the paper compares the two in urban areas only.

The three types of primary schools are:

- Single teacher schools. One teacher teaches all the grades in one room, also known as “one-teacher-one room-all primary grades”. In Peru they are known as *unidocente* schools.
- Multiple teacher schools. One teacher teaches two or three primary grades in one room. They are known as *polidocente multigrado* or only *multigrado*.
- Multiple and complete teacher schools. One-teacher-one-primary grade, and each-one-have- one room. These are known as *polidocente completas* or just *polidocente*. If these schools are integrated with secondary schools, or have two schedules for two different groups, one in the morning and one in the afternoon, they are known and identified here as *polidocente integradas*.

The cost unit variable is the *annual cost per student* at the level of the frontline provider, i.e. the school. The cost of intermediary bodies or the Ministry of Education is not considered. It should be emphasized that the approach does not take into account budgetary expenses, but the normative costs of the intervention in both cases; normative meaning the essentials for schools and the amount of inputs required by the school according to the rules and regulations of the country and the sector. The use of normative costs facilitates the construction of a standard cost. However, as explained later, some actual costs, and also opportunity costs, are used, but in a lesser degree.

The effectiveness indicator used was performance in reading comprehension and basic math, measured officially by the Ministry of Education. However, this metric is only done and available for second-graders. Factoring in this limitation, the paper uses repetition of grade and drop-out rate to evaluate efficiency models. Indirectly, it can give evidence of cost saving, which can enrich the analysis.

This paper provides interesting lessons in costing methodology and effectiveness measuring when dealing with two programs. For the purpose of applying a cost effectiveness analysis in educational programs, the scope of the evaluated program cannot be too general; the smaller the better to be able to isolate external factors and arrive at a detailed figure of the costs. As explained in the analysis section, there could be as many “costs per student” as

¹ The management of F&As consider themselves to be a type of public school.

number of schools because the list of inputs could be different and cannot be easily determined, even controlling for external factors. So, which cost should be considered? The level spent at the macro level, or the average of actual expenditure in each school? The methodology will be explained later in detail.

Policies derived from the analysis of the two topics could be:

1. We explore the possibility of moving from unidocente to multigrado, or from multigrado to polidocente models, if, and only if, the geography, distance, and population density permits. The macro analysis made here could be used as a guide to undertake case studies of school restructuring at the district level.
2. One of the proposed alternatives is to increase private or community participation through an F&A type of partnership, although not limited to it. Peru's laws take into account increasing school autonomy, but no definite decision has been taken and the Ministry is reluctant to implement a full decentralization in this regard. It is not clear whether or not the regions have the authority to pursue this direction under Peru's decentralized model.

CONTEXT

Before we describe the programs, it is necessary to review briefly the Peruvian education sector in regard to supply. This will allow us to better understand the programs because we will be dealing with two different models of supply with regard to its management. On one side we have the very well-known F&A schools, and on the other side, the public schools managed by the regional government and regulated by the central government.²

Currently, the Peruvian educational system has more than 94,000 schools and educational programs including both public and private; about 50,000 of them are located in urban areas and about 44,000 in rural areas. Similarly, the number of teachers working in public and private schools is 319,000 and 165,000, respectively. Thus, about 484, 000 teachers, of whom more than half work in public schools, must teach more than 8.6 million students across the country (MINEDU 2009).³

In Peru, public expenditure on education as a percentage of the GDP is a low 2.5 percent, much less than expenditure in Mexico (5.3 percent), Brazil (5.1 percent), Colombia (4.9 percent), and Chile (3.4 percent) (World Bank)⁴. The problem in the Peruvian educational system is closely related with the poor quality of education that public schools offer, which is aggravated if this variable is linked to a restricted public budget. This is especially true of public schools which are responsible for the education of about 75 percent of Peruvian students.

Thus, the performance indicators for students and graduates of schools are quite low, which places Peru at the bottom in different international education rankings. According to the *Global Competitiveness Report 2009-2010*, Peru currently ranks 133 out of 138 countries

² Except in Lima city, where the schools are still managed by the central government.

³ Table 1, Table 2, and Table 3.

⁴ <http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>

worldwide in quality of primary education. The results of the *Second Regional Comparative and Explanatory Study* (SERCE) of the Latin American Laboratory of Educational Quality (LLECE in Spanish) (2004–2008) showed that the levels of reading and performance in mathematics in Peru are quite low. Only 9.46 percent and 9.29 percent of sixth-graders surveyed reached the highest level of performance in reading and math, respectively. Results further worsen for rural areas.

However, one must recognize that the last evaluation by the Ministry this year concluded that there have been some achievements in the urban sites, but not in rural areas. Another factor to note is the high rates of school failure. While enrollment rates are high, repetition and drop-out rates are also high.

Although governmental attempts to reform the education sector have accelerated since the early nineties, they have not had the desired impact. Thus, while the demand for education has grown rapidly along with population growth, education supply was not completely satisfactory. First, because of inadequate resources allocated by the government to the sector, and inefficient use and distribution of funds among programs; second, because the right policies have not been chosen.

As regards budget resources, there is not enough research to demonstrate that Peru needs more resources, or if it does, how much the incremental budget should be, because there are also problems of inefficiency and mismanagement. Apparently the resources are distributed for all the inputs required, but they simply do not reach the schools equally. The decentralization process has aggravated this problem. Even though the central government still maintains some operative tasks, it is hard to track spending and decision making becomes more confusing, making it difficult to detect the leakages. This factor should be kept in mind due to its effects on the cost level that researchers can use if one considers only the numbers registered as budget expenditure.

As regards inequities in distribution of funds, there are actual differences. According to another paper on Program Budgeting by the present authors, a ratio of 1:2 was found when comparing regions with a high level of rural population versus regions with a high level of urbanization.

COSTING METHODOLOGY

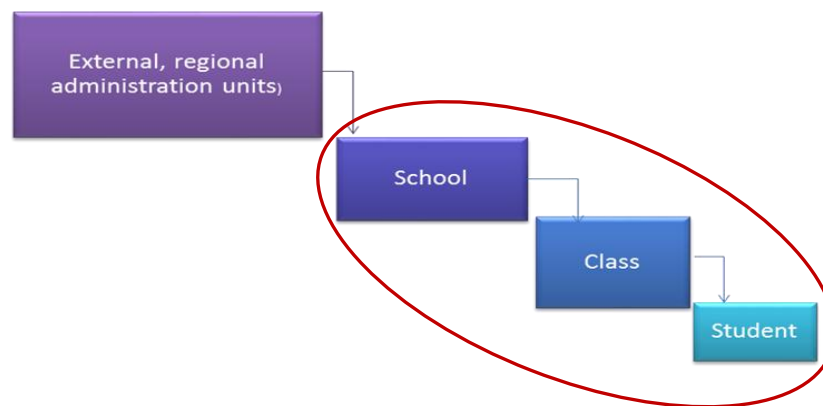
The methodology uses annual cost per student at the primarily level as a way to standardize results and enable a comparison of the two programs, two strategies, or two supply models.

The reconstruction of the costs is done using two approaches simultaneously: the ingredient (inputs) approach and the cost center process approach. The first approach was developed by Levin (Levin and McEwan 2001) and basically looks at the value of the inputs used during service provision and curriculum implementation; the second approach is used intensively in the health sector and works basically with cost centers and with a top-down process of allocation, from the administrative intermediate level cost centers to the service provision

unit or school, and within them, to the classroom, and finally to the student. The costs are registered at the school and the classroom, even though it was paid for by the Ministry.

The following graph represents the levels at which the costs are generated; basically taking into account the costs of administrative and pedagogical inputs in school administration, inside the classroom, and those other inputs necessary for each child during her/his classes. It should be noted that independent of where the expense originated (and registered as such in the budget), the costs are considered for where they were used. For example, books are paid at the Ministry level, salaries at the regional level; but for this paper, costs are determined at the student level where they are used for books, and at the level of the classroom in the case of the teacher.

Figure 1. Cost centers identified for the cost allocation process



In the previous Program Budgeting and Benefit Analysis report, the author used the budget as the prime source of information for costs. There has been little research on cost education analysis considering concepts such as opportunity costs. In that sense, trying to study CEA in a school considering only budgetary data is not completely correct. However, there are two issues that need be considered which increase complexities in the analysis.

- a. There are other (extra) sources of budgetary funds that are paid by parents out of their pocket or donations in kind that school principals are able to get. And, depending on the leadership skills of the school principal, teachers spend more time (after schools hours) coordinating curricula, peer coaching, and other extracurricular activities, making the real costs complex to calculate.
- b. There are at least two approaches to consider. First is the cost of the inputs that a school requires according to government rules and regulations, which can be called the “*Normative Package*”; this package, according to the government, is being distributed equally to schools. However, as observed during field visits⁵ and interviews, schools do not necessarily receive all the inputs equally or receive them at all. The list of the inputs that each school actually uses is identified as the “*Actual Package*” (Alvarado and Llemphen 2010). In this paper we prefer to work with the normative package which is made up of all the inputs identified and regulated by

⁵ A larger number of visits were done thanks to the study developed by USAID/SUMA on education costs during 2010.

legal or official instruments at different levels like laws, directorial resolutions, and official catalogs. This approach is a good way to standardize a minimum level of inputs per school. The inputs have been categorized as human resources, goods and services (especially instructional materials), investments in infrastructure and equipments, and student welfare. The difference in and application of each will be delineated in each topic. The actual package can be used if the analyst is conducting a case study at the district level and a direct observation can be made of most of the schools. This is crucial at this level because monetary inputs by parents or voluntary work not registered in the budget may come up.

Cost Calculation

To calculate the annual cost per student, one should consider the value of four elements in the costing process: quantity, intensity of use, replacement period, and price of all inputs. The application of the formula allows standardizing depreciation and life value. This is so because some inputs are annual current expenditures, like salaries, but there are others like equipment and infrastructure with a life value of five and 25 years, respectively.

Before elaborating the definition of the main inputs that go into the learning process, it is important to point out that the calculation of the unitary cost is highly determined by the salaries of the teachers and principals, and the number of students in each class.

Box 1. Algorithm of calculation

ELEMENTS OF COST VALUE	EXAMPLE
Q = Quantity of the input	square meter of infrastructure, one laptop
IU = Intensity of use	one book per child, one laptop per “n” child, quantity of inputs shared by a number of students
RP = Replacement period	Books: 3 years Computers: 4 years TV, DVD, photocopies, radio, multimedia: 5 years Kitchen appliances: 5 years Sound equip: 10 years Furniture, desk, tables , bookshelf: 10 years Infrastructure: 25 years
P = Price	could be provided by government, or taken from market values
N = number of students per class	
CUP = Unit cost per student	
$CUA = \frac{(Q \times P \times IU)}{RP}$	
Elaborated by the author and adapted from Alvarado and Llemphen (2011). All values have been annualized for comparison purposes. It is assumed that the opportunity cost of capital is zero to allow for comparison with annual budget data.	

In summary, the costing process was:

1. Identify the list of inputs that are currently used by the public schools according to the normative scheme.

2. Apply to each input the algorithm mentioned in Box 1. The price values were taken from public biddings and market. For family participation, an estimation of the minimum cost of a working hour was considered.
3. Apply the allocation down to the classroom and finally, the student.

To keep it simple, we will focus on the main inputs that explain the larger part of the cost structure, mainly human resources; not only for costing purposes, however, but because teachers' performance explains students' performance better than any other input. See the MacKinsey Report (Barber and Mourshed 2008). Also, the size of the classroom is crucial and determines the cost level.

One of the limitations, as some researchers have pointed out, is that it does not matter how much goes into improving classroom performance—especially with respect to classroom materials; it actually depends on how the teachers use them. In other words, again, the teacher's performance will justify the costs.

EFFECTIVENESS INDICATOR

The authors of this paper have prioritized the most sensitive and important indicators. Due to the dramatically low levels of reading comprehension and basic math skills, they are considered an excellent point of reference of education quality. Hence, this research uses the data of the national Student Evaluation Census (ECE) (for 2008, 2009, and 2010) that is conducted annually by the Ministry of Education. This is applied to a representative sample of second-graders at the national level and its objective is to assess the student's performance in reading comprehension, basic math. Additionally, there is an annual School Census (Censo Escolar) on the features of the school infrastructure, teachers, etc. The last updated School Census was in 2009.

Given that the F&A schools are mainly urban and are considered to be public schools, the effectiveness analysis concentrates on urban schools. Private schools have not been included.

As already mentioned, the metric for learning performance is only available for second-graders.

This limitation is sought to be mitigated by using repetition and drop -out rates to evaluate school efficiency. Indirectly, it can provide evidence of cost saving which improves the analysis.

TOPIC ONE. Effectiveness of the UNIDOCENTE, MULTIGRADO and POLIDOCENTE schools

A new comparison has been introduced into current discussions on the policy agenda for its relevance to Peru. Rural schools, as we know, have the lowest learning performance. As mentioned earlier, there are at least three school models related to size (number of students) and the ratio of teacher to number of grades taught in one room at the same

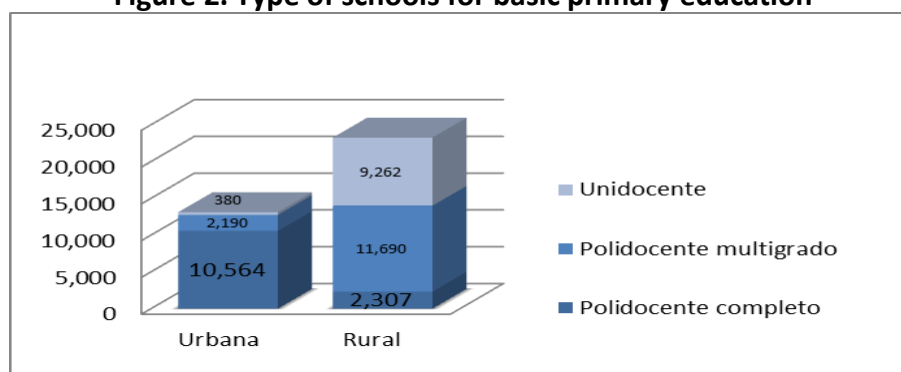
time. Where possible, we will argue that reorganization of schools and possible introduction of transport for children can make a difference. It is a very simple idea that is rarely discussed, perhaps because it will need a quota of political decision and negotiation with the Teachers' Union or because the regional governments that manage the schools are limited in their decision making by institutional rules of national governments.

Again, these are the three sizes of primary schools:

- Single teacher schools, teaching all six grades in one single room, also known as “one-teacher-one-room-all primary grades”. In Peru they are known as unidocente schools.
- Multiple teacher schools, with one teacher for two or three primary grades in one room. The school can have two or three rooms on average. These are known as polidocente multigrado, or only multigrado for our purposes.
- Multiple complete schools, with one-teacher-one-primary grade, and each grade with its own room. They are known as polidocente completas or just polidocente for our purposes. If these schools are integrated with secondary schools or have two schedules for two different groups, one in the morning and one in the afternoon, they are known and identified here as polidocente integradas.

Approximately 17 percent of schools in Peru have a single teacher attending to all grades, ors at the primary level, and 46 percent multigrado schools. Both are highly concentrated in the rural areas. Complete grade schools or polidocente represent 24 percent of the universe, and most of them are located in the urban areas. Authors worked with descriptive statistics and also, as a triangulation, with a model to isolate the effects of the characteristics of children from the size of the school in educational performance.

Figure 2. Type of schools for basic primary education



Source: Student Census.

Table 1. Type of schools by area of residence

Number schools	Unidocente	Multigrado	Polidocente
Urban	380	2190	10564
Rural	9262	11690	2307
Urban	1%	3%	16%
Rural	30%	42%	8%

Source: Student Census.

These three types of schools have different performance levels and different cost structures due to the different inputs required, number of students, and number of teachers involved in one school. So far as we can deduce, unidocente students have less effective teaching hours since the teacher has to divide her/his time between the different grades in one room. They also have other tasks outside the classroom, like preparing breakfast, cleaning the school, coordinating or bringing materials from the regional offices, etc.

Comparative effectiveness indicator

As mentioned before, we compared the learning performance in reading comprehension and basic mathematics in the three types of schools. The main source is the National Student Evaluation Census, or ECE. One shortcoming is that the evaluation pertains only to second-graders, and does not differentiate between unidocente and multigrado schools in the results.

The constructed indicator from ECE considers students who reached Level 2 and Level 1 of performance. The definition of each level is:

- Level 2: Students at this level reached the expected learning stage of a second-grader. They responded to a majority of the examination questions.
- Level 1: Students at this level did NOT reach the expected learning stage of a second-grader. They responded only to the easiest questions.
- Below Level 1: Students at this level did NOT reach the expected results for a second-grader. They had difficulty in answering even the easiest questions in the examination.
- The highest standard is Level 2, but in this case the researchers created a combined indicator, adding Level 1 and 2 to identify the minimum learning level. Levels located below 1 and 2 could be considered a proxy for a repeater student.

Table 2 Level-wise performance results: Reading comprehension, 2009-2010 of Second-graders according to type of schools

	2010		2009	
	Polidocente	Multigrado or Unidocente	Polidocente	Multigrado or Unidocente
Level 2	33.9	9.3	27	9.5
Level 1	49.9	39.1	56	45.2
< Level 1	16.2	51.6	17	45.3
Levels 2 and 1	83.8	48.4	83	54.7

The same exercise can be done using only Level 2. The difference between the schools will be higher than the results presented here with the combined indicator.

Table 3 Level-wise performance results: Basic mathematics, 2009-2010 of Second-graders according to type of schools

	2010		2009	
	Polidocente	Multigrado/ Unidocente	Polidocente	Multigrado/ Unidocente
Level 2	15.8	6.2	15.6	6.3
Level 1	35.8	22	40.4	26.4
< Level 1	48.4	71.8	43.9	67.3
Levels 2 and 1	51.6	28.2	56	32.7

Table 4 Drop-outs as percentage of final registration, 2009

	Total	First grade	Second grade	Third grade	Fourth grade	Fifth grade	Sixth grade
Urbana	3.7	5.9	4.3	3.5	3.2	3.1	2.6
Girls	3.5	5.5	4	3.3	3	2.9	2.4
Boys	3.9	6.2	4.5	3.6	3.4	3.4	2.7
Rural	7	13.4	6.2	5.7	5.6	6	5.3
Girls	7	13	6.1	5.6	5.5	6.1	5.4
Boys	7.1	13.8	6.4	5.7	5.6	5.9	5.1

Notes: Proportion of students not attending after registration.

Source: Student Census.

Table 5 Repetition as percentage of total registration in each grade or level, 2009

Area and gender	Total	First grade	Second grade	Third grade	Fourth grade	Fifth grade	Sixth grade
	2009	2009	2009	2009	2009	2009	2009
Urban	<u>7.3</u>	<u>1.5</u>	<u>7.5</u>	<u>5.8</u>	<u>4.7</u>	<u>4.0</u>	<u>2.3</u>
Girls	7.1	1.5	7.0	5.4	4.3	3.6	2.1
Boys	7.6	1.6	7.9	6.2	5.0	4.4	2.5
Rural	<u>12.8</u>	<u>7.7</u>	<u>20.8</u>	<u>17.4</u>	<u>12.1</u>	<u>10.4</u>	<u>5.6</u>
Girls	12.6	7.4	20.5	17.2	12.0	10.3	5.6
Boys	13.0	8.1	21.1	17.5	12.1	10.5	5.7

Note: Students taking the course at least twice as a proportion of total registration of a grade or level.

Source: Student Census, 2009.

Table 4 shows that the gap between urban–rural increases in the first and last grades. The latter is a clear problem for transition to secondary school. Drop-out girls and boys experienced the same problems.

The CEA calculations can also use this indicator, emphasizing the difference in Grade 1 and Grade 6. The first is crucial to continue at the primary level, and the second affects the transition to secondary school.

Table 6 Cost results for a normative package for the three types of schools, 2010 (soles)

FACTORS	COMMENTS	UNIDOCENTE 18 Students per classroom	MULTIGRADO 20 Students per classroom	POLIDOCENTE 23 Students per classroom
HUMAN RESOURCES	Teacher salaries paid by state. The media value of the salary; due to several levels in the structure, it was weighted by the number of teachers in each category.	1536	1120	1400
GOODS AND SERVICES	Market prices when dealing with educational materials and books. Ministry bids for printing books, practice books, and other schools supplies (paper, pens, ink, etc.) and concrete instructional materials (blocks, puzzles, etc.), even though schools are managed by the regions.	165	133	46
INFRAESTRUCTURE	Calculated value and provided by the Ministry of Education. The values indicate square meters needed per student, but a minimum size of classroom is considered.	391	181	232
SMALL ASSETS	Market values from commercial outlet. Here the most important units are information and communication technology (ICT), and copy machines.	194	85	138
MANAGEMENT	School management	77	25	10
STUDENT WELFARE	School breakfast and lunch.	144	144	144
TOTAL COST PER STUDENT PER YEAR, (soles)		2,506	1,688	1,969

Methodology based on Alvarado and LLempen, 2010.

The size of the schools represents the media size according to the National Student Census, 2008. The unidocente school has 18 students per class on average, the multigrado school has 20 pupils, and the complete polidocente school has 23 students.

Cost effectiveness analysis

This section will cover three methodologies to calculate effectiveness. The first one will calculate the annual cost to produce a student with minimum learning standards, the second one will calculate the total number of investment years (cost) to produce a graduate at the primary level, taking into consideration the sunk cost in repetition and drop-out. The third, as a triangulation process, will model the effects of F&A, isolating the effects of student demographic factors among others.

Cost per student reaching minimum learning standards

The following parameters, assumptions, and calculation procedures were used:

1. For the minimum standard of learning performance, Level 1 and Level 2 have been considered.
2. For the total investment by type of school, the total number of students per type of school has been multiplied by the cost per student based on the normative package calculated in this paper.
3. The number of students who actually reached the minimum standard was calculated by the percentage obtained in the sample of the ECE census 2010 and applied to the total number of students in each type of school.
4. The total investment has been divided by the number of students who actually reached the minimum learning standards.
5. The result is the actual cost to produce a student with minimum learning standards.

Table 7 Calculation of actual cost per student reaching min. learning standards in 2010

	Unidocente	Multigrado	Polidocente
Number of students in each type of school	172,958	700,675	2,205,456
Cost per student, normative package ,2010 (soles)	2,506	1,688	1,969
Total investment = students times cost per school (soles)	433,432,748	1,182,739,400	4,342,542,864
Performance reading results, ECE 2010	48.4 (39.1+9.3)	48.4 (39.1+9.3)	83.8 (49.9+33.9)
Students reaching reading minimum performance 2010= Level 1+ Level 2	66,415.9	339,126.7	1,848,172.1
Actual cost per student who reached minimum learning standards in reading comprehension, 2010 (soles)	5,343	3,599	2,297
Performance math results, 2010	28.2 (22 + 6.2)	28.2 (22 + 6.2)	51.6 (35.8+15.8)
Students reaching basic math minimum performance 2010= Level 1+ Level 2	48,774.2	197,590.4	1,138,015.3
Actual cost per student who reached minimum learning standards in basic mathematics, 2010 (soles)	9,247	6,228	3,715

Table 8. Sector efficiency based on actual students graduating deducting repetition

	Unidocente	Multigrado	Polidocente
Percentage of students graduated to the next grade and sixth grade to high school	87.2	87.2	92.9
Number of students registered in primary level of each type of school	172,958	700,675	2,205,456
Cost per student, normative package 2010 (soles)	2,506	1,688	1,969
Total investment = students registered in primary level times cost per school (soles)	433,432,748	1,182,739,400	4,342,542,864
Students graduating to the next grade deducting repetition	150,793.2	610,882.6	2,048,966.0
Actual cost per student graduating to the next grade and graduation in sixth grade	2874.4	1936.1	2119.4

Cost efficiency measured by the actual number of years to produce a primary graduate in each type of school

This calculation is identified as sector internal efficiency, i.e. number of years of investment needed to produce one graduate at the end of primary school. The methodology has three steps:

1. If one cohort of 100 students enters first grade, 600 years of investment (6 years per student) is needed. If the 100 students graduate from primary school without repeating a grade, the number of years is 6 (600/100).
2. If 50 out of the 100 students repeat any grade, the total number of years of investment will be 650 years or 6.5 per graduate (650/100) which is considered a loss in efficiency.
3. If 50 students repeat one grade and 10 students drop out in the fifth grade, the number of years of investment is reduced to 640, but only 90 students actually graduate at the end of primary school. With that, sector efficiency is further reduced with a result of 7.1 years of investment per graduate (640/90) (Deweese 2011).

Table 9 shows the three steps using information on the three types of schools. However, it was not possible to get data pertaining to repetition and drop-out rates for unidocente and multigrado. These schools were matched with rural areas and polidocente schools were matched with urban areas.

Table 9 Sector efficiency measured and cost per graduate

	Unidocente	Multigrado	Polidocente
Cohort (1)	100	100	100
Years per student (2)	6	6	6
Total number of years (3=1*2)	600	600	600
Years of repetition in the 6 grades 2009 out of 600 (4)	74	74	26
Total number of years (5=3+4)	674	674	626
Years per graduate (6= 674/100)	6.74	6.74	6.26
Drop-out 5th grade (7)	6	6	3.1
Total number of years (8=5-7)	668	668	622
Total number of students graduating after drop - outs (9)	94	94	96.9
Cost per student per year (study calculation)	2,506	1,688	1969

Process of calculation (Table 9):

1. Considering 6 years of primary school, over a base of 100 students, makes 600 years of investment.
2. Number of repetitions in grade 6 considered, simulating the number of years of a cohort first to sixth grade. This repetition subtotal is added to the 600 years.
3. Additionally, the number of drop-outs in fifth grade is subtracted from the total years.
4. Finally, the net total years of investment is divided by the actual number of graduates, arriving at the total years needed to produce a graduate.
5. Optionally, one can also calculate the total cost; converting to soles and multiplying by the level of annual cost per student calculated for this study.

The calculations show that to produce a graduate at the primary level, unidocente and multigrado have to invest 7.1 years, while polidocente has to invest 6.4 years, the equivalent of 0.7 years less, making the latter more attractive. In terms of cost, however, multigrado is attractive for rural areas.

Triangulation isolating effects of environment on student performance

In order to isolate the net effect of the type of school on a student's performance, a regression analysis has been done. For the purpose of this research, an ordinary linear square model (OLS) has been assumed. Using the National Survey, 2004 by the Ministry of Education, the analysis is based on student performance in reading comprehension, as shown in Table 11. But first, Table 10 lists the variables included in the final model. The description of each variable and its possible values were also included.

Equation (1) represents the formal expression of the econometric model:

Student's Performance =

$$\beta_0 + \beta_1 \text{Familiar Background} + \beta_2 \text{Student's Characteristics} + \beta_3 \text{School features} + \beta_4 \text{Teachers' characteristics} + \beta_5 \text{Type of School} + \varepsilon$$

... (1)

Where: Student's performance is the dependent variable that indicates quality measure obtained by the second-grade students. Type of school is the variable that measures the relevance of studying at this kind of school. The other variables are vectors that include control variables for a better specification of the econometric model.

Table 10. Description of each of the variables included in the model

Variable	Observations	Values
Student's performance level in reading comprehension	Using the RASCH method, the Ministry of Education has established a rating scale.	Continuous variable
Gender of student	Female or male.	1: Male
		0: Female
Area	Area where the school is located.	1: urban
		0: rural
Student's age	Student's current age (in second grade)	
School administration	Public or private.	1: Public
		0: Private
Type of school	Unidocente/multigrado or polidocente.	1: Unidocente/multigrado
		0: Polidocente
Child's first language is Spanish	An approximation of the cultural background of the student.	1: Yes
		0: No
Number of siblings		Discrete variable
Child receives help with homework	An approximation of the difficulties for a child at school.	1: Yes
		0: No
Number of books at home	Useful to have an idea	Discrete variable
Father's education	It is expected that the higher the father's education, the better opportunities for their children.	1: No education 2: Incomplete Primary education 3: Primary school 4: Secondary school 5: Incomplete non-university education 6: Complete non-university education 7: Incomplete university education 8: Complete university education
Mother's education	It is expected that the higher the mother's education, the better opportunities for their children.	1: No education 2: Incomplete Primary education

Variable	Observations	Values
		3: Primary school 4: Secondary school 5: Incomplete non-university education 6: Complete non-university education 7: Incomplete university education 8: Complete university education
Wall material	It is expected that the more elaborate the wall material, the more comfortable and healthy the house is for a child.	1: Straw, cardboard, plastic or pieces of can. 2: Prefabricated sheets (eternit, triplay). 3: Wood. 4: Quincha. 5: Brick or cement. 6: Adobe. 7: Stone and clay.
School has electric service	An important variable as it carries the possibility of using other assets.	1: Yes
		0: No
Roof material	It is expected that the more elaborate the roof material, the more comfortable and healthy the house is for a child.	1: Straw
		2: Mats/Cardboard
		3: Tin
		4: Cana
		5: Calamine
		6: Eternit
		7: Tiles
		8: Wood
Floor material	It is expected that the more elaborate the roof material, the more comfortable and healthy the house is for a child.	9: Concrete
		1 Sand
		2 Wood, not treated
		3 Cement
		4 Tile or similar
		5 Synthetic tile and alternate processed wood
		6 Wooden and finished
School is connected to a public sewer network	An important variable as it carries the possibility of using other assets.	1: Yes
		0: No
Teacher's age	An approximation of professional experience.	Continuous variable
Teacher's first language is Spanish	An approximation of the cultural background of the teacher.	1: Yes 0: No

Variable	Observations	Values
Teacher's education	It is expected that the higher the teacher's education, the better the student's performance.	1: Secondary school 2: Incomplete non-university education 3: Complete non-university education 4: Incomplete university education 5: Complete university education 6: Graduate education (for, at least, one year)

As can be seen in Table 11, results confirm that the type of school is an important variable in explaining a student's performance, even when other associated factors are included as control variables. The estimated regression shows that when a school changes from a polidocente to a unidocente/multigrado one, the student's performance can decline, on average, by 4.24 points, keeping the other variables constant.

On the other hand, variables associated with the student's background have shown a significant influence on performance. For example, the age of students shows a negative influence, which is logical if we consider it as an approximation to "over-age-for-the-grade" students.

The first language is also a relevant variable. It is important to point out that this variable can also reflect the family's socioeconomic status (as both these variables are strongly correlated). Nevertheless, it is important to include it because when a student's first language is Spanish, his/her performance increases by 29.51 points. The Table shows that boys have a slight disadvantage: they are, on average, 3 points below girls in reading comprehension. Both the mother's and father's education were also important variables with a positive influence, just as the number of books at home. However, helping children with their homework or the number of siblings are variables that showed a negative influence on students' performance.

Regarding variables associated with the school, and the construction material of the wall, roof, and floor are significant, but what is particularly relevant is the connection to a public sewer network and electricity service as they lead to an increase of 10.5 and 20.4 points in performance, respectively. The teacher's background is also important. His/her age (an approximation of their experience), Spanish as their first language and their professional status are statistically significant and have a positive influence. Finally, the location of the school also has a positive influence; the urban school shows, on average, an increase of 7.76 points over rural schools.

Table 11. Explaining student performance in reading comprehension, evaluation census (ECE) 2008, second-graders

Dependent variable: Students' performance

	Coef.	Std. Err.	t
Area (1: urban)	7.755	2.443	3.180
School's administration (1: public)	-29.432	2.255	-13.050
Type of school (1: unidocente)	-4.240	2.466	-1.720
Students' age	-5.944	0.667	-8.920
Child's first language is Spanish	29.508	2.313	12.760
Gender of student	-3.481	1.339	-2.600
Number of siblings	-1.841	0.335	-5.500
Child receives help with homework	-4.307	0.743	-5.800
Number of books at home	1.908	0.453	4.210
Father's education	3.825	0.433	8.830
Mother's education	1.979	0.447	4.430
Wall material	-6.631	1.302	-5.090
Roof material	4.254	0.568	7.490
Floor material	2.994	0.945	3.170
School is connected to a public sewer network	10.479	2.233	4.690
School has electric service	20.427	2.627	7.780
Teachers' age	0.387	0.089	4.350
Teachers' education	2.225	1.515	1.470
Teachers' first language is Spanish	19.887	2.233	8.900
Constant	286.775	13.582	21.110

A prediction was made as a post-estimation analysis. This analysis let us explore three scenarios. In the first scenario, it is assumed that all schools are unidocente/multigrado. In the second scenario, all schools demonstrate, on average, the current situation. Finally, in the third scenario, all schools are polidocente. This is another way to evaluate what has already been seen in Table 11, but with the performance mean for each scenario.

Table 12 Prediction model's results (mean score) for type of school

Variable	Obs	Mean	Std. Dev.	Min	Max
Prediction 1: School is unidocente/multigrado	9377	292.377	48.502	154.185	399.4
Prediction 2: The current situation	9377	295.527	49.589	154.185	403.6
Prediction 3: School is polidocente	9377	296.616	48.502	158.424	403.6

Note: Unfortunately, the census does not differentiate polidocente multigrado (schools with teachers handling two or three grades in one room at the same time) from complete polidocente (one –teacher-one grade in each of the 6 primary grades).

Policy recommendations derived from results

Our macro analysis can be used as a guide to conduct case studies of school restructuring at the regional, provincial, or district level. Results reinforce the idea that Peru should, when possible, develop a graduation policy in the school structure that moves from Unidocente schools to multigrado, and from multigrado to complete polidocente. The limitations to its implementation are related to geography, distance, and population density, the latter being important because fiscal resources are scarce and a minimum size of school must be set.

With this in mind, an applied cost effectiveness (CE) analysis can be done if one pursues the fusion of two or three unidocente schools to form a multigrado or a complete polidocente school, including in the new model a transportation cost or a boarding service cost, alone or combined, and then make a comparison of CE analysis to arrive at a recommended model in a specific territory.

TOPIC TWO: Public-Private Partnership in School Management in Comparison to Pure Public School Supply

The public-private model, *Fe y Alegria*, or F&A, run by the Jesuit community, is an alternative that is largely accepted by the community. There have been some studies on the performance of the F&A model, but it has never been put through a proper costing. Evidence from these studies shows that schools can be better run if they are managed by a third party, giving some autonomy to principals.

This paper advocates for more private and community participation in running schools, and not restricted only to their participation in infrastructure development and feeding programs.

The majority of F&A schools are concentrated in poor urban settlements; the CEA uses for comparison the polidocente urban schools presented in Topic One.

During interviews and field visits,⁶ the researchers became more acquainted with the F&A model. Not surprisingly, the total costs for F&A schools are very close to public schools. However, school density explains the lower cost per student which, together with better management and teaching strategies, appears to be more cost effective. It was also observed that parents are more involved in the maintenance of the school, liberating funds for more teacher hours.

Additionally, as some researchers have pointed out, the magnitude of inputs to improve classroom performance, especially classroom materials, is not as important as how the teachers use them. In the case of F&A, the government pays teachers' salaries on the same scale, but as elaborated later, the F&A model has the freedom to evaluate and select the teachers, to increase peer coaching and evaluations with the same budgetary funds. However, as mentioned above, in terms of opportunity cost, F&A might be more costly. For

⁶ See the preliminary list of interviews and school observation of *Fe y Alegría* in Annexure 4 and Annexure 5.

this reason, the comparison for CEA in education has turned out to be more complex than initially thought.

Background information on F&A

This is an initiative that provides comprehensive education and social advancement to impoverished or excluded sectors of society. Its main objective is to enhance personal development and social participation of students. This initiative was born in Venezuela in March 1955, with the aim of generating and combining efforts to create educational services in poor and remote areas of the country. Its founder was the Jesuit, José María Vélaz, a member of the Jesus Society.

Internationally, it operates as a Federation of National Organizations, registered as a social welfare institution established in Caracas city (Venezuela). The highest authority of the Federation is the General Assembly. Today, with the co-participation of the Catholic Church Jesuit Community, F&A has expanded to 16 countries in South and Central America through National Organizations of F&A, and now serves over a million people per year. It is important to note that these institutions are associated under the International Federation of F&A, but have levels of autonomy according to the specific needs and context of the countries in which they operate.

In each country, F&A works as a non-profit management entity with legal status under national laws and government support. It is an example of a public-private partnership where the government enters into a contract with a not-for-profit private school.

It is noteworthy that the key factor in the education model of F&A is the joint collaboration between the state, the non-profit sector and the community. This has allowed sustainability and expansion across countries through hundreds of educational institutions, but above all, it has become a successful alternative for overcoming the deficits in educational quality in Latin American countries.

In Peru, the movement began operations in July 1966 with the creation of five schools, whose goal was to bring free education to adults, youth, and children from the most deprived classes of Lima's suburbs. Currently, F&A schools serve more than 81,500 students studying in over 80 educational institutions in 19 regions: 32 schools in Lima, 42 in provinces, and 4 technological institutes. The number of teachers and administrators in F&A is nearly 3, 000, not counting the many religious congregations that also lend support. It is also regulated by the central and regional governments which make the model more complex to compare with the rest of the public schools.

F&A activities:

- Regular Basic Education (in education levels, primary, secondary): 161 campuses located in urban slums and impoverished rural areas of the country.
- Rural Education Program: Provides training and support to teachers in bilingual (Quechua), and technical and pedagogical aspects.
- Technical Education and Technology: It conducts 230 workshops on wood-work, sewing, electricity workshops, computer and secretarial, skills, among others, and

Occupational Educational Centers for youth and adults. This is important because it means extra cost at the school level in equipment and teachers.

- *Pastoral*: Under the guidance of the church, the activities aim to take action for prevention, care, and rights of children and adolescents attending school.
- Evaluation, Monitoring and Training of teachers: to improve educational quality. Of late, public schools are also giving training/coaching sessions to teachers in the rural areas, and will eventually cover the whole territory.
- Radio Education: Structured for children over 15 years who have not been able to complete their studies. It offers the possibility of completing primary and secondary levels through radio education programs.
- Inclusive Education: to improve levels of education of children with special educational needs and low functional levels (disabilities).

A comparison of the two models for CEA will be restricted to the primary Regular Basic Education (EBR) level in urban areas. This is because of the greater number of F&A students in urban rather than rural areas (see Table 9).

Likewise, the team can make comments on the incremental costs for F&A for the primary level; this is possible due to the availability of costs per student in public schools at the primary level by type of school.⁷

Table 13. Number of students according to residence of F&A students

Residence Area	Frequency	Percent	Cumulative
Rural	387	7.76	7.76
Urban	4,600	92.24	100
Total	4,987	100	

To better understand the differences within the school management and associated costs, the next section presents a model developed by Preker and Harding to facilitate such analysis.

Explaining the different models of F&A and public schools

Preker and Harding (2003) identified four types of organizations according to the level of autonomy. These production units, from low to high in range, would be: the budgetary, the autonomous, the corporate, and the privatized. In each of these models, a diagnosis is applied to explain the degree of autonomy in connection with four elements: decision making, rights over financial residual, market exposure, and accountability and governance. Each one affects the results.

- *Decision Making* refers to the degree of authority and autonomy of the head of the production unit to manage inputs such as human resources, workload, activities, financial management, pedagogical or pure management support, strategic planning (including corporate objectives), marketing strategy, sales, etc.
- *Rights over Financial Residual* refers to the ability of managers (like School Principals in education) or production unit to provide, at their discretion, funds to cover any

⁷ Alvarado and Llemphen 2010.

eventual expense or improvement and keep the funds without returning to public budget administrators.

- *Market exposure* refers to the degree of exposure to market incentives, such as dependence on resources obtained from students' families or the possibility that the student may be able to choose among suppliers. This could be influenced by payment mechanisms or the existence of a government buyer, or offering bonus due to performance.
- *Accountability and Governance* refers to the existence of hierarchical mechanisms of accountability or other mechanisms such as accountability to civil society oversight group, or parents, or associations of users or boards.

Table 14. Comparison of F&A schools and public schools

Category	Description	F&A schools	Public schools
Market exposure	The extent and nature of exposure to market forces in which the provider operates	Have direct and indirect incentives for users like feeding programs, payment of school expenses (supplies, transportation, uniform). / 1	In general, they do not have much exposure to the market as teaching is free of charge. However, they do have competitors.
		They have a good reputation among parents because of good performance. Parents know that they are required to participate and collaborate during working hours to improve the school and the preparation of school lunches.	Their competitors are defined by schools in the area. Those might be other public schools or private ones with low pensions.
		Vacancies for registration in F&A schools are limited. Since they cannot completely satisfy demand, they receive applications by order of arrival. Otherwise, raffles are used to choose the new students. This method meets the criteria of non-discriminatory inclusion by socioeconomic status.	Public schools with three levels of education on the same premises have a competitive advantage over those of lower levels in terms of ease of access to state resources. The greater the number of students in different levels of education, the more the infrastructure available to them than a site with a smaller number of students. Examples of this are the computer labs. 2/

Decision Making			From the point of view of demand, parents prefer to send their children to schools with three levels of education. This is because they can reduce the costs of education in terms of educational materials and uniforms as they can be inherited from older siblings. 3 / Similarly, savings are generated over the passage time.
		F&A schools are prestigious and the incentive for teachers is free training (every two months approx.) In some cases, teachers receive transportation.	
		F&A school principals are also trained and maintain regular contact with the central F. A.	Thus, there are structural factors that encourage demand for some schools over others. That is, without competition based on the internal management of each school.
	It is the ability of the provider to make decisions about inputs, labor, financial management, strategic planning, marketing, and production process.	Have an agreement with the MINEDU ⁸ that allows them financial and recruitment Autonomy.	
		However, they have to wait for vacancies for teachers by the public intermediary body UGEL ⁹ , which can be a lengthy process. The salaries of teachers and staff are the government's responsibility, but F&A deal with the maintenance and infrastructure of the school.	No teachers are chosen; they are mostly assigned jobs by their place of residence. If a teacher wants a change of institution, the request must come from the teacher, and not before he/she has completed at least one year in the assigned school.
		The role of the director and deputy director are key because the former is responsible for the management of the school and the latter of pedagogy (type of education to follow, teacher-training, the learning process, etc.).	Not all schools have adjunct principals. Those which do, distribute the roles in a similar way: the role of the director and deputy director are key because the former is responsible for the management of the school and the latter for pedagogy (type of education, teacher-training, the learning process, etc.).

⁸ MINEDU: Ministry of Education.

⁹ UGEL: Local Education Management Unit.

		If principals are not satisfied with the performance of teachers, they cannot fire them because of regulations (law governing teachers, or Teaching Career Law, guarantees their job security). They have qualified personnel to carry out the long and tedious process of dismissal of teachers unlike in traditional public schools.	
			Idem.
		MINEDU distributes materials (books, for example) and equipment to all public schools, but in practice, the government gives priority to traditional public schools, arguing that F&A have other sources of funding.	MINEDU distributes materials and equipment, but the process takes time.
		F &A has its own methodological approach that complements the MINEDU.	Each school has the ability to diversify and complement the core curriculum, but it depends on the abilities of the school principal.
Market exposure			
	This is the autonomy to use the money left after paying all expenses of the service.	The petty cash can be used according to the institution's needs (infrastructure, materials, etc.). This cash is provided by their own resources.	Public schools do not have financial resources budgeted by the MINEDU because everything goes straight to financed materials. The UGEL sends in-kind resources, sometimes prices higher than the local market of the school. As in F&A schools, petty cash funds are generated by them, and depend on the innovations and management capacities of each principal.

			The APAFA ¹⁰ is authorized to collect students' payments. But according to law, it must bring facilities to the students who cannot cover the payment. Mostly used for infrastructure maintenance.
Accountability and Governance			
		The principals or the supervisors, the latter sent by the Central Institution of F&A, frequently monitor teachers' performance. Most directors share results with teachers individually and with all the teaching staff. F&A used to send teams to observe classes and make suggestions to teachers and school management	
	This as a mechanism to ensure service quality by monitoring and regulating the provider.		The Parents' Association's functions include: monitoring of financial management, the timely and proper use of materials, improving services and infrastructure, and reporting irregularities.
			In practice, the Parents' Association is dedicated primarily to financial management aimed at improving school infrastructure. The CONEI (Council of Educational Institution) is the group in each school responsible for overseeing the smooth running of the institution. The weakness of this group is that it is made up of the principal, the parents, and the teachers; there is no real civil society overseeing the school.
		Parents' Association members not only involve in monitoring school's spending, but also in the performance of teachers and the supply of inputs required for the issuance of class. The resources raised internally delivered to classroom committees, who are accountable and balances to the leadership of the school every month.	

¹⁰ APAFA: Parents' Association

		Teachers are required to attend the performance evaluations; otherwise, the incidence of failure, among others, is cause for dismissal.	
			Idem. Both institutions are guided by the same law.
		At the school meetings, parents and teachers present their ideas, suggest and discuss the performance of the school. In addition, students use the "control books" to enhance communication between school and home.	

1 / Additional services provided by F&A are financed with funds raised by parents, with Basic Education Employment Project (PEBAL in Spanish) funds, and with domestic and foreign donations.

2/ In public schools, "Poly teacher schools" are those where teachers serve more than one grade.

3 / Public schools only use the standard uniforms, but many educational institutions incorporate a differentiator and a sweater accessory. Furthermore, although the MINEDU distributed educational materials to all entities, they often asked parents for additional books depending on the curriculum of each institution. They could do this because of their autonomy in the core curriculum.

Alcazar, Lorena (2001).

Law N ° 24029 - Law Faculty.

Law N ° 28044 - Ley General de Educación.

Law N ° 29062 - Law amending the Law Faculty with regard to the Public Educator.

Interview with Fe y Alegria school directors and with the Director of Francisco Bolognesi school.

Elaboration: CIUP. Edited version of 2008.

Previous findings in the research community

Given the low quality of education in Latin America, many authors have investigated the failure of the education system in some countries of the region. In this regard, recognizing successful experiences of different countries can serve as a source of valuable information about the regulation, management, and evaluation to be followed by the education policy; especially if private management of schools and financial support, provided by the government, lead to better results (Wolf, Gonzales & Navarro, 2002).

Comparing the performance indicators in primary and secondary levels in F&A and public schools in Peru, it was found that the performance of F&A students is better. Moreover, it was found that the average performance of students in these and private schools was similar. In addition, the mismatch between educational level and normative age is less in F&A than in public schools. This is related to the fact that F&A schools are able to attract children to start school when they are very young. Also, the completion rates of F&A students are better than public school students. (Alcazar & Cieza, 2002).

It is noteworthy that the continual training of teachers is another key factor in a school model such as F&A. Investment in the professional development of teachers is undoubtedly closely related to the performance of students (Hunt, 2001).

We can also say that many of the comparison results among public and F&A schools could be affected by other factors that cannot be fully controlled. Among these factors are the inputs used, management, the characteristics of students and their families. Another important factor is the location of the F&A school in the poorest areas, as compared to the location of public schools in any district, not necessarily the poorest (Alcazar & Cieza, 2002).

In 2008, the last research by UNESCO with data from LLECE¹¹ found that another significant component of the educational system proposed is autonomy. As they have shown, this factor has a relationship with the performance of students in areas such as science. Students from schools with financial and management autonomy get better grades than others, i.e. 20.3 percent and 22.5 percent, respectively.

Our hypothesis is that management and autonomy within the school is instrumental in explaining the differences.

Description of effectiveness data

As mentioned before, this topic has used the performance results of the standardized exam administered to students in the second grade through the Student Evaluation Census (ECE) for second-graders.

Additionally, there is an annual census about the features of the schools' infrastructure and teachers, which is called School Census (Censo Escolar). This information was used together with the ECE to construct the model for triangulation purposes.

11 http://www.oei.es/noticias/spip.php?article2893&debut_5ultimasOEI=35

A first review of the available data was performed to establish the average performance of urban students of F&A in comparison to students of public schools. The results were positive for F&A students, with a larger proportion of them located in the highest level of reading comprehension and basic math. In 2009, while 38 percent F&A students obtained a level 2, about 29 percent of students from public schools reached that level (a proportion of almost 3:2). The same comparison results of 2:1 were seen for math.

Table 15. Performance results by level in reading comprehension

POLIDOCENTE

	Less than level 1	Level 1	Level 2	Total
Urban Public Schools				
Students	49,048	141,023	38,021	228,092
ECE 2008	21.5	61.83	16.67	100
ECE 2009	15	56.1	28.9	100
ECE 2010	14.3	50.2	35.5	100
Fe y Alegria				
Students	292	2,984	1,297	4,573
ECE 2008	6.39	65.25	28.36	100
ECE 2009	7	56	38	100
ECE 2010	4.2	48.05	47.75	100
Total	49,340	144,007	39,318	232,665
ECE 2008	21.21	61.89	16.9	100

Source: ECE, 2008, 2009.

Table 16. Performance results by level in basic mathematics

POLIDOCENTE

	Less than level 1	Level 1	Level 2	Total
Urban Public Schools				
Students	101,566	106,643	19,505	227,714
ECE 2008	44.6	46.83	8.57	100
ECE 2009	41.5	41.7	16.8	100
ECE 2010	47.0	36.6	16.4	100
Fe y Alegría				
Students	1044	2,784	742	4,570
ECE 2008	22.84	60.92	16.24	100
ECE 2009	24	47	29	100
ECE 2010	25.12	41.41	33.48	100
Total	102,610	109,427	20,247	232,284
ECE 2008	44.17	47.11	8.72	100

Source: ECE, 2008, 2009.

Costing methodology

The central government pays F&A teachers' salaries on the same scale, but F&A schools have the freedom to evaluate and select the teachers, and to increase peer coaching and evaluations with the same budgetary funds. However, in terms of opportunity cost, F&A might be more costly. For this reason, a CE comparison has turned out to be more complex than initially thought.

Cost structure

The sample of our F&A schools is from urban areas and needs to be compared with schools having the same characteristics. The type of school determines the level of the costs for two reasons: first, the number of teachers, and second, the number of pupils per grade and school. One of the common characteristics of F&A and public schools is that the teachers are paid by the government and belong to the same salary scale; assuming thereby that they have the same cost structure and the same cost level. The only difference is the bonus paid to principals, a difference that is not really significant. A close look at the inputs required for both types of schools in urban areas shows some minor incremental costs. The hypothesis is that the F&A model has more inputs mainly the time the teachers dedicate to work outside the classroom, and the time parents devote to the maintenance and cleaning of the premises which is not registered in the budget.

Table 17 Cost results for a normative package for the three types of schools, 2010 (soles)

FACTORS	COMMENTS	PUBLIC SCHOOL POLIDOCENTE 23 Students per classroom, median, 8 classrooms	FE Y ALEGRIA URBAN SCHOOLS 35 Students per classroom, 8 classrooms	COMMENTS: INCREMENTAL OR DIFERENTIAL COSTS
HUMAN RESOURCES	Teacher salaries paid by the state. The media value of the salary, due to several levels in the structure, was weighted by the number of teachers in each category.	1,400	920	Principals receive 500 soles bonus per month (2 soles extra). F&A has more students per class. Both, public and F&A parents paid extra money to hire additional teachers. F&A selects and evaluates the teachers.

GOODS AND SERVICES	Market prices when dealing with educational materials and books. Ministry bids for printing of books and practicing books, and other school supplies like paper, pens, ink, and concrete instructional materials like blocks, puzzles; even though schools are managed by the regions.	46	35	Both models receive the same instructional materials. No difference is observed.
INFRASTRUCTURE	Calculated value and provided by the Ministry of Education. The values indicate the square meters needed per student, but a minimum size of classroom is considered	232	167	F&A is built by the community with donations and in a progressive mode. No higher levels of constructions are found so far. ***US\$ 28,000 per classroom first floor, US\$ 20,000 second floor. Computing room 12x8 m2, library and lab 20x8 m2, administration 4x8 (principal, adjunct principal and secretary each, teachers' meeting room and visits 8x8, m2 ea, perimeter s/, 250 lineal meter, multifunctional room, 2.5 module, kitchen plus storage room 2.5 module, , dining area 1.5 module, baths 1.5 for boys, girls, teachers each.
SMALL ASSETS	Market values from commercial outlet. Here the most important units are ITC, and copy machines.	138	180	Both models have the same normative scheme but F&A has a special technical room with sewing machines and carpentry. The assumption is that the value of equipment duplicates.
MANAGEMENT	School management.	10	7	Principals received money each month to cover particular needs. Principals are autonomous.
STUDENT WELFARE	School breakfast and lunches.	144	144	F&A also receive breakfast and lunches. In both schools parents cooperate, but F&A manages more donation s directly to schools. Only breakfast is considered for both.

TOTAL COST PER STUDENT PER YEAR, soles		1,969	1,454	
1.The size of the schools represents the media size according to the National Student Census 2008, number of students per room and number of classrooms. 2. *** Estimated value. 3. Parents participation measured in hours per person as opportunity costs have not been done yet.				

Cost effectiveness analysis

Cost per student reaching minimum learning standards

The following parameters, assumptions, and calculations were used:

1. For the minimum standard, Level 1 and Level 2 have been considered in learning performance for the year 2010.
2. According to the majority location of the schools, only urban polidocente in public schools were used to match F&A as evaluated by the ECE.
3. For the total investment per type of school, the total number of students per type of school has been multiplied by the cost per student, based on the normative package calculated in this paper.
4. The number of students who actually reached the minimum standard was calculated by the percentage obtained in the sample of the ECE census 2010, and applied to the total number of students in each type of school.
5. The total investment has been divided by the number of students who actually reached the minimum learning standards.
6. The result is the actual cost to produce a student who can reach minimum learning standards in reading comprehension and basic mathematics of a second-grader.

Results confirm that the public-private F&A polidocente schools are more cost-effective than the polidocente public schools in reading comprehension and basic mathematics. In reading comprehension, while the latter public schools cost 2,297.5 soles per student yearly, F&A schools cost less, at 1,517.7 soles (see Table 17).

If one considers basic mathematics skills as an effectiveness indicator, the gap is wider. Public polidocente urban schools cost 3,721 per student yearly, while F&A schools cost 1,942 soles; a difference of almost 2:1.

Table 18 Calculation of the actual cost per student reaching minimum learning standards in reading comprehension, 2010

	Public Schools Polidocente	F&A URBAN
Performance Reading Results 2010, ECE 2010	85.7	95.8
Number of Students in each Type of School	228092	4573
Cost per student, Normative Package 2010 (soles)	1,969	1,454
Total Investment = students times cost per school (soles)	449113148	6649142
Students reaching Reading Minimum Performance 2010= Level 1+ Level 2	195,474.844	4,380.9
Actual cost per student who reached Minimum Learning Standards in Reading Comprehension, 2010 (soles)	2,297.5	1,517.7

Table 19 Calculation of the actual cost per student reaching minimum learning standards in basic mathematics, 2010

	Public Schools Polidocente	F&A URBAN
Performance Math Results 2010, ECE 2009	53.0	74.9
Number of Students in each Type of School	227,714	4,570
Cost per Student, Normative Package 2010 (soles)	1,969	1,454
Total investment = students times cost per school (soles)	448,368,866	6,644,780
Students reaching Reading Minimum Performance 2010= Level 1+ Level 2	120,688	3,422
Actual cost per student who reached Minimum Learning Standards in Reading Comprehension, 2010 (soles)	3,721	1,942

Triangulation isolating effects of the environment on student performance

A model isolating other factors besides type of school was performed for triangulation in urban schools. The last updated information available to run the model was from 2008 (both the ECE and the School Census). As was pointed out, F&A schools are mainly concentrated in the urban areas and are compared to public schools.

Until now, selection bias in F&A was not controlled. To reduce the bias, the authors worked out and ran an equation with control variables to isolate factors that can explain performance as well as school work. This was observed during the visits to F&A schools and interviews with principals and adjunct principals in F&A. They found that there is always a long list of poor families waiting to register their children in these schools.

Table 19 summarizes the variables included in the model, with some observations if necessary and the value of categoric variables.

Table 20 Description of each of the variables included in the model

Variable	Observations	Values
Students' performance level	Using the RASCH method, the Ministry of Education has established a rating scale	Continuous variable
Gender of student		1: Men 0: Women
Students' age	Student's current age (in second grade)	
It is the first time the student attends the second grade	This variable collects information about the repetition problem	1: Yes 0: No
First language is Spanish		1: Yes 0: No
School has electric service	An important variable as it carries the possibility of using other assets.	1: Yes 0: No
School has internet connection	Very important as it provides access to information.	1: Yes 0: No
Roof material	It is expected that the more elaborate the flooring material, the more comfortable and healthy the house is for a child.	1: Straw 2: Mats/Cardboard 3: Tin 4: Cana 5: Calamine 6: Eternit 7: Tiles 8: Wood 9: Concrete
School is connected to a public sewer network		1: Yes 0: No
School is administered by "Fe y Alegria"	The key variable for the purpose of this CEA.	1: Yes, it is an F&A school 0: No (it is a regular public school)
Educational level of household head	It was constructed as a district average, not individually.	1: No education 3: Primary school 4: Secondary school 5: Incomplete non-university education 6: Complete non-university education 7: Incomplete university education 8: Complete university education
% of male teachers in school	For second grade	Continuous variable
% of teachers with (only) secondary school	Its intention is to collect information about teacher's quality	Continuous variable

Minutes of effective study in school	Without considering the break time	
% of local students from extremely poor families	Constructed at a district average	Continuous variable
IDH level	Constructed at a district average.	1: Low development 2: Middle development 3: High development
School belongs to the North Coast region		1: Yes 0: No
School belongs to the South Coast region		1: Yes 0: No
School belongs to the North Mountain region		1: Yes 0: No
School belongs to the Middle Mountain region		1: Yes 0: No
School belongs to the Jungle region		1: Yes 0: No
School belongs to the metropolis (Lima)		1: Yes 0: No

In order to measure effectiveness, the marginal effect of each one of the determinants of students' performance was estimated. The database for this regression will be based on the information from the ECE 2008 and the observation unit will be second-grade students. Equation (2) represents the formal expression of the econometric model:

$$\text{Student's Performance} = \beta_0 + \beta_1 \text{Familiar Background} + \beta_2 \text{Student's Characteristics} + \beta_3 \text{School features} + \beta_4 \text{Teachers' characteristics} + \beta_5 \text{"Fe y Alegria" School} + \varepsilon$$

... (2)

Where: Student's performance is the dependent variable that indicates the quality measure obtained by second-grade students. The Fe y Alegria School is the variable that measures the relevance of studying in this kind of school. The other variables are vectors that include control variables for a better specification of the econometric model. Table 20 shows each of the model's regressors in more detail.

Table 21 Performance results by level in logic and mathematics

	Coef.	Std. Err.	t
Students' age	-0.05	0.005	-10.4***
First time the student attends second grade	0.231	0.013	18.0***
Gender of student	0.088	0.007	12.0***
First language is Spanish	0.344	0.045	7.7***
School is administered by "Fe y Alegria"	0.316	0.028	11.2***
Educational level of household head	0.057	0.005	11.1***
School has internet connection	0.138	0.008	17.1***
Roof material	0.029	0.002	11.8***
% of local students from extremely poor families	-0.004	0.001	-7.3***
IDH level	0.155	0.034	4.6***
School is connected to a public sewer network	0.023	0.011	2.1**
School has electric service	0.099	0.028	3.6***
% of male teachers in school	-0.236	0.015	-16.2***
% of teachers with secondary school	-1.344	0.227	-5.9***
Minutes of effective study in school	0.001	0.000	13.0***
School belongs to the North Coast region	-0.031	0.011	-2.8***
School belongs to the South Coast region	0.124	0.021	5.9***
School belongs to the metropolis (Lima)	-0.191	0.011	-17.3***
School belongs to the Jungle region	-0.179	0.015	-11.8***
School belongs to the Middle Mountain region	0.235	0.017	13.7***
School belongs to the North Mountain region	0.322	0.033	9.7***
Constant	-0.451	0.105	-4.3***

a\ Significance level: 1% (***), 5% (**).

Once the estimation of the magnitude of impact was made, the next step was to predict the performance mean if all schools, or none, in urban areas were F&A schools. Table 21 shows the prediction results when all other variables are held constant but students are in one of the three options. First is the mean score if they were all in a public school (Prediction 1). This prediction is compared to the actual mean (Prediction 2). And, finally, Prediction (3) if all students were attending F&A schools. The results confirm the positive effects of belonging to an F&A school and supports the CE analysis.

Table 22 Prediction model's results

Variable	Obs	Mean	Std. Dev.	Min	Max
Prediction 1: All students are in a public school	89620	0.878	0.234	-0.498	1.6
Prediction 2: The actual average student	89620	0.883	0.239	-0.498	1.6
Prediction 3: All students are in an F&A School	89620	1.193	0.234	-0.182	2.0

Policy recommendations derived from results

A policy recommendation is made to (a) increase the participation of third parties in the management of public schools, (b) promote public-private partnerships, or (c) increase

school autonomy. According to the General Law of Education, a school can be autonomous in some respects; however, it has not been considered or implemented during the present government administration which ends July 31 2011. Indirectly, F&A has become a kind of parameter to check the normative educational package.

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**Annex 1. Inputs considered in the basic, normative and incremental package for costing in
Topic one and Topic two
N= Normative Package, B=Basic Package, I=Incremental Package**

CATEGORÍES	Levels	Unidocente	Multigrado	Polidocente
2. MATERIALES				
2.1.Materiales para estudiantes				
2.1.1.Libros de texto áreas curriculares	Alumno	N,B	N,B	N,B
2.1.2.Cuadernos / fichas de trabajo	Alumno	N,B	N,B	N,B

CATEGORÍES	Levels	Unidocente	Multigrado	Polidocente
1. RECURSOS HUMANOS				
1.1. Docentes de aula	Aula	N,B	N,B	N,B
1.2.Profesor de Educación Física	Aula	I	I	B
1.3.Auxiliar de educación	Aula	I	I	B
1.4.Profesor de Computación	IIEE	I	I	B
1.5.Profesor de Lengua Extranjera	IIEE	I	I	B
1.6.Programa de Recuperación Pedagógica	Docente	N,I	N,I	N,B
1.7.Profesor de Talleres (danza, música)	IIEE	I	I	B
1.8.Director/a	IIEE	N,B	N,B	N,B
1.9.Sub director	IIEE	-	-	N,B
1.10.Coordinador académico	IIEE	-	-	-
1.11.Secretaria	IIEE	-	-	N,B
1.12.Auxiliar de biblioteca	IIEE	-	-	N,B
1.13. Personal de servicio (limpieza y guardianía)	IIEE	B	B	N,B
1.14.Investigación	IIEE	-	-	-
1.15.Trabajo en equipo	IIEE	B	B	B
1.16.Formación en servicio	IIEE	N,B	N,B	N,B
2.1.3.Paquete escolar fungible para alumno	Alumno			
2.1.4.Paquete Textos Plan lector	Aula	N,B	N,B	N,B
2.1.5.Biblioteca de aula	Aula	-	-	-
2.2.Materiales para uso pedagógico aula y escuela				
2.2.1.Módulo de material concreto para Comunicación	Aula	N,B	N,B	N,B
2.2.2Módulo de material concreto para Matemáticas	Aula	N,B	N,B	N,B
2.2.4. Paquete materiales fungibles para el aula.	Aula	N,B	N,B	N,B

2.2.5.Módulo de Educación Física	IIEE	N,B	N,B	N,B
2.2.6.Módulo arte/música/teatro	IIEE	B	B	B
2.2.7.Módulo de Material Cívico	IIEE	B	B	B
2.2.8.Biblioteca Escolar Básica	IIEE	N,B	N,B	N,B
2.2.9.Material Mediateca	IIEE	I	I	I
2.3.Materiales para uso pedagógico para docentes				
2.3.1.Guía para el docente: CI, LM, CA, PS,	Aula	N,B	N,B	N,B
2.3.2.Biblioteca básica para docentes	IIEE	N,B	N,B	N,B
2.3.3.Libros de texto áreas curriculares	Aula	N,B	N,B	N,B
2.3.4.Cuadernos / fichas de trabajo	Aula	N,B	N,B	N,B
2.4.Materiales para gestión y servicios				
2.4.1.Material fungible para administración	IIEE	B	B	B
2.4.2.Material de limpieza	IIEE	B	B	B

CATEGORÍES	Levels	Unidocente	Multigrado	Polidocente
3. EQUIPOS Y MOBILIARIO				
3.1.Mobiliario de aula	Aula	N,B	N,B	N,B
3.2.Equipo de cómputo para sala de innovación	IIEE	N,B	N,B	N,B
3.3.Televisor	IIEE	B	B	B
3.4.DVD	IIEE	B	B	B
3.5.Fotocopiadora	IIEE	I	I	B
3.6.Radio Grabadora	IIEE	B	B	B
3.7.Proyector multimedia/pantalla	IIEE	I	I	B
3.8.Equipo de sonido	IIEE	I	I	I
3.9.Cámara Fotográfica	IIEE	I	I	B
3.10.Paquete-Juegos al aire libre	IIEE	I	I	B
3.11.Equipo y mobiliario para administración	IIEE	B	B	B
3.12.Equipo y mobiliario cocina	IIEE	B	B	B

CATEGORÍES	Levels	Unidocente	Multigrado	Polidocente
4.INFRAESTRUCTURA				
4.1.Aulas de clase	Aula	N,B	N,B	N,B
4.2.Aula de innovación pedagógica	Aula	-	-	N,B
4.3.Aula multiusos	Aula	-	N,B	N,B
4.4.Área administrativa	IIEE	N,B	N,B	N,B

4.5.Sala de profesores	IIEE	-	-	I
4.6.Biblioteca	IIEE	-	-	I
4.7.Patio /Cancha de deporte multiusos	IIEE	N,B	N,B	N,B
4.8.Cocina/depósito	IIEE	N,B	N,B	N,B
4.9.Áreas verdes	IIEE	-	-	-
4.10.Cerco perimétrico	IIEE	-	-	N,B
4.11.Servicios higiénicos	IIEE	N,B	N,B	N,B
4.12. Comedor	IIEE	N,B	N,B	-
4.13. Vivienda	IIEE	N,B	N,B	-
4.14. Albergue	IIEE	I	I	-

CATEGORÍES	Levels	Unidocente	Multigrado	Polidocente
5. GESTIÓN Y SERVICIOS				
5.1.Excursiones/visitas de estudio	IIEE	I	I	I
5.2.Gasto en transporte para coordinaciones.	IIEE	B	B	B
5.3.Teléfono	IIEE	I	I	I
6. BIENESTAR ESTUDIANTIL				
6.1.Alimentación	Alumno	N,B	N,B	N,B
6.2.Uniforme	Alumno	I	I	I
6.3.Apoyo psicológico	IIEE	I	I	I
6.4.Controles médicos	IIEE	B	B	B

Annex 2. Complementary Statistics

Table 23 Performance results by level in reading comprehension, 2008-2010 second-graders

Resident areas	Less than level 1	Level 1	Level 2
Urban 2008	21.0	62	17
Urban 2009	15.0	56.1	28.9
Urban 2010	14.3	50.2	35.5
Rural 2008	48.0	45.0	7.0
Rural 2009	39.9	48.5	11.6
Rural 2010	53.1	39.3	7.6
Source: ECE, 2008,2009, 2010.			

**Table 24 Performance Results by level in logic and mathematics, 2008-2010
second-graders**

Resident areas	Less than level 1	Level 1	Level 2
Urban 2008	44.0	47.0	9.0
Urban 2009	41.5	41.7	16.8
Urban 2010	47.0	36.6	16.4
Rural 2008	58.0	35.0	7.0
Rural 2009	64.4	28.5	7.1
Rural 2010	72.9	21.3	5.8
Source: ECE, 2008,2009, 2010.			

Table 25 Total years of repetition in primary school in one cohort of 100 students

Urban	25.8021
Girls	23.9511
Boys	27.5859
Rural	74.0536
Girls	73.0156
Boys	75.0483

Table 26. Repetition rate of second-graders in primary level per type of school

Type of school	Number of repetitions	No repetitions	TOTAL
Polidocente	23,089	170,895	193,984
%	11.9	88.1	100
Unidocente/multigrado	1547	7,891	9,438
%	16.39	83.61	100
TOTAL	24,636	178,786	203,422
%	12.11	87.89	100

Table 27. Normative and over-age students in second grade, primary, per type of school

Type of school	Over-age	Normative age	TOTAL
Polidocente	23,263	199,477	222,740
%	10.44	89.56	100
Unidocente/multigrado	1790	8,985	10,775
%	16.61	83.39	100
TOTAL	25,053	208,462	233,515
%	10.73	89.27	100

**Table 28 Repetition rate of second- graders in primary per type of schools:
F&A versus other public schools**

Fe y Alegría schools	Number of repetitions	Number of No repetitions	TOTAL
No	24,198	174,908	199,106
%	12.15	87.85	100
Sí	438	3,878	4,316
%	10.15	89.85	100
TOTAL	24,636	178,786	203,422
%	12.11	87.89	100

**Table 29 Normative and over-age students in second grade, primary, per type of school:
F&A versus other public schools**

Fe y Alegría schools	Over-age	Normative age	TOTAL
No	24,822	204,118	228,940
%	10.84	89.16	100
Sí	231	4,344	4,575
%	5.05	94.95	100
TOTAL	25,053	208,462	233,515
%	10.73	89.27	100

Annex 3. Calculation of Classroom: Number of Students (using census data)

alumporsalon						(first) alumporsalon
type: numeric (float)						
range: [1,53]		units: 1				
unique values: 51	missing : 0/10242					
mean: 22.3544						
std. dev: 8.03326						
percentiles:		10%	25%	50%	75%	90%
		11	17	23	28	33
. codebook alumporsalon if fe_y_alegria==1						
alumporsalon						(first) alumporsalon
type: numeric (float)						
range: [8,41]		units: 1				
unique values: 24	missing : 0/140					
mean: 32.6786						
std. dev: 5.50248						
percentiles:		10%	25%	50%	75%	90%
		25	31	34	36	38

Annex 4. Interviews and School Visits

1. Father, Cucarella, S.J., Head of Fe y Alegría in Peru. Central Management Unit. Wednesday 11 May, 2011. In Fe y Alegría Office.
2. Maria Elena Romero. Administrative Manager. Central Unit. Wednesday 11 May, 2011. In Fe y Alegría Office.
3. Father Antonio Bachs, S.J., Head of infrastructure Fe y Alegría, Phone interview, June 9, 2011.
4. SCHOOL OBSERVATION. Fe y Alegría 13, Lima, Collique Sister, Fatima Bustello, Principal F&A number 13. Collique. Friday May 20, 2011.

Ms. Sara Cecilia Rojas Salas, Adjunt Principal. F&A number 13. Primary. May 20, 2011.

5. SCHOOL OBSERVATION. Fe y Alegria 4, Lima, San Juan de Lurigancho
Ms. Victoria Urbana Geldreds Bejarano, Principal F&A number 4. Monday 23 May 2011.

Angela Gonzales Guerra. Adjunt Principal. F&A number 4. Monday 23 May 2011

Annex 5. School Observations: Fe y Alegria

SCHOOL OBSERVATION. Fe y Alegria 13, Lima, Collique
Sister, Fatima Bustello, Principal F&A number 13. Collique. Friday May 20, 2011. Ms. Sara Cecilia Rojas Salas, Adjunt Principal. F&A number 13. Primary. May 20, 2011. Photographs: Betty Alvarado.
From a dream to a concrete school with parents' participation in the construction and preparation of the land
Current situation. Example of progressive construction
Classroom observation allows us to identify the existence or not of inputs, especially instruction materials
Computer labs, number of computers
Small assets in kitchen; Visits allow us to observe the existence of appliances and their size
Workshops stations; Industrial sewing.

SCHOOL OBSERVATION. Fe y Alegria 4, Lima, San Juan de Lurigancho
Ms. Victoria Urbana Geldreds Bejarano, Principal F&A number 4. Monday 23 May 2011. Angela Gonzales Guerra. Adjunt Principal. F&A number 4. Monday 23 May 2011 Photographs: Betty Alvarado.
Fe y Alegria's infrastructure is built following modular designs
More dense classrooms make the model cost efficient
Extra resources provided by the community support infrastructure maintenance
Fe y Alegria schools are also beneficiaries of one laptop per child as compared to public schools
A well- organized administration system makes good use of scarce resources
Feeding program; Targeted program provides incentive to maintain attendance of the poorest children