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Does Community Management Help Keep Kids in Schools?
Evidence Using Panel Data from El Salvador's EDUCO Program

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Abstract

This paper investigates how community management of schools can affect educational outcomes, such as retention and repetition rates. In our model, parents make decisions about whether their children should remain in school or not, and they monitor the performance of the teachers. To test the theoretical implications, we use a unique data set from El Salvador, which has recently expanded the role of communities in school management through its EDUCO program. We find that EDUCO has a positive and robust influence on students, encouraging them to continue their schooling. Our results suggest that community participation is largely responsible for the positive effect of the EDUCO program. The better classroom environment and careful teacher management under the EDUCO program also seem to contribute to the positive results. We conclude that in El Salvador, decentralization of responsibilities to communities has had significant positive effects on educational outcomes.

Keywords: Educational investment; school continuation; probit model with endogenous selection

JEL Classification: I2; O12

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1. Introduction

Over the past couple of decades, worldwide enrollment rates in primary schools have improved dramatically, spurred by global campaigns, such as Education for All (EFA). Yet, one of the most vexing problems for policy makes and civil society alike is how to keep children in school once they come.[1] Dropouts are a problem everywhere. About 44% of children who enter school never finish the 5th grade in the least developed countries. Even in relatively advanced regions such as Latin America, this figure is 33%. These dropout rates mean that, despite improved enrollments, the average years of education remain a paltry 8.5 years (World Bank, 1999).

The problem has not gone unnoticed. There have been many efforts to keep children in school. Some work on the demand side. An example is the Female Secondary Scholarship Program in Bangladesh which provides monetary incentives to families who send and keep their girls in school. Others work on the supply side. For examples, schools are accessible and of better quality will make them attractive enough that children want to remain enrolled. Yet, the most difficult question is how to make the schools better. The traditional way has been for governments to improve access and provide more or better inputs. In a rare rigorous evaluation, Tan et al. (1999) found that providing multilevel teaching materials caused dropout behavior to decrease in the Philippines. However, more often than not, it has been hard to implement and maintain such "top-down" interventions.

A more recent innovation for the provision of education has been to decentralize responsibility from governmental agencies or departments to communities. The hope is that, by bringing decision-making power and accountability closer to those who teach and manage schools, this would make schools more efficient and induce parents to keep their kids in school (King and Orazem, 1999). First, empowering parents with budget and responsibility to oversee a

[1] In 2000, the World Education Forum held in Dakar adopted a Framework for Action that ensures that all children, particularly girls, have access to and complete free and compulsory primary education of good

school may give them more of a stake and make it less likely to "give up" on education. Furthermore, decentralization improves the quality of schools and allows parents to more easily observe the value of education. In addition, the peer pressure that develops from a community-based approach helps with overall retention."? Please check and change as appropriate.

While the reasoning is compelling, the evidence on the effectiveness of these schools is only beginning to emerge (King and Orazem, 1999; Jimenez and Sawada, 1999; Eskeland and Filmer, 2000). There are no other studies on the impact of decentralization on dropout behavior.[2] The main contribution of this paper is to fill a part of this void by evaluating the effect of a specific school decentralization program on school continuation and grade repetition. We introduce a model where parents decide how much to invest in education by keeping their kids in school as well as by participating in community monitoring of teachers' efforts. To test the theoretical implications, we use a unique data set from El Salvador, which has recently and massively expanded the role of communities in school management by the introduction of a program entitled *Educación con Participación de la Comunidad* (EDUCO), or Education with Community Participation (World Bank, 1997a; Jimenez and Sawada, 1999). We employ a unique panel data set (from 1996 and 1998) that has information on students' background, educational attainment and educational achievement, as well as background information on households to which they belong, their school, and their teachers. The information is used to evaluate the EDUCO program.

To anticipate our results, we find that the EDUCO program contributed significantly to decisions to remain in school beyond grade three. The EDUCO effect can be explained by intensive community participation, a better classroom environment and careful teacher management. Another finding is that the probability of continuing school is negatively related to

quality by 2015.

[2] Indeed, although policymakers in developing countries are concerned about high dropout rates and poor grade progress in primary education, quantitative studies on the relationship between various inputs and dropout behavior and between exogenous environments and grade repetition are rare. The study by Tan et al. (1999) stands out as an exception.

age when all else is constant, which is consistent with significant opportunity costs of schooling in rural El Salvador. Finally, students in EDUCO schools are less likely to repeat grades than students in traditional schools; however, the result was not statistically significant. We conclude that decentralizing responsibilities to communities induces kids to stay in school because of the positive effects of community involvement in the oversight of teachers, administrators, and school-level infrastructure investments.

The remainder of this paper is as follows: Section 2 provides more background information on El Salvador and the EDUCO program. In section 3, we construct an analytical framework for the determination of optimal teacher effort and optimal schooling investments, which is translated into an empirical specification in Section 4. After an overview of the data set in Section 5, discussion of the empirical results on dropouts is presented in Section 6. Then the effects of grade repetition are empirically examined. Finally, Section 7 summarizes the empirical results and policy implications.

2. Program Background

While El Salvador was embroiled in a civil war in the 1980s, rural communities lost access to traditional public schools. Some communities, therefore, organized their own schools, which were administered and financially supported by an association of households. In May 1991, El Salvador's Ministry of Education (MINED) institutionalized these community schools as the EDUCO schools and also decided to use the prototype as the principal method of expanding education in rural areas.

In EDUCO schools, the *Asociación Comunal para la Educación* (ACE), or Community Education Association, whose members are elected from among the parents of the students, has a central role in school administration and management: ACE is responsible for allocating school budgets, hiring and firing of teachers, and monitoring of teacher performance.

The partnership between the MINED and ACEs is expected to improve school administration and management by producing a more accurate reflection of local needs. On the other hand, the *Sociedad de Padres de Familia* (SdPF), or parent association, has limited responsibilities in traditional schools and no administrate authority over school personnel or budgets.

Currently, the basic education system in El Salvador (*Educación Básica*) consists of one year of preschool and three cycles, each of 3 years, of primary education from Grade 1 through 9. After the successful completion of Grade 9, students are allowed to enter secondary school (*Educación Media*; grades 10-12), which provides a *Bachillerato* diploma. As can be seen in Figure 1, while most students enter grade school at the appropriate age, the levels that they attain vary significantly, particularly in rural areas, as children drop out.

The EDUCO program was meant to address these shortfalls. Its main objective was to expand the supply of education in the poorest communities, originally by offering preschool and the first three grades of primary school. Moreover, the EDUCO program aimed to improve the quality of pre-school and primary school in El Salvador. Although causality has not been established, the EDUCO program, which began in 1991, is associated with major improvements that have helped the country meet these objectives (El Salvador, MINED, 1995). The net school enrollment rate for grades 1-6 was 76% in 1989 and 1992, and it improved to 83.1% in 1993 and 85% in 1995. Particularly, the enrollment rate for the first cycle (grades 1-3) increased by 6.4% between 1990 and 1993, a period in which EDUCO schools grew from zero students to 10 percent of rural students in grades 1 to 3 (World Bank, 1994).

There are also strong indications that EDUCO has improved the quality of education. In an earlier paper (Jimenez and Sawada, 1999), student achievement on standardized tests and school attendance of rural students in EDUCO schools were compared with those who are in traditional schools. We control for student characteristics, school and classroom inputs, and endogeneity due to parents' school type selection, using municipality-level EDUCO and traditional school densities as identifying instrumental variables. The findings indicate that, although the expansion of rural schools through the EDUCO program has been rapid, it has not resulted in lower achievement rates for math and in fact has positively affected student achievement in language skills through enhanced community involvement. Moreover, the program has resulted in fewer student absences, which may have long-term effects on achievement.

3. Analytical Framework

In developing countries, most kids who drop out of school never return. Therefore, the decision to drop out is a *de facto* decision about educational attainment. Parents and students weigh the costs and benefits of attending school by comparing their lifetime gains, evaluated by the income increment from another year of school with the direct and opportunity costs of time. In a centralized system, parents would make these choices given the quality of schools and teachers. However, in a decentralized system, the quality of education is, at least in part, endogenous to parental participation. Thus, school continuation is a function of the degree of that participation.

In this section, we extend a highly stylized model of educational investments in which parents decide how much schooling their children should have and teachers decide how much to make their own teaching efforts. We incorporate the principal-agent relationship between teacher and parents into an extended version of the Levhari and Weiss (1974) model in order to determine the optimal retention rate as a function of community participation. The decisions made by the teachers, as well as parents, would affect overall student performance.[3] We use this model as the theoretical basis for our econometric specification. We first present a basic model with teacher effort as exogenous and then relax the assumption.

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[3] See Hanushek et al. (2002) for a discussion of designing incentives to promote human capital and the

Basic Schooling Model

Assume that a household with one child lives two periods. The consumption and schooling decisions are assumed to be made by parents so as to maximize the household's aggregated expected utility, which is represented by a utility function over two periods. In the first period, this household, with initial assets, A_1, decides its first and second period consumption, C_1 and C_2, respectively, and schooling, S, where $0<S<1$, after the initial parental income, Y_1, is realized. We assume that the child's first period income is known to the parents and is given by $(1-S)W_1$, where W_1 is the child's (shadow) wage from household duties, the household farm, or the labor market. The household makes these decisions on first-period consumption and schooling without knowing the parental and child incomes at period two, Y_2 and W_2, respectively. We also assume that parents do not know an important determinant of the educational outcome of their child – true teacher effort. Hence, parents treat a teacher's effort as an exogenous parameter in solving their optimization problem.

The child's human capital production function is assumed to be a function of years of schooling, a variable that captures school quality inputs, q, true teacher effort, e, and an additive stochastic element, η, to account for the vagaries of the labor market.

$$W_2(S) = f(S, q, e) + \eta, \tag{1}$$

where we assume that $\partial f/\partial S > 0$, $\partial^2 f/\partial S^2 < 0$, $\partial f/\partial q > 0$, $\partial f/\partial e > 0$, and $E(\eta) = 0$. In addition, we assume that η is independently distributed across individuals and independent of the second period stochastic income as well.

Most education production function studies measure output by students' achievement scores, school attendance rates, repetition rates, school continuation or dropout rates under the

special issues which have to do with teacher behavior.

presumption that these variables capture prospects of future earnings in the labor market. Equation (1) is in this tradition, with a new dimension, which is the inclusion of teacher effort, e.[4]

We relax the assumption of perfect credit markets in a simple manner. Since there is an inherent informational asymmetry between households and money-lenders, some households may be unable to borrow money (Stiglitz and Weiss, 1981). For example, landless poor farmers are likely to be credit-constrained. Asset ownership is an important signal of a borrower's creditworthiness and can be used as the sorting device by lenders (Carter, 1988; Hoff and Lyon, 1995). Hence, we assume that the interest rate imposed by lenders is a negative function of asset ownership of lenders or a sort of continuous credit constraint: $r = r\,(A_1)$, where $r' < 0$. This implies that the cut-off rate of investment opportunities is lower for rich households with large amount of assets.[5]

The household problem can be described as a standard two-period utility maximization model subject to an intertemporal budget constraint, the technology represented by equation (1), and the interest rate, $r\,(A_1)$. By combining the first-order conditions of this problem, we obtain a structural form to the schooling decision (See Appendix 1 for the derivation):

$$\frac{\partial f(S,q,e)/\partial S}{W_1} = 1 + r(A_1), \qquad (2)$$

for all states of the world.[6] Equation (2) indicates that a household will determine the level of schooling so as to equalize the net marginal productivity of schooling and the non-stochastic exogenous cut-off interest rate. From equation (2), we can write a reduced-form optimal schooling function,

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[4] Equation (1) corresponds to Gaynor and Pauly (1990)'s "technical production function," that is, the relationship between inputs and maximum outputs dictated by technology.
[5] This formulation generates a tractable model, since households solve their problem taking interest rate r as given, although there is an implicit credit market imperfection. Moreover, the continuity assumption of the equation, $r = r\,(A_1)$, allows us to focus on the internal solution.
[6] Note that r and $f(\cdot)$ are assumed to be non-stochastic elements in this model. This result indicates that if uncertainty in the human capital investment function η is incorporated in an additive manner and η is independent of other random variables in the model, uncertainty has no effect on schooling decision. This is mainly because the limited but some access to credit market can act as the access to income insurance as

(3) $$S = S(q, e, W_1, A_1),$$

where $\partial S/\partial q>0$, $\partial S/\partial e>0$, $\partial S/\partial W_1<0$, and $\partial S/\partial A_1>0$.[7]

The Role of Community Participation in Determining Teacher Effort

We introduce community participation into the model through a principal-agent framework. The "principal" is either MINED in traditional schools or parental associations in EDUCO schools, and the "agent" is a teacher. At the beginning of the first period, a teacher is assumed to select his/her level of effort, given the incentives embedded in the intensity of community participation.[8]

A teacher is assumed to maximize utility, given a wage compensation scheme. In El Salvador, specific government regulations (*Escalafón Magisterial*) ensure a teacher's job stability and teacher salaries can be described by a fixed wage system (World Bank, 1995). On the other hand, teachers in EDUCO schools receive yearly contracts, and contract renewal depends on performance. Although the annual negotiated teacher wage in EDUCO schools is comparable to that in a traditional school, an EDUCO teacher's job stability depends on performance, as monitored and evaluated by the ACEs (World Bank, 1995).

The true level of any teacher's effort is not observable to MINED or parental associations. We can plausibly assume that contract renewal probability π is a positive function of the observed effort level, *OE*, i.e., $\pi=\pi(OE)$. If a contract is extended, a teacher can receive a wage, w^{ED}. If

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Eswaren and Kotwal (1989) pointed, though the cost of it is not uniform across households due to credit market imperfection.

[7] In order to derive a tractable analytical solution, suppose that human capital production function can be described as the following exponential function: $f(S,q,e)=qe[\gamma_0\text{-exp}(-S)]$ with a constant parameter, γ_0, being larger than one so that $f>0$ for all S. Then the reduced-form optimal schooling decision rule becomes: $S^*=\log(q)+\log(e)-\log(W_1)-\log[1+r(A_1)]$.

[8] The literature on theoretical treatments of principal-agent problem is substantial. On the other hand, empirical studies of agency relationships are not widely available. Moreover, as Prendergast (1999) observed, there are almost no studies, except for those by Kawasaki and McMillan (1987), to show that the optimal slope of the compensation scheme is determined by risk aversion and that the returns to effort and contracts are designed to optimally trade off risk against incentives.

not, he/she will obtain an outside wage, w^{OU}. Then the teacher's expected wage in the next period, W^T, becomes: $W^T = w^{OU} + (w^{ED} - w^{OU})\pi(OE)$. A self-selection condition to be a teacher implies that $w^{ED} > w^{OU}$. Then we can represent the teacher payment scheme by a linear function of the observed effort level as follows:[9]

(4) $$W^T = a_1 + a_2\, OE.$$

Note that $a_1 > 0$ and $a_2 = 0$ represents a fixed wage contract in traditional schools, while $a_2 > 0$ denotes a *de facto* piece rate contract in EDUCO schools. The observed level of a teacher's effort, OE, which we assume to be a measurable indicator, such as days of teacher attendance, is a contaminated measure of true effort, e, and by random events beyond the control of the teacher, so that: $OE = e + z$, where z indicates measurement error with $E(z) = 0$. Note that e and z are not separately observed by the principal.

With greater involvement, the community association can observe teacher effort with fewer mistakes through close and frequent monitoring of a teacher's performance. Therefore, the degree of community participation enhances the precision with which teacher effort is estimated. Mathematically, this can be represented as: $Var(z) = V(CP)$, where CP is the intensity of community participation with $\partial V/\partial CP < 0$.[10]

In order to examine the level of intensity of community participation, we must discuss the teacher and the community optimization problems.[11] A teacher will select an effort level that balances the marginal reward with the marginal cost. More formally, from the teacher's optimization problem, we obtain the incentive compatibility constraint $a_2 = CS'(e^*)$, where $CS(\bullet)$

[9] While we can simply interpret the linearity with respect to effort level as an approximation of a general non-linear wage payment formula, theoretically, the linear compensation scheme is shown to be quite robust to the specification of the environment (Holmstrom and Milgrom, 1987; Laffont and Tirole, 1987; McAfee and McMillan, 1987; Hart and Holmstrom, 1987).

[10] This function $V(CP)$ denotes the technical relationship between teacher monitoring by community participation and precision of observing a teacher's true effort. Note that the precision of effort estimation is defined as the inverse of the variance of measurement error, $V(CP)$.

[11] The model constructed in this paper follows a standard principal-agent model with a linear compensation scheme. For example, see Ross (1973), Hart and Holmstrom (1987), and Milgrom and Roberts (1992).

is the effort cost function of a teacher (see Appendix 2 for the derivation). Hence, the optimal level of effort is a function of the slope of the wage payment scheme:

(5) $$e^* = e\,(a_2),$$

where it is easily verified that $\partial e^*/\partial a_2 > 0$.

If a community or parental association has full administrative and management responsibility, the slope of the teacher wage compensation scheme, a_2, is determined endogenously by a parental association in order to "discipline" teachers.[12] Suppose that a parental association is concerned about the net social benefit of education, which is measured by the weighted sum of student educational achievement, the net of which is paid to the teacher. Then, assuming a risk-neutral principal and a risk-averse teacher, the first-order condition for the parental association's optimization problem generates the optimal slope of the wage compensation scheme, a_2, as a function of the intensity of community participation (See Appendix 2 for a formal derivation).

(6) $$a_2^* = g\,(CP),$$

where $\partial a_2^*/\partial CP > 0$. Intuitively, this says that when community participation is low, the effort is less precisely estimated, and, thus, there is less gain using a wage-incentive scheme. As a result, the relatively fixed teacher compensation scheme would be optimal. On the other hand, intensive community participation improves the measurement of teacher effort. Strong incentives, therefore, are likely to be optimal since a teacher's performance is easier to identify.

From equations (5) and (6), the optimal level of effort is a function of the level of community participation and school type:

(7) $$e^* = e\,[g\,(CP)],$$

where $\partial e^*/\partial CP > 0$.[13]

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[12] In fact, the association member module in our data set indicates that 80% of ACEs in EDUCO schools discussed teacher discipline at their meetings.

[13] The formal model in this section shows that the intensity of the incentives provided to teachers differs according to the degree of community involvement in teacher monitoring. In a typical case, $CP^{ED} > CP^{TR}$, where CP^{ED} and CP^{TR} represent the level of community participation for an EDUCO school and a

Finally, combining equation (3) and (7), the reduced-form optimal-schooling function is:

(8) $$S^* = S\,[q, e(CP), W_1, A_1].$$

Equation (8) provides a theoretical foundation of an empirical model to be estimated in this paper.

4. The Econometric Framework

We take a dynamic approach to estimating equation (8) where current period outcome depends on past outcomes; that is, we estimate the schooling transition probability from 3rd grade in 1996 to 5th grade in 1998.[14]

Probit Model

In equation (8), school quality, q, is parameterized by a linear function of a dummy variable d, which takes one for EDUCO schools and zero otherwise, and other school supply-side variables, Q. The child wage rate effect, W_1, is also assumed to be a linear function of a vector of child variables, CH. Adding an i.i.d. unobserved stochastic element, ε, the schooling function is:

(9) $$S^* = \alpha d + Q\boldsymbol{\mu} + \psi CP + CH\boldsymbol{\theta} + A_1\boldsymbol{\beta} + \varepsilon.$$

Note that A_1 represents a matrix of household asset variables. In this equation, $\alpha>0$ indicates a positive EDUCO effect and $\psi>0$ indicates a positive community participation effect. We also expect that coefficients on variables that serve as proxies for child wage, $\boldsymbol{\theta}$, are negative, and that the elements of $\boldsymbol{\beta}$ are all positive.

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traditional school, respectively. As a result, we have that e (CP^{ED}) > e (CP^{TR}), i.e., the level of teacher effort is systematically higher in EDUCO schools than in traditional schools due to difference in the intensity of community participation. This result indicates the existence of moral hazard of teacher effort in traditional schools. We should also note that there is a possibility that many teachers join EDUCO schools in the hopes of obtaining steady work in a traditional school. As a result, EDUCO teachers might work hard. If there were no chance of obtaining work in a traditional school, they may not work as hard even with a wage incentive to do so.

[14] The statistical foundation for the estimation of this sequential decision-making model has been

We do not directly observe the time allocation to schooling, S^*; nor do we observe children who are not in school in 1996 since our sample is school-based. Hence, our dependent variable is whether a child who is in school in 1996 continues education in 1998, which can be represented by a discrete variable, s:

$$s = 1 \;\; if \;\; S^* > 0 \qquad (10)$$

$$s = 0 \;\; otherwise.$$

Note that Prob($S^* > 0$) = Prob($\varepsilon > - \alpha d - Q\mu - \psi CP - CH\theta - A_1\beta$) and Prob($S^* \leq 0$) = Prob($\varepsilon \leq - \alpha d - Q\mu - \psi CP - CH\theta - A_1\beta$). Figure 2 is a decision tree for household schooling.

Endogenous Program Participation

A key estimation issue is endogeneity of program participation in 1996. This issue arises because households select the school type of their children, conditional on having chosen to attend school in 1996.[15] If this EDUCO program participation variable, d, is systematically correlated with unobserved characteristics, ε, that would also influence the decision to continue attending school, and then the estimated effect of EDUCO through the simple binary dependent variable model would be problematic. In equation (9), α may not accurately measure the value of being in EDUCO schools.[16]

To take these effects into account, we explicitly model program participation, i.e., whether or not a student enrolls in an EDUCO rather than a traditional school.[17] Program participation is

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developed and applied by various researchers. See Amemiya (1975), Mare (1980), Lillard and Willis (1994), Cameron and Heckman (1998), and Willis and Rosen (1979).

[15] While EDUCO sections were targeted to those areas where primary school coverage was limited, parents still would have had a choice whether or not to attend. Parents could have had their children commute, albeit over long distances. Moreover, child fosterage for schooling is not uncommon in developing countries (Ainsworth 1992; Glewwe and Jacoby 1994). Alternatively, they could have changed residences since Salvadorean migration rates are high (Funkhouser, 1997). Unfortunately, the school-based nature of the sample precluded including non-attendance as an option.

[16] Strictly speaking, parameters can be estimated consistently, though not efficiently. This is similar to the estimation of the seemingly unrelated-regression model.

[17] A complicating econometric issue is that the second stage equation also is also a discrete, rather than a

affected by the targeting procedure into EDUCO schools. First, the government establishes a priority list of municipalities that are to receive an EDUCO program. Households then use that information, as reflected in the relative availability of EDUCO schools in their municipality, in judging the relative merits of one program versus another. In particular, households select the school that will maximize their net benefit of schooling, *NB*. Hence, the selection decision depends on the benefits and costs of EDUCO versus other types of schools. The benefits of choosing EDUCO depend on household perceptions of the value of a decentralized educational program. Some of these preferences can be captured by measurable household characteristics, A_1, and child variables, *CH*, but others are unobserved.

The relative cost of entering an EDUCO program compared to a traditional one depends on direct costs such as tuition, books, and other fees. These expenses for the most important components are largely the same for decentralized EDUCO and traditional rural programs (Jimenez and Sawada, 1999). The principal cost differential between EDUCO and traditional schools has to do with access because of the relative paucity of schools in rural areas. The cost aspects will be proxied by a vector of school density variables, *V*.

Considering the above aspects of EDUCO program placements, we construct the formal model of program participation as follows. A household chooses the school type, *j*, which yields the highest level of net benefit of schooling, NB_j. In rural areas, there are two options, i.e., a decentralized EDUCO school ($j = ED$) or a traditional school ($j = TR$). Then we can define a latent variable of the relative net benefit of schooling at an EDUCO school, D^*, as follows:

$$D^* = NB_{ED} - NB_{TR}.$$

The actual selection of school type, which is represented by a discrete variable, *d*, is then observed. Following Cox and Jimenez (1990), we assume that this latent variable, D^*, is a linear function of exogenous variables, *Z*, a matrix which captures the relative benefits and relative costs of attending EDUCO schools against traditional schools. Then the econometric model for the

continuous, dependent variable model. This is discussed below.

selection of the school type is determined by:

(11) $$D^* = Z\gamma + u$$

(12) $$d = 1 \; if \; D^* > 0$$

$$= 0 \quad otherwise,$$

where E(u) = 0, Var(u) = σ_u^2, and $Z \equiv [CH \;\; A_1 \;\; V]$. Note that the benefit is proxied by child characteristics, *CH*, and household characteristics, A_1. The cost variables are proxied by, *V*, a matrix of school density variables. In the estimation, we take the percentages of EDUCO and traditional schools out of all primary schools in a municipality as the elements of *V*.

Our econometric model is composed of two interrelated probit model. The first probit model for school continuation is composed of equations (9) and (10), and the second probit equation for the selection of the school type consists of equations (11) and (12). If we assume that ε and u follow a standard bivariate normal distribution, then the model will become a version of the bivariate probit model (Greene, 2000; 849-856):[18]

(13) $$S^* = \alpha d + Q\boldsymbol{\mu} + \psi CP + CH\,\boldsymbol{\theta} + A_1\boldsymbol{\beta} + \varepsilon,$$

$$s = 1 \;\; if \;\; S^* > 0$$

$$s = 0 \;\; otherwise.$$

(14) $$D^* = Z\gamma + u$$

$$d = 1 \; if \; D^* > 0$$

$$= 0 \quad otherwise,$$

where it would be necessary to impose the conditions var(ε) = 1 and var(u) = 1 for identification. In order to estimate the parameters of this model with cov(ε, u) $\neq$ 0, we can employ the full-

[18] Theoretical development of the probit model with endogenous selection took place in the 1970's (Maddala and Lee, 1976; Maddala, 1983). However, almost no empirical applications were made until recently (Burnett, 1997; Greene, 1998; Greene, 2000, pp.852-856). Maddala (1983; 122-123) called this model a *recursive* model, although we assume that cov(ε, u) $\neq$ 0.

information maximum likelihood (FIML) method.[19] Denote the joint normal distribution function of the stochastic elements by $F(\varepsilon, u)$ and $\mathrm{cov}(\varepsilon, u) = \rho$. Then the likelihood to be maximized is[20]

(15) $$L(\gamma, \alpha, \theta, \beta; \rho) = \Pi\, P_{11}^{ds} P_{10}^{d(1-s)} P_{01}^{(1-d)s} P_{00}^{(1-d)(1-s)},$$

where

$$P_{11} = Prob(d=1, s=1) = F(Z\gamma, \alpha + Q\mu + \psi CP + CH\theta + A_1\beta; \rho)$$

$$P_{10} = Prob(d=1, s=0) = F(Z\gamma, -\alpha - Q\mu - \psi CP - CH\theta - A_1\beta; -\rho)$$

$$P_{01} = Prob(d=0, s=1) = F(-Z\gamma, Q\mu + \psi CP + CH\theta + A_1\beta; -\rho)$$

$$P_{00} = Prob(d=0, s=0) = F(-Z\gamma, -Q\mu - \psi CP - CH\theta - A_1\beta; \rho).$$

If the error terms in the selection probit and the outcome probit equations are positively correlated, i.e., $\rho > 0$, there is positive program selection.

Identification

To identify equation (15) the variables Z should contain at least one instrumental variable, V, that is not in the schooling equation (Maddala, 1983; pp. 122-123). It should be noted that V captures mainly the accessibility of schools. There is no information regarding the schooling options available to households (such as the distances from homes to EDUCO or traditional schools) because the data are school-based. However, we assume that a household would be more likely to choose EDUCO when a municipality was considered a government priority and EDUCO schools were available in the community.[21] The government gives priority to the

[19] When $\mathrm{cov}(\varepsilon, u) = 0$, the model can be estimated single probit model repeatedly.
[20] Although it involves the evaluation of double integrals, the endogenous nature of one of the variables on the right-hand side of the program selection equation can be simplified in formulating the log-likelihood due to the inherent nature of the partition of the likelihood function (Greene, 2000; pp. 852-853). This particular nature of the likelihood function eases the burden of computation. The actual computation is done by the seemingly unrelated (probit) regression method. First, the univariate probit model for the first equation is run. Then, the second equation is independently estimated by the probit model. Finally, full bivariate probit model is estimated by the maximum likelihood method using the independent probit results as the initial values.
[21] Uneven access to social services by municipalities has always been a serious issue in El Salvador,

municipalities that are considered to have the greatest need according to a classification system developed by MINED and the Ministry of Health (MOH).[22] The result of this prioritization, which is exogenously determined by government, is used as an instrument for identifying the effectiveness of the program. That is, the percentages of EDUCO schools and traditional schools relative to all primary schools within a municipality, which are pre-determined by the government. We use these two measures as instruments in identifying the program effects. The particular geographical targeting procedure allows us to use school density variables as identifying instrumental variables.

There may be a criticism on our identification strategy since the government placements of EDUCO schools may be neither exogenous nor random. In order to check the plausibility of this identification assumption, we compare observable characteristics of communities with more or fewer EDUCO schools. Table A1 shows the average household characteristics by municipality ranked by the fraction of pure EDUCO schools in all primary schools within municipality. There is no systematic differences in education level of parents and house ownership, while EDCUO school availability is negatively correlated with household-level infrastructure. This is likely to be a reflection of the government priority formula in school placements. Since there are constraints on both data and methodology, we will leave the endogeneity issue of government program placement for the future work.

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although poverty is more widespread in the smaller municipalities. These small municipalities usually suffer from lack of financial and institutional capacity to administer and manage social services. The EDUCO program was developed in 78 of the country's poorest municipalities. It started in 1991 with six ACEs in three departments; by the end of 1992, the program had extended to all 14 departments.

[22] The key variables in the targeting system are the incidence of severe malnutrition, represented by the percentage of undersized children in the municipality, the rate of grade repetition, the percentage of over-aged students, and the net enrollment rate. Except for the last category, higher levels of the variables are accorded more points in the priority listing of municipalities.

5. Data

The data set, which was designed purposefully to evaluate EDUCO, was collected in June-July 1996 and in May-July 1998. The 1998 survey includes a panel sample, since the surveyors returned to the same schools and interviewed those who could be located from the 1996 sample and a new cohort of students.

The sampling scheme is designed so that the survey is nationally representative. The 1996 sample of 311 primary schools was randomly selected from a universe of 3,634 primary schools. The instruments used to collect survey data were developed by the World Bank's Development Research Group (DECRG), the Ministry of Education's Research and Evaluation Division (DNEI) and local consultants. The survey covered 162 of 262 municipalities that share responsibility with the central government for the delivery of social services.

Four types of schools are represented in the sample: pure EDUCO schools, mixed schools with EDUCO and traditional sections, traditional public schools and private schools. Since EDUCO was introduced in 1991, third-grade sections were selected for each school for in-depth interviews. Five sets of interviews were conducted in each school with the director of the sampled school, the teacher of the sampled 3rd grade section, five students sampled randomly from the selected 3rd grade sections, parents of the students, and members of the parents' association. In this evaluation, we omitted students from private schools and traditional public urban schools from the sample since the students were not comparable with the EDUCO students. This left us with 878 students in 35 pure and mixed EDUCO schools and 107 pure and mixed traditional rural schools.

As a part of the 1998 survey of EDUCO schools, follow-up interviews were conducted for the 1996 cohort of students and teachers. The students themselves were interviewed again if they could be found in the same schools. Otherwise, teachers or school principals were interviewed concerning student decisions, such as reasons for leaving school.

Salvadorans' internal and external emigration rates are quite high (for example, see Funkhouser, 1997, and Murray, 1997). This accounts for 6.64 % of all children's schooling status in 1998 (Table 1). Since we were unable to identify whether migrant children remained in school or dropped out in 1998, these children were omitted from our analysis.

Table 2 lists definitions and descriptive statistics of the variables used in the analysis. According to the school continuation variable, *enrol*, more than 80% of 3rd grade students who were studying in 1996 were continuing their education at the same school in 1998. About 7% of the students repeated grades over a two-year period.

The explanatory variables include various child, household, school, and classroom level variables that were collected in 1996. With respect to the child variables, there were no significant gender differences in school attendance in 1996, and many children lived in households without parents. EDUCO students tend to come from more disadvantaged backgrounds. Parents of students in traditional schools have more education than those of students in the EDUCO program. The education differences are also reflected in the asset indicators. Fewer parents participating in the EDUCO program own their homes or have access to electricity, sanitary services, or running water.

The school and classroom characteristics are consistent with the pattern for household characteristics. For example, fewer EDUCO schools have access to electricity or running water. More EDUCO teachers have completed their university education but they have little experience. Typically, EDUCO teachers are relatively young and are recent graduates who receive a bonus for teaching in the program.

A very large difference between EDUCO and traditional schools is that EDUCO parent associations visit classrooms more than once a week on average, which is almost 3-4 times more frequently than their traditional counterparts. This indicates that community involvement is far more intensive in EDUCO schools than in traditional schools.

6. Estimation Results

The basic estimation results are summarized in Table 3. We control for the difference in an initial test score variable, which is the sum of 1996 mathematics and language test scores as well as household background and grade availability. Since schooling is a sequential process, the reduced-form solution of schooling should include the entire history of the exogenous variables that affect the schooling process. Although such retrospective data is not available here, the initial educational outcome might be a useful proxy for these long-term dynamic effects, capturing the entire history of the past schooling process.

The following four findings emerge from the basic specification (specification 1).[23] First, the coefficient on the EDUCO dummy variable is positive and statistically significant. Being in an EDUCO school is associated with a greater probability of continuing in school. Second, a child's age has a negative and significant coefficient, indicating that older children are more likely to drop out. This finding suggests the importance of the opportunity cost of schooling, since older children can provide important domestic, on-farm or off-farm labor. Third, the coefficient of the availability of electricity is positive and statistically significant. This implies that relatively rich households with access to electricity have children who are less likely to drop out. Based on the theoretical results, a possible interpretation of this finding is that wealthy households face a lower cutoff rate of interest for educational investments because of their ability to borrow. Another possible explanation is that electricity allows children to study at home. Finally, the initial test score variable has a statistically insignificant coefficient.[24] This result suggests that the estimation bias due to omitting past education variables is not serious. It might also reflect the mitigating effect that, while higher previous achievement enhances the chances of future success in school, it might also lead to better employment prospects.

[23] Note that we also added regional poverty head count ratio to cope with the potential bias due to omitting region-specific unobserved heterogeneity, where there are four regions in El Salvador, i.e., Western, Central 1, Central 2, Eastern, and Metropolitan regions.

Importantly, supply-side quantity constraints seem to be significant. The coefficient of the variable measuring the number of sections at the second cycle (grades 4-6) is positive and highly significant (the first specification in Table 3). Once we drop this supply-side variable, the EDUCO dummy coefficients become smaller and insignificant (the second specification in Table 3). This implies that students who studied at an EDUCO school in 1996 were likely to face supply constraints at the second cycle. They were in schools where there were fewer opportunities for further schooling beyond the first cycle. This is not surprising since, originally, EDUCO was meant principally to expand access to preschool education and to the first cycle (grades 1-3) in rural areas (World Bank, 1994; 1995; MINED, 1994). Once we control for this physical constraint, we observe positive and statistically significant EDUCO effects.

When the 1996 mixed school dummy is added, it consistently has positive and significant coefficients (Table 3, specifications 3 and 5), indicating that supply-side constraints are not binding for mixed schools at the second cycle of primary education. This is not surprising since, by definition, a mixed school is a school that can accommodate both EDUCO and traditional sections. As Reimers (1996) noted, when a community already has a traditional school as well as teachers in grades 1-3 and initiates a new mixed school by adding an EDUCO section, the existing traditional teachers are often transferred to the second cycle (grades 4-6). Then the newly provided funds are made available to hire teachers for preschool and the first cycle (grades 1-3) EDUCO section. As a result the community is left with a mixed school that offers at least the initial two cycles (grades 1-6) of education.

The estimated ρ is negative for basic specifications, suggesting that the error terms in the selection probit and the outcome probit equations are negatively correlated. This parameter is statistically significant, suggesting that there is negative program selection. Unobserved characteristics regarding the children, households, and communities might positively affect the

[24] Dropping this variable does not change the qualitative results for the school type variable.

likelihood of selecting an EDUCO school and might negatively, thought not significantly, affect a student's decision to continue in school.

Explaining the Positive Effects of the EDUCO Program

Can we attribute the positive EDUCO effects to other observable community and/or school characteristics, such as those which are related to the decentralization initiative? To capture this effect, we add the community participation variable in the estimation. The result was a decline in the magnitude and level of significance of the EDUCO coefficient. At the same time, a positive and reasonably significant community participation effect on school continuation emerged (Table 3, specifications 4 and 5).

These results suggest that a significant portion of positive EDUCO effect can be explained by community participation. As explained earlier, this can be due to enhanced teacher monitoring or community peer pressure to keep kids in school.[25]

Besides the intensive involvement of parental groups, school and classroom inputs, such as teacher-pupil ratios, teacher remuneration or the educational background of teachers and their experience might also be intervening factors. To capture these effects, we enter school and classroom-level characteristics and teacher characteristics as the elements of *Q* in equation (13). The results are shown in Table 4.[26] The EDUCO effect is lower than that in regressions without school and classroom-level variables (Table 5), and the EDUCO coefficient is statistically insignificant. The results indicate that a significant portion of the difference between EDUCO and traditional schools can be captured by observable school characteristics as well as by differences in community

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[25] See Sawada (1999) for a structural estimation of the teacher effort function in EDUCO schools. The role of community participation and social capital attract a significant amount of attention in recent research. See, for example, Stiglitz (2002) and Isham, Narayan, and Pritchett (1995).

[26] They are entered linearly and interactively with the EDUCO dummy -- EDUCO may change the character of school provision. For the sake of brevity, we do not show the regressions with the interaction terms; they are available from the authors.

involvement. On the other hand, the basic results for the effects of socioeconomic characteristics do not change even after including the characteristics of the schools, classrooms, and teachers.

According to Table 4, all of the school-level variables are insignificantly different from zero. However, a teacher's wage compensation affects schooling behavior significantly. In addition, the number of books in the classroom library is positively related to a higher probability of student retention. This is consistent with the findings in other studies that use other educational outcomes, such as scores in language tests (World Bank, 1995, pp.19-20; Jimenez and Sawada, 1999).

We also interact teacher characteristic variables with the EDUCO dummy variable (Table 6). Two important findings emerge. First, the effect of a teacher's experience on the probability of a student's decision to continue in school is positive in EDUCO schools, while it is negative in traditional schools. Second, the positive effect of higher wages for teachers is larger in EDUCO schools than it is in traditional schools. These results suggest that appropriate compensation for teachers has an important effect on teacher effort. Over time, EDUCO teachers receive a piece wage rate which depends on their performance and is determined by ACEs, while traditional schools employ a fixed teacher wage scheme (World Bank, 1995). The results concerning teacher salaries might represent the inefficiency of a fixed teacher wage-compensation scheme in traditional schools, as suggested by the theory. On the other hand, the incentive provided by intertemporal pay raises depending on high performance has a positive effect in EDUCO schools.

In El Salvador, the multi-grade classrooms has made it easier to offer a full cycle of basic education (grades 1-9) in rural areas, where resources are scarce and the density of students is low. We found that, in the EDUCO schools, the effect of the multi-grade classroom on the probability of continuing school is positive, yet statistically insignificant (Table 6). On the other hand, the school dropout rate is significantly higher in a multi-grade classroom than in a single-grade classroom in traditional schools. This is why the multi-grade coefficient is also negative in all schools, as shown in Table 4. Therefore, it is important to examine the multi-grade setting more closely. Teachers must learn how to deal with the multi-grade situation on the job and to adjust their pedagogical strategies frequently and flexibly. The slight positive effect of multi-grade classrooms in EDUCO schools suggests the importance of flexible teacher and school management scheme as a complementary and necessary condition to generate an advantage with multi-grade classrooms.

Incidence of Grade Repetition

Among those who decided to continue education from 1996 to 1998, some of the students repeated grades (Figure 2). Forty-eight students or only eight percent of those who continued schooling, repeated a grade in the sample taken. This limited sample does not allow us to derive a robust inference, although we can estimate a model of grade repetition, conditional on school continuation. Hence, in the Appendix, we summarized the estimation procedure of grade repetition. Estimated coefficients for the probability of grade repetition, conditional on school continuation, as well as school continuation equation are shown in Table A2. The estimated result of the first equation suggests that EDUCO schools and mixed schools decreased the incidence of grade repetition, although the results were not statistically significant (see Appendix 2).

7. Conclusions

There is no doubt that the EDUCO program has been successful in expanding access to schools in rural areas. Our estimation results indicate that EDUCO schools have also increased the probability of students continuing in school after controlling for child, household, and supply-side constraints. This positive effect seems to be generated to a large extent by active community involvement, better classroom environment, and careful teacher management. Moreover, our empirical results suggest that EDUCO schools might generate a smaller incidence of school repetition than traditional schools, although the findings are not statistically robust (Appendix 2).

The positive effects of EDUCO have a great deal to do with community involvement in the management of schools. Parents in EDUCO settings meet more frequently with teachers. These meetings are important for the teacher because their teaching efforts are directly related to their tenure and compensation. The flexibility of the teacher and school management scheme in EDUCO schools seems to work even in a multi-grade classroom. We conclude that when a school system decentralizes, there are large gains from delegating the management and administration of schools to communities.

While more students are staying in school longer in El Slavador, the grade progression from the first cycle (grades 1-3) to the second cycle (grades 4-6) still remains a serious problem (World Bank, 1997b). In fact, this problem of inter-cycle progression is an inherent constraint of the EDUCO program because, originally, it was used to expand access to preschool education and to the first cycle (grades 1-3) in rural areas (Reimers, 1997; World Bank, 1994). Usually, EDUCO programs are set up for the first cycle only (World Bank, 1994; 1995). Indeed, our estimation results suggest that the lack of 4-6th grade sections in most EDUCO schools imposes supply-side constraints of primary education in El Salvador. Hence, extending of EDUCO into the second cycle should be an important policy target. In fact, the Ten-Year Education Plan (1995-2005) proposed increasing the number of schools that offer grades 1 to 6 by 20%, especially in rural EDUCO schools (World Bank, 1997b). As a result, remarkable progress has already been observed in the expansion of the second cycle of primary education in pure and mixed EDUCO schools (Table 7). The government issued the second education decree concerning second-cycle education in February 1995. Since then the EDUCO program has been extended to the second cycle (grades 4-6). Moreover, the third decree of April 1998 targeted the extension of the EDUCO program to the third cycle (grades 7-9). The empirical results of this paper support such policy interventions in El Salvador.

Appendix 1: The First-Order Conditions of the Optimization Model

The household maximizes expected utility over two periods subject to a budget constraint:

(A1-1) $$V = E[U(C_1, C_2)] ,$$

where $U(\cdot)$ is a well-behaved concave utility function. $E[\bullet]$ represents the expectations operator, conditional on the information set at the beginning of the first period. The household's intertemporal budget constraint is:

(A1-2) $$C_2 = [A_1 + Y_1 \ + (1 - S)W_1 \ - C_1] * [1 + r(A_1)] + Y_2 \ + W_2 \ (S) .$$

In order to solve the above problem, we define the Lagrangian:

(A1-3) $$\begin{aligned} L \equiv\ & E[U(C_1, C_2)] \\ & + \lambda\{[A_1 + Y_1 \ + (1 - S)W_1 \ - C_1] * [1 + r(A_1)] + Y_2 \ + [f(S, q, e) + \eta] - C_2\}, \end{aligned}$$

where λ is the Lagrange multiplier associated with the budget constraint (A1-3). Then the first-order conditions for a maximum are:

(A1-4) $$\frac{\partial L}{\partial C_1} = \partial V / \partial C_1 - \lambda[1 + r(A_1)] = 0 ,$$

(A1-5) $$\frac{\partial L}{\partial C_2} = \partial V / \partial C_2 - \lambda = 0 ,$$

(A1-6) $$\frac{\partial L}{\partial S} = \lambda\{- W_1 \ [1 + r(A_1)] + \partial f / \partial S\} = 0 ,$$

(A1-7) $$\frac{\partial L}{\partial \lambda} = [A_1 + Y_1 \ + (1 - S)W_1 \ - C_1] * [1 + r(A_1)] + Y_2 \ + [f(S, q, e) + \eta] - C_2 = 0,$$

(A1-8) $\lambda > 0$.

Note that by a non-satiation assumption of the household, the intertemporal budget constraint is always binding. Combining (A1-4) and (A1-5), we get:

(A1-9) $$\partial V / \partial C_1 = [1 + r(A_1)] \partial EU / \partial C_2 .$$

Equation (A1-9) is the usual intertemporal marginal utility equalization condition that gives an Euler equation for the optimal consumption path. From equations (A1-5) and (A1-6), we obtain:

(A1-10) $$(\partial V / \partial C_2) W_1 \ [1 + r(A_1)] = (\partial V / \partial C_2)[\partial f(S, q) / \partial S] .$$

The left-hand side of equation (A1-10) represents a marginal benefit of the participation of a child in the labor market during the first period, as valued by marginal utility. The right-hand side indicates the marginal benefit of a child's schooling. The optimal amount of schooling is determined so that marginal costs and marginal benefits are equalized. Rewriting equation (A1-10) gives a structural form to the schooling decision

(A1-11) $$\frac{\partial f(S, q, e) / \partial S}{W_1} = 1 + r(A_1),$$

for all states of the world.

Appendix 2: Derivation of the Optimal Effort and Incentive Conditions

Following Sawada (1999), suppose that the principal has difficulty observing true teacher effort, e, directly and can observe only an imperfect indicator. Assume that the expected teacher wage in the next period, W^T, is a linear function of the observed effort level, OE:

(A2-1) $$W^T = a_1 + a_2\, OE.$$

(A2-2) $$OE = e + z,$$

where z indicates a measurement error with $E(z) = 0$. Note that e and z are not separately observed by the principal. We also assume that the degree of community participation, CP, determines precision with which teacher effort is estimated, i.e., $Var(z) = V(CP)$ with $\partial V/\partial CP < 0$. From (A2-1) and (A2-2), the reduced-form payment scheme equation is:

(A2-3) $$W^T = a_1 + a_2\, e + a_2\, z,$$

and assuming that a teacher's utility depends on the wage level, his/her optimization problem becomes

(A2-4) $$e^* = argmax_{\{e\}}\ E\ \{u[a_1 + a_2\, e + a_2\, z - CS(e)]\},$$

where $u(\bullet)$ represents a teacher's concave utility function and $CS(e)$ is the convex function of the cost created by effort. Assume that a teacher is risk-averse with the constant coefficient of absolute risk aversion, γ. Then a teacher's certainty equivalent is approximately represented by $E(W^T) - CS(e) - (1/2)\gamma Var\,(W^T) = E(a_1{+}a_2e{+}a_2z) - CS(e) - (1/2)\gamma(a_2)^2V(CP)$. Then, we have the first-order condition of a teacher's utility maximization problem as follows:

(A2-5) $$a_2 = CS'(e^*).$$

This is the incentive compatibility constraint.

Following the solution method of Holmstrom and Milgrom (1991), we can derive the incentive-efficient linear contract. Suppose that the parents' association is concerned with the net community benefit of education, which is measured by a weighted average of student i's educational achievement evaluated at the market wage rate, W_{2i}, the net of a teacher's benefit. Let λ_i be the weight for child i, which represents the parents' association's preference over students. Then, assuming a risk-neutral principal, we can derive the principal's certainty equivalent as $E(\Sigma_i\lambda_iW_{2i}) - E(W^T)$. A risk averse teacher's certainty equivalent is represented by $E(W^T) - CS(e) - (1/2)\gamma(a_2)^2V(CP)$. Combining these two formulas, the sum of the certainty equivalent incomes of the teacher and the parents' association becomes $E(\Sigma_i\lambda_iW_{2i}) - CS(e) - (1/2)\gamma(a_2)^2V(CP)$. The optimization problem of parents' association, therefore, becomes

(A2-6) $$\underset{\{a_1,a_2\}}{Max}\sum_{i=1}^{N}E(\lambda_iW_{2i}) - CS(e) - \frac{1}{2}\gamma(a_2)^2V(CP)$$

$$s.t.\ \ a_2 = CS'(e)$$

$$W_{2i} = f(S_i, q, \mathrm{e}) + \eta_i$$

Note that this problem is equivalent to the problem of a principal's total net output maximization subject to an individual agent's rationality constraint and incentive compatibility constraint. The first-order conditions for this problem are $[\Sigma_i\lambda_i(\partial W_{2i}/\partial \mathrm{e}) - CS'(e) - \gamma\, a_2\, CS''(e)V(CP)](\partial e/\partial a_2) = 0$ and $a_2 = CS'(e)$. Hence, the optimal slope of the wage compensation scheme becomes:

(A2-7) $$a_2{}^* = \sum_{i=1}^{N}\lambda_i\frac{\partial f_i}{\partial e}\bullet\frac{1}{1+\gamma V(CP)CS''(e)}$$

This condition, a.k.a., the optimal intensity of incentives condition, indicates that the parents' association will choose a_2 optimally to induce the teacher to set the marginal cost of effort equal to its marginal social value of effort, i.e., the weighted average of the students' educational attainments. Assuming that $\partial f_i/\partial e$ is an exogenous technical coefficient and the $CS(\bullet)$ function is quadratic, we simply have

(A2-8) $$a_2{}^* = g\,(CP),$$

where $\partial a_2{}^*/\partial CP > 0$.

Appendix 3: Probability of Repetition for Students Who Choose to Remain in School

Among those who decided to continue their education from 1996 to 1998, some of the students repeated grades, while others did not (Figure 2). This appendix explains the estimation procedure and estimated results of a model of grade repetition, conditional on school continuation. The main econometric issue here is the interrelationship between the school-continuation decision and grade-repetition decision. Since we observe grade repetitions only among the students who continued schooling, the probit model with sample selection is a natural choice of an econometric framework, following the model of Van de Ven and Van Pragg (1988). First, we have the latent equation, which is the grade repetition equation in our model:

(A3-1) $$R^* = X\eta + e,$$

where R^* is a latent variable that represents continuous outcome of repetition. We observe only the binary outcome of grade repetition, i.e.,

$$r = 1 \;\; if \;\; R^* > 0$$
$$r = 0 \;\; otherwise.$$

However, this dependent variable is not always observed. The grade repetition variable, r, is observed only if a student continued schooling in 1998, i.e.,

(A3-2) $$S^{**} = \alpha d + Q\mu + CH\theta + A_1\beta + \varepsilon > 0.$$

Note that this is a selection equation. According to the nature of school-based sampling, there is no repetition information for the students who switched to other schools. Hence, simply by eliminating the students who switched, the binary observations for S* are limited to S** for those who continued schooling at the same school as in 1996 (Figure 2).

Again, we need to impose the conditions var(e) = 1 and var(ε) = 1 for parameter identification. If the error terms are not correlated, the repetition model could be estimated by a simple probit model. Otherwise, we have to conduct the full-information maximum likelihood estimation. Suppose that the cumulative joint normal distribution function of the stochastic elements can be represented by $F(e, \varepsilon)$ and that cov(e, ε) = ρ_2. Then the likelihood function becomes

(A3-3) $$L^* (\eta, \alpha, \theta, \beta; \rho^*) = \Pi \, q_{11}^{rs} \, q_{01}^{(1-r)s} \, q_0^{(1-s)},$$

where

$$q_{11} = Prob(r{=}1, s{=}1) = F(X\eta, \alpha d + Q\mu + CH\theta + A_1\beta; \rho_2)$$
$$q_{01} = Prob(r{=}0, s{=}1) = F(- X\eta, \alpha d + Q\mu + CH\theta + A_1\beta; - \rho_2)$$
$$q_0 = Prob(s{=}0) = 1 - F(\alpha d + Q\mu + CH\theta + A_1\beta).$$

We can plausibly assume that repetition is determined by teacher- and school-specific variables, while school continuation is mainly a decision made on the household level. This assumption provides the important parameter identification of our model. The matrix, X, includes school-level variables and teacher and classroom variables, while the school continuation equation includes the same variables that were used before. The estimated coefficients for the probability of grade repetition, conditional on school continuation, and the school continuation equation are summarized in Table A2.

Estimated results for the repetition equation are summarized in Table A2. With respect to the grade repetition equation, two findings emerged. First, with respect to the variables of our interest, the EDUCO dummy variable and mixed school dummy variable have negative coefficients. This suggests that the EDUCO and mixed schools have a positive effect on the educational quality, albeit one that is not statistically significant. Second, the variable for the years of teacher experience has a negative and statistically significant coefficient, indicating that teacher experience decreases the incidence of repetition.

With respect to the sample selection equation, the estimated coefficients are consistent with the estimation results reported in Table 3 (specification (2)). The effects of a child's age are negative, suggesting the existence of high opportunity costs of schooling. Moreover, the household's economic level, represented by the availability of electricity, has a positive and statistically significant coefficient.

Estimated ρ_2 is negative and indicates that there is a negative correlation between the selection of an EDUCO school and grade repetition. Yet, we cannot reject the null hypothesis that this coefficient is zero.

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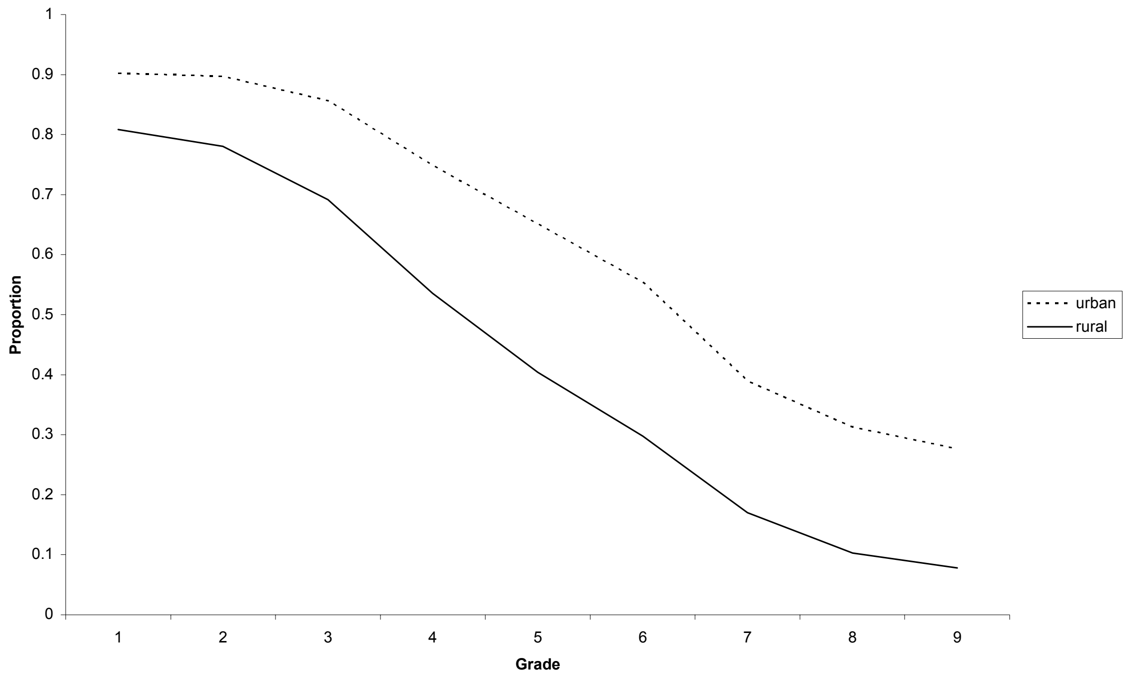
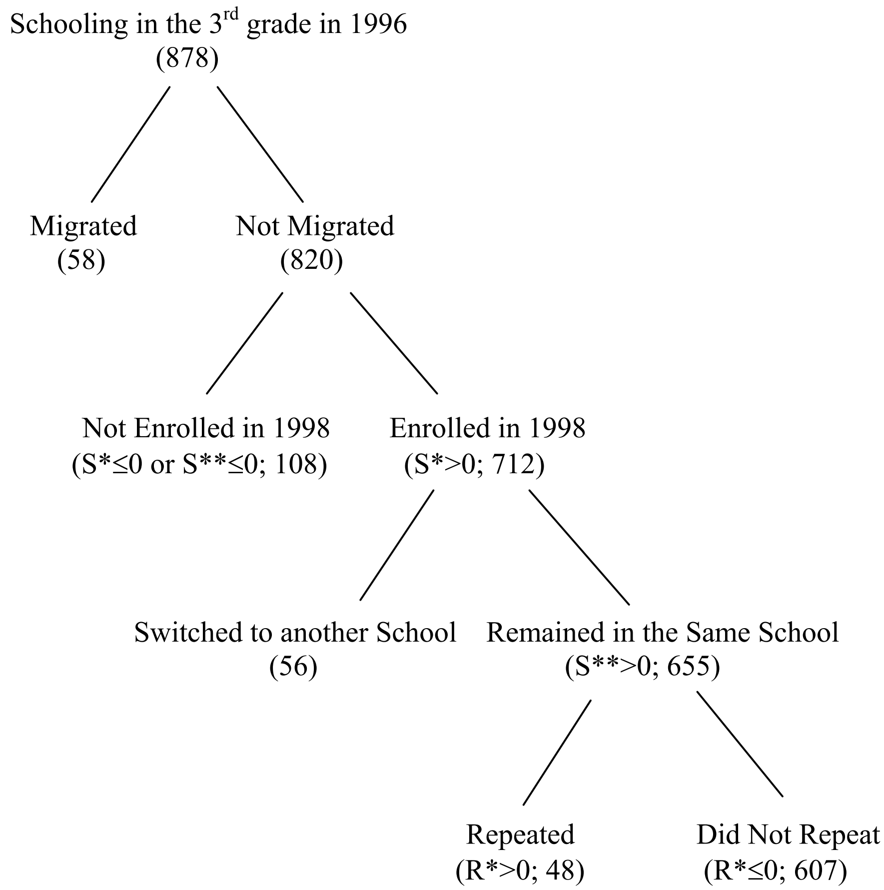
Figure 1
Percentage of 16- to 18-year-old individuals who have completed each grade
El Salvador 1996



Data source) El Salvador 1996 Household Survey, Republic of El Salvador

Figure 2

The Sample Structure



Note: This tree diagram does not necessarily represent a sequential decision-making process.
The number of children is indicated in parentheses.

Table 1
School Decisions from 1996 to 1998

	Number of cases	Percentage
Continued schooling	712	81.09
Dropped out for reasons related to the child, household or school	108	12.30
Of which dropped out due to supply side constraints	(37)	
Other reasons related to the household or child	(71)	
Migrated and 1998 schooling status unknown	58	6.61
Total	878	100

Table 2
The List of Variables and Their Descriptive Statistics

Variable definitions	Code	All Schools Mean	All Schools Std. Dev.	EDUCO Schools Mean	EDUCO Schools Std. Dev.	Trad. Schools Mean	Trad. Schools Std. Dev.
School Outcome Variable (s)							
Continued schooling in 1998=1	enrol	0.87		0.85		0.87	
Repeated a grade or grades in 1996-1998=1	rep	0.07		0.07		0.07	
School Type and Supply-side Variables (d,Q)							
EDUCO=1	e_w	0.21		1.00		0.00	
Mixed=1	mix	0.35		0.26		0.37	
Number of sections in the second cycle	n_sec2	2.73	(2.13)	0.89	(1.26)	3.22	(2.05)
Output Variables (1996); Q							
Achievement test score, math plus language (number of subjects taken)	score	5.31	(3.70)	5.20	(4.25)	5.34	(3.55)
Child Variables (1996); CH							
Gender (female=1)	a_d_1d	0.50		0.47		0.50	
Child's age	childage	10.51	(1.76)	10.74	(1.79)	10.45	(1.81)
Lives without parent(s)=1	a_c_1d2	0.10		0.13		0.10	
Number of siblings (aged 4-15)	pa_b3	2.13	(1.67)	2.27	(1.74)	2.10	(1.65)
Household Variables (1996); A_1							
Mother entered basic education=1	edl_m	0.56		0.51		0.57	
Mother's education missing=1	ed_mm	0.10		0.09		0.11	
Father entered basic education=1	edl_p	0.41		0.35		0.43	
Father's education missing=1	ed_pm	0.03		0.03		0.04	
Own house=1	pa_e1d	0.73		0.71		0.73	
Electricity available=1	pa_e81d	0.55		0.31		0.61	
Sanitary service available=1	pa_e82d	0.15		0.06		0.18	
Water available=1	pa_e85d	0.05		0.01		0.07	
School Variables (1996); Q							
If sanitation/latrine available at shool=1	d_d11d	0.93		0.93		0.93	
If electricity available at school=1	d_d12d	0.69		0.39		0.77	
If running water available at school=1	d_d21d	0.35		0.19		0.39	
Teacher and Classroom Variables (1996); Q							
# of students in classroom	pr_d2	26.47		22.11		27.63	
If teacher has completed university education=1	predu_un	0.43		0.67		0.37	
Years of teacher experience	pr_year	7.83	(7.22)	4.26	(2.55)	8.78	(7.74)
Monthly base salary of teacher	pr_c2	3034.25	(575.83)	2932.16	(244.57)	3061.15	(632.39)
If teacher receives bonus=1	pr_bonu	0.65		0.63		0.66	
If teacher teaches in multi-grade classroom=1	pr_d15d	0.23		0.32		0.20	
# of books in classroom library	books	73.94	(158.56)	93.22	(251.73)	68.86	(122.58)
If classroom library information missing=1	book_m	0.40		0.32		0.41	
Community Participation Variable (1996); CP							
# of ACE/SpDF's visits to classroom in the last month	pr_d11	2.03	(4.06)	4.91	(5.99)	1.27	(2.94)
Regional School Distribution (1996); V							
Fraction of pure EDUCO schools compared to all primary schools within a municipality	fmeduco	0.21	(0.34)	0.75	(0.30)	0.06	(0.15)
Fraction of pure traditional schools compared to all primary schools within a municipality	Fmtrad	0.79	(0.34)	0.25	(0.30)	0.94	(0.15)
Sample size		820		171		649	

Table 3
Estimation Results of Probit Model with Endogenous Selection
Equation (13): School Continuation Equation

Specification		(1)	(2)	(3)	(4)	(5)
		Coef. z-stat	Coef. z-stat	Coef. z-stat	Coef. z-stat	Coef. z-stat
EDUCO variable (α)						
EDUCO school dummy	e_w+	0.32 (1.65)*	0.09 (0.51)	0. 36 (1.84)**	0.27 (1.34)	0.30 (1.51)
School Supply Availability (Q)						
Number of sections for the second cycle	n_sec2	0.12 (2.90)***		0.12 (2.79)***	0.13 (2.95)***	0.12 (2.87)***
Mixed school dummy	Mix+			0.28 (2.22)**		0.30 (2.40)**
Initial Human Capital (Q)						
Test score in 1996	Score	-0.02 (1.13)	-0.02 (1.27)	-0.02 (1.19)	-0.02 (1.11)	-0.02 (1.15)
Regional Poverty Measure						
Regional head-count ratio in 1994	Head_c	0.38 (0.54)	0.23 (0.34)	0.39 (0.54)	0.44 (0.62)	0.46 (0.65)
Community Participation Variable (Q)						
Number of classroom visits by association	pr_d11				**0.02 (1.28)**	**0.02 (1.61)**
Child Variables (CH)						
Gender (female=1)	a_d_1d+	-0.05 (0.39)	-0.04 (0.36)	-0.04 (0.33)	-0.05 (0.39)	-0.04 (0.33)
Child's age	Childage	-0.16 (5.09)***	-0.16 (4.94)***	-0.16 (5.18)***	-0.17 (5.16)***	-0.17 (5.29)***
Lives without parent (s)=1	a_c_1d2+	-0.16 (0.80)	-0.14 (0.71)	-0.14 (0.66)	-0.18 (0.87)	-0.15 (0.73)
Number of siblings (aged 4-15)	pa_b3	-0.02 (0.60)	-0.02 (0.66)	-0.03 (0.85)	-0.02 (0.61)	-0.03 (0.88)
Household Variables (A_1)						
Mother entered basic education=1	edl_m+	0.14 (1.08)	0.13 (1.07)	0.14 (1.08)	0.12 (0.97)	0.12 (0.95)
Mother's education missing=1	ed_mm+	0.27 (1.21)	0.27 (1.20)	0.26 (1.15)	0.26 (1.18)	0.24 (1.09)
Father entered basic education=1	edl_p+	0.12 (0.97)	0.13 (0.99)	0.12 (0.94)	0.13 (1.00)	0.13 (0.98)
Father's education missing=1	ed_pm+	0.08 (0.23)	0.06 (0.19)	0.11 (0.32)	0.07 (0.22)	0.11 (0.32)
Own house=1	pa_e1d+	0.15 (1.12)	0.10 (0.82)	0.15 (1.12)	0.15 (1.12)	0.15 (1.12)
Electricity available=1	pa_e81d+	0.35 (2.57)***	0.43 (3.44)***	0.40 (3.06)***	0.35 (2.61)***	0.41 (3.15)***
Sanitary service available=1	pa_e82d+	0.02 (0.10)	0.06 (0.33)	0.04 (0.20)	0.01 (0.07)	0.03 (0.18)
Water available=1	pa_e85d	-0.22 (0.81)	-0.08 (0.32)	-1.88 (0.70)	-0.22 (0.81)	-0.19 (0.70)
Constant	_cons	2.16 (4.36)***	2.51 (5.33)***	2.07 (4.17)***	2.14 (4.30)***	2.04 (4.07)***

+Discrete variable
Note 1: The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively
Note 2: The Huber/White/sandwich robust estimator of variance is used.

Table 3 (continued)
Estimation Results of Probit Model with Endogenous Selection
Equation (14): School Type Selection Equation

Specification		(1)		(2)		(3)		(4)		(5)	
		Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Child Variables											
Gender (female=1)	a_d_1d+	-0.03	(0.18)	-0.03	(0.18)	-0.03	(0.18)	-0.03	(0.18)	-0.03	(0.18)
Child's age	Childage	0.03	(0.50)	0.03	(0.50)	0.02	(0.49)	0.03	(0.50)	0.03	(0.49)
Lives without parent(s)=1	a_c_1d2+	-0.10	(0.32)	-0.10	(0.32)	-0.11	(0.33)	-0.10	(0.32)	-0.11	(0.33)
Number of siblings (aged 4-15)	pa_b3	0.06	(1.10)	0.06	(1.10)	0.06	(1.10)	0.06	(1.10)	0.06	(1.10)
Household Variables											
Mother entered basic education=1	edl_m+	-0.16	(0.89)	-0.16	(0.89)	-0.16	(0.89)	-0.16	(0.89)	-0.16	(0.89)
Mother's education missing=1	ed_mm+	-0.99	(3.15)***	-0.99	(3.15)***	-0.99	(3.14)***	-0.99	(3.15)***	-0.99	(3.14)***
Father entered basic education=1	edl_p+	-0.45	(2.26)**	-0.45	(2.26)**	-0.46	(2.27)**	-0.45	(2.26)**	-0.45	(2.27)**
Father's education missing=1	ed_pm+	-0.04	(0.09)	-0.04	(0.10)	-0.04	(0.10)	-0.04	(0.09)	-0.04	(0.10)
Own house=1	pa_e1d+	0.02	(0.11)	0.02	(0.11)	0.02	(0.11)	0.02	(0.11)	0.02	(0.11)
Electricity available=1	pa_e81d+	0.08	(0.38)	0.07	(0.38)	0.08	(0.40)	0.07	(0.38)	0.08	(0.39)
Sanitary service available=1	pa_e82d+	-0.33	(1.00)	-0.33	(1.00)	-0.33	(1.00)	-0.33	(1.00)	-0.33	(1.00)
Water available=1	pa_e85d+	-1.95	(4.33)***	-1.95	(4.34)***	-1.96	(4.32)***	-1.95	(4.33)***	-1.96	(4.32)***
Schooling Cost Variables (Identifying IV)											
Fraction of EDUCO schools compared to all primary schools within a municipality	Fmeduco	2.80	(4.10)***	2.80	(4.10)***	2.81	(4.10)***	2.80	(4.10)***	2.81	(4.10)***
Fraction of traditional schools compared to all primary schools within a municipality	Fmtrad	-2.40	(3.95)***	-2.40	(3.96)***	2.40	(3.95)***	-2.40	(3.96)***	-2.40	(3.95)***
ρ		-0.016		-0.019		-0.000		-0.022		-0.005	
(Wald Stat.)		(0.009)		(0.014)		(0.000)		(0.016)		(0.000)	
Sample size		820		820		820		820		820	

+Discrete variable

Note 1: The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

Note 2: The Huber/White/sandwich robust estimator of variance is used.

Table 4
Estimation Results of Probit Model with Endogenous Selection with School Inputs
Equation (13): School Continuation Equation

Variable definitions	Code	(6) Coef. z-stat	(7) Coef. z-stat
EDUCO variable (α)			
EDUCO school dummy	e_w+	0.19 (0.99)	0.21 (1.08)
School Supply Availability (Q)			
Number of sections for the second cycle	n_sec2	0.10 (2.19)**	0.09 (2.02)**
Mixed school dummy	Mix+		0.42 (3.13)***
Initial Human Capital (Q)			
Test score in 1996	Score	-0.02 (1.17)	-0.02 (1.31)
Regional Poverty Measure			
Regional head-count ratio in 1994	Head_c	0.23 (0.31)	0.24 (0.32)
Community Participation Variable (Q)			
Number of classroom visits by association	pr_d11	0.01 (0.53)	0.01 (0.95)
Child Variables (CH)			
Gender (female=1	a_d_1d+	-0.06 (0.52)	-0.05 (0.43)
Child's age	Childage	-0.18 (5.14)***	-0.18 (5.26)***
Lives without parent(s)=1	a_c_1d2+	-0.16 (0.75)	-0.12 (0.58)
Number of siblings (aged 4-15)	pa_b3	-0.03 (0.71)	-0.04 (1.03)
Household Variables (A_1)			
Mother entered basic education=1	edl_m+	0.12 (0.89)	0.11 (0.84)
Mother's education missing=1	ed_mm+	0.27 (1.25)	0.26 (1.19)
Father entered basic education=1	edl_p+	0.17 (1.30)	0.17 (1.25)
Father's education missing=1	ed_pm+	0.05 (0.15)	0.08 (0.24)
Own house=1	pa_e1d+	0.15 (1.15)	0.15 (1.09)
Electricity available=1	pa_e81d+	0.31 (2.11)**	0.36 (2.51)**
Sanitary service available=1	pa_e82d+	-0.02 (0.09)	0.01 (0.07)
Water available=1	pa_e85d	-0.20 (0.74)	-0.14 (0.53)
School Variables (Q)			
If electricity available at school=1	d_d12d	0.03 (0.23)	0.01 (0.04)
If running water available at school=1	d_d21d	-0.04 (0.28)	-0.08 (0.55)
Teacher and Classroom Variables (Q)			
# of students in classroom	pr_d2	0.01 (1.50)	0.01 (1.37)
If teacher has completed university education=1	predu_un	0.16 (1.22)	0.21 (1.55)
Years of teacher experience	pr_year	-0.01 (1.10)	-0.01 (1.33)
Monthly base salary of teacher (in 100 *colones*)	pr_c2	0.02 (1.57)	0.02 (2.01)**
If teacher teaches in multi-grade classroom=1	pr_d15d	-0.24 (1.61)	-0.30 (1.93)*
# of books in classroom library (in 100 books)	books	0.11 (1.78)*	0.11 (2.11)**
If classroom library information missing=1	book_m	0.08 (0.57)	0.15 (1.08)
Constant	_cons	1.69 (2.65)***	1.64 (2.72)***

Table 4 (continued)
Estimation Results of Probit Model with Endogenous Selection
Equation (14): School Type Selection Equation

Specification		(6)		(7)	
		Coef.	z-stat	Coef.	z-stat
Child Variables					
Gender (female=1)	a_d_1d+	-0.03	(0.19)	-0.03	(0.19)
Child's age	Childage	0.02	(0.30)	0.01	(0.29)
Lives without parent(s)=1	a_c_1d2+	-0.09	(0.29)	-0.10	(0.30)
Number of siblings (aged 4-15)	pa_b3	0.06	(1.12)	0.06	(1.12)
Household Variables					
Mother entered basic education=1	edl_m+	-0.16	(0.86)	-0.16	(0.86)
Mother's education missing=1	ed_mm+	-0.98	(3.14)***	-0.97	(3.12)***
Father entered basic education=1	edl_p+	-0.46	(2.28)**	-0.47	(2.29)**
Father's education missing=1	ed_pm+	-0.02	(0.06)	-0.03	(0.08)
Own house=1	pa_e1d+	0.01	(0.03)	0.01	(0.04)
Electricity available=1	pa_e81d+	0.08	(0.42)	0.09	(0.45)
Sanitary service available=1	pa_e82d+	-0.33	(1.00)	-0.33	(1.00)
Water available=1	pa_e85d+	-1.94	(4.34)***	-1.95	(4.33)***
Schooling Cost Variables (Identifying IV)					
Fraction of EDUCO schools compared to all primary schools within a municipality	Fmeduco	2.89	(4.20)***	2.89	(4.21)***
Fraction of traditional schools compared to all primary schools within a municipality	Fmtrad	-2.29	(3.77)***	-2.29	(3.76)***
ρ		-0.050		-0.011	
(Wald Stat.)		(0.078)		(0.003)	
Sample size		818		818	

+Discrete variable
Note 1: The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively
Note 2: The Huber/White/sandwich robust estimator of variance is used.
Note 3: Two observations are eliminated since multi-grade classroom information is missing.

Table 5
Summary of EDUCO Effect "α"
From Estimation Results of Probit Model with Endogenous Selection

Specification	(3)	(5)	(7)
	Coef. (z-statistics)	Coef. (z-statistics)	Coef. (z-statistics)
Community participation variable	Not included	Included	Included
School, teacher, and classroom inputs	Not included	Not included	Included
EDUCO school dummy	0.36	0.30	0.21
	(1.84)**	(1.51)	(1.08)

Note: The symbol, **, indicates statistical significance at 5%

Table 6
Interaction Terms of Teacher Variables and EDUCO Dummy
Probit Model with Endogenous Selection with School Inputs [Specification (6)]
Equation (13): School Continuation Equation

Specification		(7)	
		coefficient	z-statistics
Teacher and Classroom Variables (Q)			
Years of teacher experience	pr_year	-0.01	(1.29)
Interaction terms with EDUCO dummy	epr_yr	0.13	(1.97)**
Monthly base salary of teacher (in 100 *colones*)	pr_c2	0.02	(1.44)
Interaction terms with EDUCO dummy	epr_cw	0.11	(1.82)*
If teacher teaches in multi-grade classroom=1	pr_d15d	-0.31	(1.80)*
Interaction terms with EDUCO dummy	epr_15	0.33	(1.05)

Note: Basic estimation is based on the specification (7) of Table 4 with three additional interaction terms. Only the relevant coefficients are reported.

Table 7
Availability of Second-Cycle Sections at Primary School
(Percentage of Schools with One or More Sections for Grades 4-6)

School Type	1996	1998
EDUCO	38.60% (171)	52.26% (267)
Traditional	92.14% (649)	93.09% (553)

Note: Number in parentheses indicates number of schools

Table A1

Comparing Characteristics of Communities with More or Fewer EDUCO Schools by Using Household Level Data

		Fraction of pure EDUCO schools compared to all primary schools within municipality							
		0%	16.7%	25%	33.3%	50%	60%	66.7%	100%
Fraction of mother entered basic education	edl_m+	0.57	0.52	0.46	0.66	0.46	0.54	0.53	0.55
Fraction of father entered basic education	edl_p+	0.44	0.48	0.38	0.43	0.41	0.39	0.4	0.36
Fraction of households with own house	pa_e1d+	0.69	0.56	0.73	0.57	0.82	0.61	0.54	0.7
Fraction of households with electricity availablilty	pa_e81d+	0.70	0.85	0.85	0.59	0.38	0.5	0	0.23
Fraction of households with sanitary service availability	pa_e82d+	0.31	0.42	0.20	0.16	0.08	0.11	0	0.06
Fraction of households with water availablity	pa_e85d	0.16	0.33	0.12	0.05	0.08	0.07	0	0.01

Table A2
Estimation Results of Probit Model with Sample Selection Equation (A3-1): Grade Repetition Equation

Variable definitions	Code	Coef. z-stat
Repetition Equation		
School Type		
EDUCO Dummy	e_w+	-0.08 (0.45)
Mixed school dummy	Mix+	
Number of sections for the second cycle	n_sec2	
School Variables		
If sanitation/latrine available at school=1	d_d11d+	-0.26 (0.88)
If electricity available at school=1	d_d12d+	-0.21 (1.19)
If running water available at school=1	d_d21d+	-0.01 (0.04)
Teacher and Classroom Variables		
# of students in classroom	pr_d2	0.00 (0.65)
If teacher has completed university education=1	predu_un+	-0.17 (1.00)
Years of teacher experience	pr_year	-0.03 (1.71)*
Monthly base salary of teacher	pr_c2	0.00 (0.36)
If teacher receives bonus=1	pr_bonu+	-0.03 (0.17)
If teacher teaches in multi-grade classroom=1	pr_d15d+	-0.17 (0.82)
# of books in classroom library	Books	0.00 (1.44)
If classroom library information missing=1	Book_m+	-0.48 (2.21)**
Constant	_cons	-0.59 (0.93)

Note 1: The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively
Note 2: The variable, pr_d15m, is dropped since it has a perfect prediction.

Table A2(continued)
Estimation Results of Probit Model with Sample Selection Equation (A3-2): School Continuation Equation

Variable definitions	Code	Coef. z-stat
Sample Selection Equation		
EDUCO Variables (α)		
EDUCO dummy	e_w	0.22 (1.30)
Initial Human Capital (Q)		
Test score in 1996	Score	0.03 (1.39)
Regional Poverty Measure		
Regional head-count ratio in 1994	Head_c	0.47 (0.66)
Child Variables (CH)		
Gender (female=1)	a_d_1d+	-0.02 (0.11)
Child's age	Childage	-0.15 (3.48)***
Lives without parent(s)=1	a_c_1d2+	-0.18 (0.86)
Number of siblings (aged 4-15)	pa_b3	-0.02 (0.51)
Household Variables (A_1)		
Mother entered basic education=1	edl_m+	0.11 (0.87)
Mother's education missing=1	ed_mm+	0.24 (1.06)
Father entered basic education=1	edl_p+	0.15 (0.94)
Father's education missing=1	ed_pm	0.07 (0.19)
Own house=1	pa_e1d+	0.19 (1.35)
Electricity available=1	pa_e81d+	0.38 (2.75)***
Sanitary service available=1	pa_e82d+	-0.03 (0.15)
Water available=1	pa_e85d	-0.30 (1.04)
Constant	_cons	1.96 (3.05)***
ρ_2		-0.4123
(Wald Stat.)		(0.31)
Sample size		761

+Discrete variable
Note 1: The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively
Note 2: The Huber/White/sandwich robust estimator of variance is used.
Note 3: Two observations are eliminated since multi-grade classroom information is missing.