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Abstract

Using the most recent round of a nationally representative survey series, this study examines determinants of dropout from primary to higher levels of education in Lao PDR. The existing studies show that, unlike in other developing countries, the effects of household income and gender are limited. Our analysis confirms the former, that is, net household income has a negligible effect but not the latter—gender inequality remains an issue to be resolved at relatively higher levels of education. Further, despite the government's significant emphasis on early childhood education, the earlier studies report only insignificant effects. In contrast, we find that preschool attendance helps reduce dropout rates, implying that the government policy has been gaining effectiveness in recent years. As in other countries, mothers' schooling and school construction have positive effects on school enrollment in Lao PDR as well.

Keywords: School dropout; education; preschool; gender inequality; survival analysis; Laos

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1. Introduction

Education is important not only for the personal development of individuals but also for the economic development of countries (Barro and Lee, 2015; Hanushek and Woessmann, 2015). Therefore, developing countries, with the assistance of international development agencies and developed countries, have been trying to raise their citizens' educational attainment by implementing a variety of education policies from building new schools to providing food and medical services to increasing the quantity and quality of teachers. As a result, primary and secondary school enrollment rates in developing countries increased steadily until a decade ago.

According to UNESCO Institute for Statistics, despite the continuing efforts of low-income countries towards universal primary education and more secondary and higher education among the population, progress has stalled—primary and secondary school enrollment rates have remained almost unchanged at around 80% and 33%, respectively, over the past several years. Concern also lies with a rapid increase in school dropouts—in 2000, the survival rate to the final grade of primary school was nearly 60%, which drastically dropped to around 51% in 2016.[1] Given the high gross entry rate of 125% into the first grade of primary education, the key to raising educational attainment in developing countries is to find out the determinants of school dropout and implement appropriate policies to address them.

This paper aims to find factors affecting school dropout in the Lao People's Democratic Republic (hereafter Lao PDR) and provide policy implications for the country's education development. The approach taken in the current paper, as well as the issues it addresses, are not restricted to the context of Lao education. In addition, education systems in developing countries oftentimes share similar characteristics and challenges. Thus, our analysis may provide useful information not only to those interested in Lao PDR but also those working in other developing countries.

By utilizing the data from the most recent round of the Lao Expenditure and Consumption

[1] Source: http://data.uis.unesco.org/ No data are available on the survival rate of secondary education for low-income countries as a whole.

Survey (LECS), we examine the effects on school dropout of possible factors on both the demand and supply sides of education, as well as economic and demographic characteristics of individuals and households. Although the net enrollment rate of primary schools decreased from 97.2% in 2014 to around 93.3% in 2017, universal access to primary education has now become a realistic goal.[2] As a result, the government of Lao PDR has identified upper secondary and higher education as one of the highest-priority goals to be met by 2030 (Ministry of Education and Sports, 2015). Accordingly, this paper studies school dropout over a wider range of school levels than is usually studied, covering primary to tertiary education. Because the data include both groups of individuals who are and are not currently enrolled in schools, part of the observations is censored. One of the methods that can appropriately deal with censoring is survival analysis (Willet and Singer, 1991). Therefore, we apply survival analysis methods to investigate determinants of school dropout. To our knowledge, there are no studies that examine factors of dropout from primary to higher education in Lao PDR by appropriately dealing with the censoring issue using survival analysis.

The remainder of the paper is organized as follows. The next section briefly introduces the situation surrounding education in Lao PDR. Section 3 describes the data used in the analysis. Section 4 explains our estimation method. Section 5 presents the results, and Section 6 concludes the paper.

2. Education in Laos[3]

Over the past decades, Lao PDR has made significant progress in improving people's access to education. The net enrollment rate of primary school increased more than 30 percentage points over the last quarter of a century—as of 2017, 93.8% of male children and 92.8% of female children of official primary school age were enrolled in primary schools. Secondary school enrollment has more than quadrupled during the same period. The gross enrollment ratio of tertiary education increased from 1.3% in 1993 to 15.7% in 2017. Further, gender equality has been steadily improving. The Gender Parity Index (GPI), the ratio of female to male students, for gross enrollment in 2017 was

[2] UNESCO Institute for Statistics and the World Bank: https://data.worldbank.org/indicator/SE.PRM.NENR?locations=LA

[3] Unless otherwise noted, this section draws on the data from UNESCO Institute for Statistics and the World Bank, available from the following website: https://data.worldbank.org/indicator/

0.967 and 0.932 at the primary and secondary levels, respectively. According to available data, the number of female students even exceeds that of male students at the tertiary level, with the GPI of 1.05.

Despite these achievements, however, the country still faces challenges in raising educational attainment among the population. Only around 82% of students enrolled in primary schools persist to the final grade. As mentioned above, the secondary school enrollment rate has drastically increased but it remains as low as 60.4%. Further, not only enrollment and completion rates but also the quality of education is a major concern. Because of teachers' limited skills and weak pedagogical systems, students do not learn essential knowledge and skills.[4] In terms of literacy, 7.5% of people aged between 15 and 24, 9.5% of females and 5.6% of males in that age group, are illiterate.[5] In addition, according to the Assessment of Student Learning Outcomes (ASLO), 72.8% of fifth graders had pre-functional mathematical skills (Lao PDR, 2010).

The government of Lao PDR, especially the Ministry of Education and Sports, regards reducing dropout and repetition rates as its major challenge (Lao PDR, 2015). They identified distance to schools and low quality of primary schools as two of the most important causes of primary school dropouts. Given the high repetition rates of the first grade, the government has put a significant emphasis on early childhood education. As a result, around half the children between the ages of three and five and more than 70% of five-year-old children are enrolled in kindergarten or preschool. Therefore, it is of particular interest to examine whether the above-mentioned factors affect school dropout and, if they do, to what extent.

3. Data and Descriptive Statistics

Our analysis draws on data from the fifth Lao Expenditure and Consumption Survey (LECS V), a nationally representative survey implemented by the Lao Statistics Bureau between April 2012 and March 2013. LECS V is the most recent round of LECS series, containing rich economic and demographic information on 8304 households in 519 villages. The survey asked questions in terms of a variety of households' and their members' characteristics from age, education, ethnic origin,

[4] https://www.unicef.org/laos/education
[5] http://uis.unesco.org/en/country/LA

earnings from different activities, and crops planted to nutrition and health.

Given the importance of education for economic development, the number of papers studying determinants of schooling and school dropout in developing counties has been increasing. By reviewing "high-quality" studies on time in school for developing countries that appropriately deal with the problem of omitted variable bias, Glewwe and Muralidharan (2016) find the following. On the demand side, income support such as cash-transfer and scholarship programs, among other interventions, increases time spent in school. On the supply side, the construction of schools, which also helps to reduce commuting time (Lloyd, et al., 2005), higher teacher quantity and quality, and the provision of pedagogical materials, food, and medical services all have a positive impact on time spent in school and students' educational outcomes. Other factors found to affect school completion or school dropout include household income, parental education, and gender (for example, Alderman, et al., 1996; Behrman et al., 1997; Holmes, 2003), as well as ethnic and ethno-linguistic affiliation and geographical region (King and van de Walle, 2007).

Quantitative analysis of determinants of school enrollment and dropout in Lao PDR is very limited. King and van de Walle (2007) study factors that explain school enrollment of children six to 15 years of age. Onphanhdala (2010) studies the determinants of primary school enrollment for children between the ages of six to 10 in rural areas. Both studies use a probit model and the third Lao Expenditure and Consumption Survey (LECS 3), which was conducted from 2002 to 2003. Their findings are largely consistent with those from other developing countries. However, the latter study reports that, in contrast to other developing countries, gender and household income have little effect on school enrollment in Lao PDR.

As will be explained in the next section, the current study applies survival analysis to cross-sectional data, where analysis time starts with entrance into a primary school. Because individual, household and other characteristics are assumed to be invariant throughout the analysis time, we first restrict attention to variables that tend to remain unchanged, namely, gender and parents' schooling on the demand side of education, and whether primary, secondary, and higher-level schools exist within the village on the supply side (Table 1). Given the government's emphasis on preschool, its effect on school dropout is also examined. After identifying the most appropriate parametric functional forms for the baseline hazard function, other factors deemed to be

more variable over time will also be considered. Those include demand-side factors such as an agriculture dummy, which takes the value of 1 if the household produces crops, the number of household members aged five or younger, and net household income, which is calculated as the total household income subtracted by the individual's income if any, and supply-side factors such as student-teacher ratios in primary and secondary schools.

The data include both those people who are currently enrolled in school and those who already dropped out or graduated from school. The survey asked the year in which the individual started grade one of primary school as well as the respondent's highest grade completed. However, years of entry are missing for almost all first graders. Besides, the parents of first graders seem to have responded that their children had already completed one year of education, and they were surveyed on different dates. Thus, the number of years (or, more precisely, months) first graders completed is unavailable. Therefore, we assume that the first graders had attended school for 0.5 years.[6]

Since our assumption of factor invariance is more valid the shorter the period of time under consideration, elder people who were educated many years ago should be excluded from analysis. Among those who are currently enrolled, 99% are 23 or younger. Although formal education in Lao PDR starts from six years of age, there are many five-year-old children who are already enrolled in primary schools. We thus focus on those between the ages of five and 23. To eliminate incorrect data entries and outliers, individuals with a difference between age and grade completed of fewer than four years were removed from our analysis. Lastly, only villages with positive student-teacher ratios were considered when applying the generalized gamma model (Table 3).

4. Estimation Method

Finding determinants of school dropout for developing countries involves difficulties that do not often arise when studying developed countries. First, data obtained from randomized controlled trials, though increasing in recent years, are still rare (Glewwe and Muralidharan, 2016). Second, most data

[6] Because of this treatment, the current study is not meant to find causes of dropout during the first year of primary school, which requires more accurate information on first graders.

collected by surveys are cross-sectional, even when surveys are conducted in multiple years.[7] Third, because of limited information available, it is oftentimes difficult to find an instrumental variable with which to distinguish between correlation and causation (Hanushek, et al., 2008). Because of the above-mentioned difficulties, logit and probit models have been used to study determinants of educational attainment or school dropout in developing countries (Jukes et al., 2014; Sabates, et al., 2013; No, et al., 2012). However, those methods are not well-suited to analyzing censored data on school dropout, in which a non-negligible number of dropouts usually occur after the observation period.

Willett and Singer (1991) argue that the most appropriate method to study the timing of educational events such as teacher attrition and student dropout is survival analysis. This method has been widely used in different areas with different names. Examples include survival analysis in biology, failure-time analysis in operations research, life table analysis in demography, and hazard analysis in insurance and accident theory (Cameron and Trivedi, 2005). The method has been applied to study school dropout in developing countries by, for example, Akhtar (1996) for Karachi, Pakistan; Brown and Park (2002) for rural China; Cox-Edwards and Ureta (2003) for El Salvador; Glewwe and Jacoby (2004) for Vietnam; Krafft (2015) for Egypt; No et al. (2016) for Cambodia; and Weybright et al. (2017) for South Africa.

We first take a nonparametric approach and obtain the Kaplan-Meier estimator to estimate the survival function, $S(t)$, which is the probability of remaining in school beyond year t. Let $F(t)$ be the cumulative distribution function of school dropout. Then the survival function is expressed as follows: $S(t) = 1 - F(t)$. The Kaplan-Meier estimate is given by

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(\frac{n_j - d_j}{n_j} \right),$$

where n_j is the number of students enrolled in school at time t_j and d_j is the number of dropouts at time t_j. As noted in the previous section, analysis time, or time at risk of dropout, for each individual is counted from entrance into a primary school. Thus, analysis times for different individuals correspond to different calendar times unless they entered primary schools in the same year.

[7] Cristia et al. (2014) utilize longitudinal data for Peru to study the effect of technology access in school on repetition, dropout, and enrollment. They use differences in differences in doing so.

We next employ a semi-parametric model, the Cox proportional hazards model, to study the effects on dropout of possible factors. Let $f(t)$ be the density function of dropout. The hazard function, $h(t)$, is represented as

$$h(t) = \frac{f(t)}{S(t)},$$

which gives the instantaneous rate of dropout at time *t*. In the Cox model, the hazard function is assumed to take the following form:

$$h(t, x) = h_0(t) exp(x\beta),$$

where *x* and β are vectors of explanatory variables and coefficients, respectively. $h_0(t)$, which is not parameterized, is called the baseline hazard.

Finally, a fully parametric model that parameterizes the hazard function will be considered. Different assumptions about the shape of the baseline hazard leads to different models (Cleves et al., 2016). For some models, accelerated failure-time (AFT) parametrization, in addition to proportional hazards (PH) parametrization, is also allowed. In the PH metric, some functional form is assumed for the baseline hazard. Typical AFT models, on the other hand, are of the form

$$ln(t) = x\beta + ln(\tau),$$

where $\tau = \exp(-x\beta)\, t$ is assumed to have some distribution. We compare major models, namely, Exponential (PH, AFT), Weibull (PH, AFP), Gompertz, Log-normal, Log-logistic, and Gamma distributions to find the most appropriate model for our analysis. We then consider the dropout effects of a broader set of factors using the most appropriate model.

5. Results

Figure 1 shows the Kaplan-Meier estimate of the survival function. The formal education in Lao PDR has four levels: primary (five years), lower secondary (four years), upper secondary (three years), and tertiary education (three to seven years).[8] The estimate shows large "dropout" rates at the fifth, eighth, 12th and 15th years, which correspond to the completion of each level of education. It also shows that part of the student population drops out from school during each level of education, but the dropout rates decrease as the educational level becomes higher.

[8] The period of lower secondary education changed from three years to four years in 2010.

Table 2 presents the results of Cox semi-parametric and representative parametric models. The Gompertz model is written in the PH metric while the Log-normal, Log-logistic, and (generalized) Gamma models are written in the AFT metric. Only the PH models are comparable with the Cox model. Likewise, only the coefficients in the same metric can be compared with one another. In the PH metric, a positive coefficient indicates that an increase in the variable increases dropout rates. In contrast, a positive coefficient in the AFT model means that an increase in the variable *delays* dropout.

The Cox model shows that girls drop out from school more often than boys do and that mothers' schooling, attending preschool, and the existence of lower-secondary school in the village are factors that reduce dropout rates. All the other models point in the same direction with largely similar magnitudes (except for the exponential models). Thus, the parameter estimates can be regarded as relatively robust for our sample.

Because of the largest log likelihood and lowest Akaike Information Criterion, the most appropriate model is generalized gamma. Table 3 presents the estimation results using a broader set of possible factors that might affect school dropout. For the samples analyzed by models Gamma2-Gamma4, all villages had a primary school, and no village had a university. Thus, village_ps and village_univ are dropped from those models. The results are largely consistent with the findings from other models presented in Table 2—female students tend to drop out earlier than male students, mothers' schooling and preschool attendance delay dropout, and lower-secondary school within the village raise the highest grade completed. School quality, measured by student-teacher ratio, has no significant or a counterintuitive effect. In any case, the magnitude of the effects is much smaller than that of the factors that are found to have significant effects. Fathers' schooling, schools of different levels from lower secondary, agricultural production, village population, and the number of young children in the household have no significant effect on children's dropout rates. Further, net household income has a significant but very small effect on dropout, which confirms the finding of earlier studies on education in Lao PDR.

The coefficients of ethnic and province dummies are not reported in the tables but, as has been pointed out by earlier studies, they show that there remains significant inequality across ethnic groups and regions. Ethnic minorities or students who live in rural provinces such as Saravane and

Oudomxay are more likely to drop out of school earlier than those who are Lao or living in the capital, Vientiane.

6. Discussion and Conclusion

Using the most recent round of a nationally representative survey, LECS V, we examine determinants of school dropout from primary to higher levels of education in Lao PDR. Given very limited study on this issue for the country, this study aims to find obstacles to educational attainment in recent years and to be of help for the government and practitioners to design education policies that effectively enhance further educational development in the country.

The Kaplan-Meier estimate indicates that the keys to raising educational attainment are reducing dropout rates at lower levels of education, especially primary education, and encouraging students to advance to the next level. Students' (and parents') perceived returns to school are sometimes much lower than actual returns. Thus, giving accurate information on the high returns has a potential to enhance education (Glewwe and Muralidharan, 2016; Jensen, 2010). Creating jobs for educated people that compensate for educational costs is also a challenging but important task.

According to our main results from semi-parametric and parametric estimations, mothers' education and the existence of a (lower secondary) school within the village reduce dropout rates, which are consistent with earlier studies across regions/countries. In the context of Lao PDR, Onphanhdala (2010) found that, in contrast to other developing countries, the effects on school dropout/enrollment among children between the ages of six and 10 of household income and gender are limited.[9] We confirm the former finding, that is, net household income has a negligible effect on school dropout. However, by covering a broader range of ages, namely between five and 23 years, the current study finds that gender inequality still exists. This implies that, despite the nearly equal access to primary schools across genders, gender inequality persists at higher levels of education. As of 2017, the percentage of female students at primary education was 48.1%, and it gradually decreases to 47.7% at the lower-secondary level, 46.8% at the upper-secondary level, and 40.7% in post-secondary non-tertiary education. Moreover, in contrast to earlier studies, our results show that

[9] A Japanese article by Onphanhdala and Suruga (2010) analyzes children aged seven to 14 years old and confirms the main findings of Onphanhdala (2010).

attending a kindergarten or preschool does reduce dropout rates. In fact, preschool does not have a significant effect if we include older generations in our analysis, which implies that pre-schooling has been gaining effect in recent years. School quality measured by (the inverse of) student-teacher ratio shows insignificant or counterintuitive effects, though further scrutiny is needed to determine the effect of school quality. Lastly, reducing dropout rates for ethnic minorities and in rural areas remains a major challenge.

Because of the limited amount of data available, we were unable to apply survival analysis to more restricted age groups (for example, students aged six to 11, six to 15, etc.). Such analysis is expected to reveal useful information peculiar to each educational level. Moreover, survival analysis is more suited to study longitudinal (or panel) data. More detailed investigation into school enrollment/dropout in Lao PDR awaits accumulation of further survey and experimental data.

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Table 1. Variables and summary statistics

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
female	Female dummy	648	0.645	0.479	0	1
sch_father	Father attended school	648	0.722	0.448	0	1
sch_mother	Mother attended school	648	0.582	0.494	0	1
presch	Individual attended preschool	648	0.156	0.363	0	1
village_ps	Primary school in village	648	0.954	0.210	0	1
village_lss	Lower secondary school in village	648	0.302	0.460	0	1
village_uss	Upper secondary school in village	648	0.108	0.311	0	1
village_tech	Technical school in village	648	0.023	0.150	0	1
village_inst	Technical and vocational institute in village	648	0.022	0.146	0	1
village_univ	University in village	648	0.0046	0.068	0	1
agri	Household produces crops	296	0.699	0.459	0	1
vlg_pop	Village population	296	1234.9	826.8	173	4591
STratio_ps	Student-teacher ratio in primary school	296	9.737	7.636	1	85.33334
STratio_lss	Student-teacher ratio in lower secondary school	296	33.407	27.545	2.6	268
yc	Children aged 5 and younger	296	0.145	0.389	0	2
NetHhInc	Net household income	296	9503239	4.49E+07	-666666.7	6.01E+08

Figure 1. Kaplan-Meier estimate of the survival function

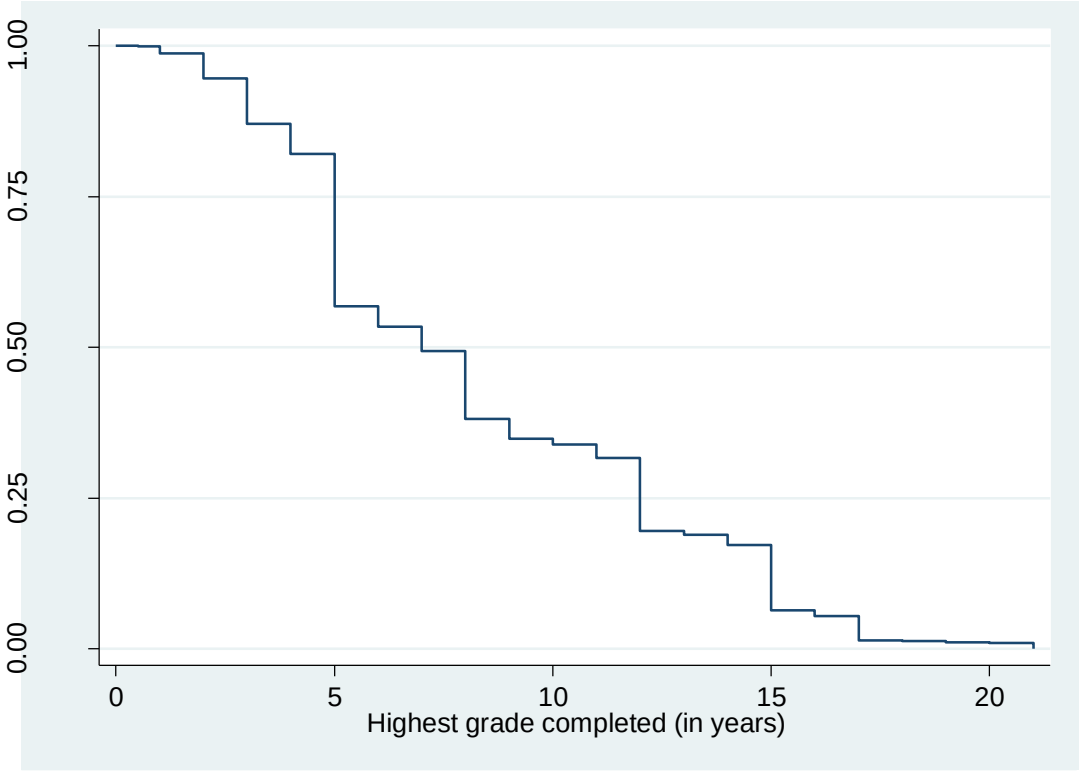

Table 2. Estimation results for the Cox semi-parametric and major parametric models

	Cox	Exponential (PH)	Exponential (AFT)	Weibull (PH)	Weibull (AFT)	Gompertz	Log-normal	Log-logistic	Gamma
female	0.341***	0.264***	-0.264***	0.378***	-0.137***	0.377**	-0.125**	-0.144***	-0.139***
	(0.117)	(0.074)	(0.074)	(0.141)	(0.051)	(0.149)	(0.050)	(0.056)	(0.050)
sch_father	-0.109	-0.057	0.057	-0.174	0.063	-0.211	-0.038	-0.038	0.03
	(0.154)	(0.092)	(0.092)	(0.182)	(0.066)	(0.176)	(0.088)	(0.078)	(0.075)
sch_mother	-0.367***	-0.284***	0.284***	-0.397***	0.144***	-0.371**	0.257***	0.194***	0.171***
	(0.130)	(0.075)	(0.075)	(0.154)	(0.056)	(0.157)	(0.073)	(0.069)	(0.062)
presch	-0.426**	-0.375***	0.375***	-0.474**	0.172**	-0.546**	0.176**	0.179**	0.172**
	(0.170)	(0.133)	(0.133)	(0.198)	(0.072)	(0.213)	(0.085)	(0.086)	(0.076)
village_ps	0.205	0.176	-0.176	0.259	-0.094	0.216	-0.054	-0.058	-0.084
	(0.288)	(0.203)	(0.203)	(0.321)	(0.116)	(0.327)	(0.141)	(0.181)	(0.130)
village_lss	-0.453***	-0.268***	0.268***	-0.495***	0.180***	-0.450***	0.215***	0.211***	0.193***
	(0.129)	(0.087)	(0.087)	(0.150)	(0.054)	(0.162)	(0.063)	(0.064)	(0.057)
village_uss	-0.053	-0.046	0.046	-0.139	0.05	-0.236	0.045	0.015	0.048
	(0.206)	(0.146)	(0.146)	(0.234)	(0.085)	(0.256)	(0.099)	(0.104)	(0.091)
village_tech	-0.198	-0.329	0.329	-0.15	0.054	-0.236	0.173	0.188	0.093
	(0.392)	(0.356)	(0.356)	(0.545)	(0.198)	(0.570)	(0.172)	(0.165)	(0.187)
village_inst	-0.381	0.122	-0.122	-0.429	0.156	-0.606	0.023	0.102	0.128
	(0.458)	(0.434)	(0.434)	(0.604)	(0.219)	(0.618)	(0.238)	(0.213)	(0.218)
village_univ	-0.765	-0.772	0.772	-0.749	0.272	-0.778	0.595**	0.442*	0.357
	(0.540)	(0.654)	(0.654)	(0.686)	(0.250)	(0.646)	(0.266)	(0.236)	(0.260)
Log pseudolikelihood	-650108.3	-80401.2	-80401.2	-44696.7	-44696.7	-163307.9	-158997.5	-157727.9	-44237.3
AIC	1300323	160908.4	160908.4	89495.5	89495.5	326715.8	318097.1	315557.8	88576.5
N	648	648	648	648	648	648	648	648	648

Notes: Province and ethnicity dummies are included in all regressions. Standard errors clustered by village are in parentheses. The levels of statistical significance are indicated as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3. Estimation results for the generalized gamma model

	Gamma	Gamma1	Gamma2	Gamma3	Gamma4
female	-0.1508***	-0.1566***	-0.1820**	-0.1834**	-0.1065
	(0.0543)	(0.0554)	(0.0810)	(0.0806)	(0.1139)
sch_father	0.0572	0.0428	-0.004	-0.005	-0.2584
	(0.0836)	(0.0866)	(0.1815)	(0.1840)	(0.2737)
sch_mother	0.1600**	0.1532**	0.1099	0.1127	0.2691*
	(0.0715)	(0.0717)	(0.1698)	(0.1729)	(0.1379)
presch	0.1595**	0.1512*	0.1448	0.143	0.2137*
	(0.0757)	(0.0772)	(0.1001)	(0.0992)	(0.1098)
village_ps	-0.056	-0.0446			
	(0.1304)	(0.1291)			
village_lss	0.1675**	0.1323*	0.2202*	0.2189*	0.2510***
	(0.0660)	(0.0720)	(0.1177)	(0.1148)	(0.0913)
village_uss	0.0423	0.0355	-0.1614	-0.1582	-0.1426
	(0.0934)	(0.0924)	(0.1163)	(0.1172)	(0.1562)
village_tech	0.0889	0.0398	0.2037	0.2092	0.361
	(0.1922)	(0.2119)	(0.2143)	(0.2130)	(0.2370)
village_inst	0.129	0.1054	-0.152	-0.1533	-0.608
	(0.2206)	(0.2407)	(0.2834)	(0.2849)	(0.5220)
village_univ	0.3106	0.3172			
	(0.2546)	(0.2727)			
agri		-0.0400	0.0062	0.0093	0.0578
		(0.0648)	(0.0873)	(0.0862)	(0.0974)
vlg_pop		0.0001	0.0000	0.0000	0.0000
		(0.0000)	(0.0001)	(0.0001)	(0.0001)
STratio_ps			0.0022	0.0022	0.0044
			(0.0053)	(0.0053)	(0.0082)
STratio_lss			-0.0018*	-0.0019*	-0.0018
			(0.0010)	(0.0010)	(0.0013)
yc				0.0263	0.0668
				(0.0860)	(0.1228)
NetHhInc					0.0000*
					(0.0000)
Log pseudolikelihood	-39746.59	-39384.31	-21419.72	-21413.32	-19280.65
N	578	571	325	325	296

Notes: Only villages with positive student-teacher ratios are analyzed. Province and ethnicity dummies are included in all regressions. Standard errors clustered by village are in parentheses. The levels of statistical significance are indicated as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.