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## Role of Public Schools in Education Decisions in Rural India

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### Abstract

In this paper, we attempt to determine the role of various factors which affect the decision of school participation and continuation of children in the age-group of 5-16 years in the context of rural India. We specifically focus on the role that the presence of an appropriate public school within the village plays in this decision, in the period after the implementation of the Right to Education Act, 2009. The analysis is carried out using the nationally representative Annual Survey of Education Report (ASER) dataset. The results from the pooled cross section logistical model highlight that the presence of an appropriate public school significantly enhances the odds of a child attending school. The results remain consistent and significant across different levels of schooling. Additionally, we find that for middle and secondary level schools, the effect of the presence of an appropriate public school accentuates for children in higher age cohorts.

**Keywords:** education; school participation; dropouts; public schools; logit

**JEL classification:** D1, I2

## 1 Introduction

A vital requirement to achieve the United Nations' Sustainable Development Goal (SDG) of 'promoting lifelong learning opportunities for all' by 2030 is for the governments across countries to invest more in education infrastructure, particularly among the developing countries. According to the SDG report of 2019, more than half of children and adolescents worldwide do not meet minimum proficiency standards in reading and mathematics in 2015. One of the reasons for this is that many children are still out of school - 262 million children (6 to 17 years old) were out of school in 2017. Moreover, even if they attend, they either drop out or have very poor learning outcomes. It is clear that although considerable progress has been made worldwide in the last decade in terms of improving enrolments at the primary level of education, the continuation and completion of education remain as major concerns in many countries, especially in developing countries. Furthermore, these gaps are wider among girls, and among the poorest and the most disadvantaged (Muralidharan and Prakash 2017).

India has a score of 58 (out of a total of 100) in the SDG Goal 4 of 'Quality Education' (NITI Aayog 2019). Even with various big policy initiatives over time, India still has only 75.83 per cent of its children of eligible age groups enrolled in schools at the elementary and secondary levels of education. Furthermore, nearly 20 percent of the children dropout at the secondary level of education (NITI Aayog 2019). These reports highlight that despite near cent percent enrolment rates at the primary level of education, a huge proportion of children in India do not complete their schooling due to insufficient and inequitable access to school infrastructure. Given this premise, our paper is an attempt to quantify the significance of the most basic requirement for education, that is, the presence of a school, and specifically the presence of a government school, which is of particular importance in the context of rural India. The objective is to determine the role of different factors affecting school participation and continuation, with specific focus on the presence of a public school in a village.

While in case of a developing country the state bears most of the responsibility of providing for education and related infrastructure, the demand for education, and schooling in particular, is affected by various socio-economic, demographic and cultural factors. There exist numerous studies which have analysed the impact of some or most of these factors on school participation measured by enrolment as well as decision to stay in

school measured by dropouts. The research on India covers a wide range of factors contributing to lower enrolments and/or higher dropouts, which include individual factors like child's sex and age cohort (Duraisamy 2001), household factors like parental education (Drèze and Kingdon 2001; Huisman, Rani, and Smits 2010) with some studies finding a significantly higher effect of mother's education (Kurosaki et al. 2006; Maitra and Sharma 2009; Afridi 2010), household wealth (Filmer and Pritchett 2001), religion and caste (Drèze and Kingdon 2001; Borooah and Iyer 2005), and at an aggregated level, community and village factors like culture (Huisman, Rani, and Smits 2010), caste-composition of village and village infrastructure (Dostie and Jayaraman 2006). While these studies summarise various demand-side factors affecting schooling decisions, the implicit assumption is that there are no supply-side constraints.

The other strand of literature has focussed on the importance of school infrastructure and school quality as major supply-side factors affecting a child's educational outcomes. To measure school quality, different measures have been discussed across different studies, such as teacher regularity, pupil-teacher ratio and the quality of school infrastructure (Duflo, Hanna, and Ryan 2012; Kingdon and Banerji 2009; Banerjee et al. 2007; Glewwe and Kremer 2006; Drèze and Kingdon 2001). Once again, this strand of literature makes an implicit assumption of the school being present in the vicinity or accessible. In other words, while these studies analyse the 'quality of supply', they do not discuss the issue of supply per se to begin with. Moreover, a large part of studies focusing on school quality has often delved into quality effects on students' learning outcomes, rather than their school participation decisions.

This paper, thus, aligns itself with the third strand of literature which has emphasised on the necessity of having access to a school in the first place, for the households to then take education decisions for their children, based on a host of demand and supply-side factors (Sipahimalani 1998; Bhatti 1998; Muralidharan and Prakash 2017). In this paper, we raise the same question again as was pointed out by Bhatti(1998) more than two decades ago. How much has India progressed in terms of school supply? Can we still disregard the importance of having a public school in the vicinity of a child's house and concentrate on all the other sets of explanations in isolation? This paper, thus, contributes to this scant literature by undertaking analysis at the child level, based on different years of a nationally representative dataset by the Annual Status of Education Report (ASER),

for period post the implementation of the Right to Education Act, 2009. Access to a school is often measured by distance to school or simply the presence of a school in the village. However, in this paper, we instead define ‘access’ to school for each child in a household, based on the availability or presence of an appropriate public school in the village. We define the appropriate publicness of a school depending on the last class attended by the child. This novel classification enables us to capture the effect of differential access of schools for children belonging to different age cohorts in the same household. To get deeper insights, we have further split our sample across the level of appropriate public school being either primary, middle or secondary, to analyse how the importance of the presence or absence of a public school differs across different levels. Mukhopadhyay & Sahoo(2016) have acknowledged the importance of access to middle and secondary level schools for enrolments at primary levels of education, with there being a plausibility of having access to schools at the higher or highest level playing an important role in affecting households’ current decisions of enrolling their children at lower levels of schooling.

Based on a pooled cross-sectional logit model, we find that the presence of an appropriate public school within the village significantly improves the probability of a child going to school. The effect is more pronounced for a girl child than a boy child. However, for the children of older age cohorts, there is a dampening effect of age as it reduces the positive effect of the presence of an appropriate public school. Further, our results also highlight that the presence of appropriate public school matters for the educational outcomes of children at all levels of schooling. Particularly for the middle and secondary level schools, we find that the importance of an appropriate public school is higher for the children of higher age cohorts.

In the rest of the paper, we first describe the theoretical framework for the paper in section 2; data used for our analysis in section 3. We, then, define our empirical methodology and possible issues of endogeneity in section 4. We present our findings in the following section 5 and then finally, conclude our paper with possible policy implications in section 6.

## 2 An Economic Model of Child Education Outcomes

In order to get a deeper insight into the economic channels that determine the educational outcomes of children, we propose a simple partial equilibrium model which looks at the forces at play within the household as well as the supply-side factors.

### 2.1 Household Decision Making

We consider a two-parent household who have two children, a girl and a boy<sup>1</sup>. We indicate the parents, a traditional wife and husband couple, by  $i = w, h$ . The children are identified by the indicator variable  $j = g, b$ ,  $g$  standing for the girl and  $b$  for the boy, respectively. The parents have preferences over wife and husband specific private consumption given by  $x_w$  and  $x_h$  respectively, and a household public good  $e$  which in this model is education expenditure. The children in the household do not make decisions, consume nothing and acquire education as decided by their parents. Further, we assume that the parents have well behaved individualistic preferences which for simplicity are captured by log-transformed Cobb-Douglas type utility functions which are as follows :

$$\begin{aligned} u_w &= (1 - \alpha) \ln x_w + \alpha \ln e \\ u_h &= (1 - \alpha) \ln x_h + \alpha \ln e \end{aligned}$$

Here,  $\alpha$  captures the importance placed by the parents on their children's education. Both parents share the same preference for their children's education and the reason for this can be argued to be the nature of marriage market matching, exhibiting positive assortative matching based on education, which aligns the education preferences of the parents. The income of the wife and husband is given by  $w_w$  and  $w_h$  respectively, and is determined endogenously. We assume that the household makes decisions collectively and the household's welfare function à la Chiappori(1992) is given by:

$$H = \theta u_w + (1 - \theta) u_h$$

Here, the weights on the couple's utilities in the household welfare function,  $\theta$  and  $1 - \theta$ , can be interpreted as their say or bargaining power in the household. The bargaining

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<sup>1</sup> The results can be generalized for a household with more than two girls and boys.

power of an agent is determined by several factors such as earned incomes and education level. Further, we assume that the household pools its resources to maximize the household's welfare function. Their budget constraint is hence given by:

$$x_w + x_h + e = w_w + w_h \equiv I$$

The household's choice problem is described as follows:

$$H = \theta u_w + (1 - \theta)u_h$$

subject to,

$$x_w + x_h + e = I$$

Setting up the Lagrangian and solving the first-order conditions, we find the optimal choice of  $x_w$ ,  $x_h$  and  $e$  as follows:

$$x_w = \theta(1 - \alpha)I$$

$$x_h = (1 - \theta)(1 - \alpha)I$$

$$e = \alpha I$$

Refer to the Mathematical Appendix A for the detailed solution.

Of particular interest to our analysis is the income allocation by the household to children's education which depends on the parents' preferences for children's education and the combined household income. Further, we assume that this expenditure ( $e$ ) is allocated to each child with the boy's education receiving priority over the girls' education<sup>2</sup>. Hence, for a household resource allocation ' $e$ ' to children's education, if the allocation to the boy is  $e_b$  then the allocation to the girl is  $e_g = \max[e - e_b, 0]$ .

## 2.2 *The Supply Side of Education: Presence of a Public School*

The demand side provides us with only part of the story. To completely understand the children's education outcomes we look at the supply side of education given by the presence of a public school. This is because the commitment of a certain amount of

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<sup>2</sup> The reason for this is that classical patriarchal societies, like India, are characterized by the subordination of women and their confinement to the household sphere (Derné 1994). The social micro-traditions put women in a disadvantageous position in the labour market and this reflects on the importance that the household places on the girl's education. This results in the girl child receiving the residual of the household's resources allocated to education after fulfilling the resource requirements for the boy child.

resources by the parents does not necessarily ensure completion of their children's education. The funds committed by the parents for the child may not cover the full cost of completing her/his education thus forcing the child to drop out of school. We assume that the village public school is the lowest cost option for the parents and the minimum cost of completing a child's education in the village public school is  $\underline{e}$ . Further, we assume that the higher-cost option costs  $\bar{e}$  which is at least greater than  $\underline{e}$ . The schools outside the village have a higher cost as parents need to bear an additional travel cost which includes the out-of-pocket expense for transportation, the opportunity cost of an accompanying adult and the physiological cost owing to child safety.

A child's education is complete if the education expenditure allocated to the child exceeds the minimum cost of acquiring that level of education. To highlight the effect of the presence or absence of a public school on children's education we now present five potential cases:

**CASE 1:**  $e < \underline{e} \Leftrightarrow e_g, e_b < \underline{e}$

This case describes the situation of extremely poor families or families where parents don't value education. The money allocated to education is so low that it does not cover the cost of completing the education of children even from the village public school. Children in such households will drop out of school as soon as the resources allocated to their education runs out.

**CASE 2:**  $e_g < \underline{e}, \underline{e} \leq e_b < \bar{e}$

In this case, the resources allocated to the boy is sufficient to complete his education from the village public school but the residual resources allocated to the girl is not sufficient to complete her education.

**CASE 3:**  $\underline{e} \leq e_g, e_b < \bar{e}$

In this case the parents have sufficient income or value the education of their children adequately to allocate enough resources to ensure that both their children complete their education from the village public school.

**CASE 4:**  $\underline{e} \leq e_g < \bar{e}, \bar{e} \leq e_b$

In this case the parents have sufficient income or value the education of their children adequately to allocate enough resources to ensure that the boy can complete his education either from the public school or one of the higher cost schooling options, and the residual

is adequate to complete the girl's education from the public school. In this case both children complete their education.

**CASE 5:**  $\bar{e} \leq e_g, e_b$

In this case the parents have sufficient income or value the education of their children high enough to allocate enough resources to ensure that both their children complete their education from either the village public or one of the higher cost schooling options.

To summarize, our theoretical model shows that both demand and supply-side factors are key in determining whether a child completes her/his education. Bringing together these factors help explain whether or not a child completes schooling. The lower-cost public schooling ensures that even if the parents' allocation to the child's education is low, the likelihood that the child completes education is higher. The model provides a basis for a latent variable model to determine whether or not a child completes schooling. The latent variable is the difference between the resources allocated by parents to schooling less the cost of schooling. Whenever this difference is greater than zero the child completes schooling and whenever this is less than zero the child drops out of school. It is adequately clear that all things kept the same, the absence of public schooling raises the possibility of children from poorer households, especially girls, not being able to complete their education. This holds true even when the village has a private school (higher cost option) as parents who were earlier falling back on public schooling when private schooling wasn't affordable, are now left with no other low-cost alternative. Furthermore, mere presence of any public school need not ensure that children from poor families can continue with their education. This is because the absence of an appropriate public school at either primary, middle or secondary level can drive up the costs of children's education thereby increasing the likelihood of them dropping out of school due to a deficit of resources.

### 3 Data

Data for the study comes from the Annual Status of Education Report (ASER). This is a nationally representative survey, spanning over all the states of India, covering all rural districts. ASER, therefore, follows two-stage sample designs. In the first stage, 30 villages are randomly selected from each of the districts based on the village directory of 2001

census. In the second stage, 20 households are randomly selected from each of the selected 30 villages. This gives a sample size of 600 households from each district.

The survey includes modules on household information, on the availability of a variety of village-level infrastructure, like post office, primary health center, banks, internet café, availability of private schools as well as the availability of public schools at different levels- primary, middle and secondary. Additionally, it collects information on learning outcomes of all the children in the age group of 3-16 years.

For our analysis, we have utilized the survey reports of five years – 2012, 2013, 2014, 2016 and 2018, that is, the period after the implementation of the Right to Education Act, 2009. Our dataset spans over approximately 15 lakh households across all the specified years. Since, for our analysis, the sample of interest are the children in the school going age-group, that is between the age of 5 to 16 years, our working sample has 23,83,157 observations.

Moving on, we will now discuss the estimation strategy and the econometric model in the next section that has been employed for the analyses.

#### 4 Econometric Model

To adequately estimate the probability of a child going to school, given that he or she is in the eligible age-group, we employ a logistic (logit) model drawing inferences from our theoretical framework. The estimation equation is defined as follows:

$$Y_{ihv} = \alpha + \omega \text{Appropriate\_school}_{ihv} + \beta C_{ihv} + \gamma H_{hv} + \delta V_v + \theta + \tau + \varepsilon_{ihv}$$

Where,  $Y_{ihv}$  is a binary variable that takes value 1 if the child  $i$ , of household  $h$  and village  $v$ , is going to school and zero if the child is not going to school. The value zero, therefore, includes children who have either never been enrolled or who have dropped out after completing some grade.

Our main variable of interest is the presence of an appropriate public school ( $\text{Appropriate\_school}_{ihv}$ ) for each child in the household. It is important to note that the

variable has been constructed at the child level and not at the household level, keeping in mind the age as well as the last completed level of education of the child. So, if the child in question has never attended school, then irrespective of the age, the appropriate class for this child is class 1 and hence the appropriate school is a primary school or one that has primary level schooling available. But if the child has attended school and has dropped out after completing some level, then the appropriate class is assumed to be one class higher than the one in which the child dropped out. Hence, the appropriate school would be primary if the appropriate class is till level 5, it would be middle school if the appropriate class is between level 6-8 and finally, it would be secondary school if the appropriate class is higher than level 8. Therefore, appropriate school is a binary variable that takes value 1 if for the specific child that school is present in the village and zero<sup>3</sup>, otherwise. Given the construction of the variable, children in the same household can have differential access to the appropriate public school.

Besides, we have also controlled for a host of other factors.  $C_{ihv}$  captures all the child level factors, which includes the age of the child, sex of the child, if any elder sibling is going to school or not, and if the mother of the child has ever gone to school or not.  $H_{ihv}$  includes all the household level factors. They include primarily four factors – one is the wealth index of the house, which is meant to capture the financial well-being of the house; other is the information index, which is a composite index created using variables like – if the household has television, if it gets newspaper daily, if it gets any other reading material like magazines etc., and if there is anyone in the house who knows how to operate the computer. The information index intends to capture how well informed or well-read a household is. Finally, we have controlled for the total number of children in the household and whether or not the mother went to school. There are also a host of village specific factors,  $V_v$ , that have been controlled for. These include variables that capture information on the state of infrastructure in the village – such as if the village has a *pucca* (cemented) road, if it has a post office or not, if it has a primary health center or not, if there exists a bank branch within the village or not, if the village has an internet café or not and if the village has a private school or not. Lastly, we have also controlled for district and year fixed effects.

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<sup>3</sup> The variable has been constructed only on the basis of availability of government schools and has not taken into account the availability of private schools, because of lack of data on the levels of education for which the private school provides education.

Further, to enrich our analyses, we have also investigated if the school going behaviour differs across the three levels of schooling namely, primary, middle and secondary, by running sub-sample estimations. The sub-sample has been constructed based on the appropriate public school being primary or middle or secondary. The idea is that it is possible for the decision of going to school to differ across different levels of schooling by factors other than the availability of an appropriate public school. These could be factors like opportunity cost of going to school, which will be higher for higher levels of schooling because not only can the child provide labour but can also be a potential caregiver to other siblings or for the house, in general. Hence, it may render the availability of an appropriate public school less or more critical for different levels of schooling. Similarly, it is expected that if the child or family or both are highly motivated for getting or providing education, the availability of a school within a village may not be a concern for them as they would be willing to travel outside the village as well. This is especially expected to be true for the secondary level of schooling. Hence, making these sub-sample comparisons can enlighten us on many aspects that contribute to the decision of going to school other than just the availability or the distance to schools.

In the next section, we discuss the estimation results from the specified econometric model.

## 5 Results

We first present the results (in **Table 1**) from the logit estimation of our main model to analyse the odds of a child going to school. Column (1) of the table presents the estimation of the model where we include only our main variable of interest, that is the availability of an appropriate public school defined uniquely for each child in the eligible age group (5-16 years), within the household. In column (2), we additionally control for child-specific characteristics which include the child's age, sex and an indicator for whether the child has an elder sibling going to school. In column (3), we include various household-level characteristics which include the child's mother's education status, measured by whether she ever went to school or not, total children, an index for household wealth and information index. Lastly, in our complete model in column (4), we control for various village-level characteristics indicative of a village's infrastructure, such as the presence

of a bank, post office, internet cafe, pucca road and access to a government primary health centre. In this model, we also control for the presence of a private school in the village. All the specifications in columns (1) to (4) control for district and time fixed effects. Furthermore, to test for any differential effect of appropriate public school across girl child and boy child, we estimate the complete model including an interaction of the appropriate public school and gender of the child, coefficient of which is presented in column (5).

**Table 1: Modelling the decision of going to school in presence/absence of appropriate public school within the village**

Going to school	(1)	(2)	(3)	(4)	(5)
	<i>Child-specific characteristics</i>				
Appropriate public school	1.389*** (0.033)	1.639*** (0.101)	1.593*** (0.105)	1.576*** (0.104)	
Child age					
6 years		3.074*** (0.204)	3.392*** (0.240)	3.428*** (0.247)	
7 years		13.013*** (1.468)	15.871*** (1.889)	16.137*** (1.915)	
8 years		15.932*** (1.662)	20.136*** (2.211)	20.001*** (2.199)	
9 years		18.882*** (1.972)	24.007*** (2.566)	24.029*** (2.576)	
10 years		16.514*** (1.402)	20.945*** (1.856)	21.037*** (1.881)	
11 years		25.614*** (2.128)	31.198*** (2.776)	31.438*** (2.789)	
12 years		16.186*** (1.144)	19.611*** (1.498)	19.791*** (1.516)	
13 years		12.627*** (0.869)	14.909*** (1.094)	14.934*** (1.100)	
14 years		9.903*** (0.675)	11.519*** (0.848)	11.520*** (0.847)	
15 years		6.714*** (0.452)	7.789*** (0.562)	7.761*** (0.560)	
16 years		4.160*** (0.286)	4.793*** (0.354)	4.776*** (0.353)	
Appropriate public school *					
Child age					
6 years		1.044 (0.068)	1.044 (0.073)	1.032 (0.073)	
7 years		1.150 (0.123)	1.096 (0.125)	1.082 (0.124)	
8 years		1.174	1.126	1.136	

		(0.119)	(0.120)	(0.122)	
9 years		1.302**	1.247**	1.240**	
		(0.136)	(0.134)	(0.135)	
10 years		0.970	0.963	0.955	
		(0.079)	(0.083)	(0.083)	
11 years		0.734***	0.745***	0.733***	
		(0.061)	(0.066)	(0.065)	
12 years		0.559***	0.592***	0.584***	
		(0.040)	(0.045)	(0.044)	
13 years		0.583***	0.623***	0.624***	
		(0.041)	(0.046)	(0.047)	
14 years		0.375***	0.409***	0.405***	
		(0.026)	(0.030)	(0.030)	
15 years		0.263***	0.290***	0.288***	
		(0.018)	(0.021)	(0.021)	
16 years		0.269***	0.295***	0.291***	
		(0.018)	(0.021)	(0.021)	
Appropriate public school *					1.132***
Gender=Female					(0.027)
Female child		0.883***	0.907***	0.905***	
		(0.015)	(0.016)	(0.016)	
Elder sibling going to school		2.172***	2.662***	2.659***	
		(0.032)	(0.040)	(0.040)	
<b>Household specific characteristics</b>					
Mother went to school			1.789***	1.785***	
			(0.023)	(0.023)	
Total children			0.850***	0.851***	
			(0.004)	(0.004)	
Wealth index			1.195***	1.191***	
			(0.007)	(0.006)	
Information index			1.164***	1.162***	
			(0.007)	(0.007)	
Private school				1.088***	
				(0.014)	
Constant	15.003***	2.676***	2.867***	2.731***	
	(0.347)	(0.176)	(0.210)	(0.202)	
Village specific characteristics	No	No	No	Yes	Yes
<b>N</b>	<b>2336568</b>	<b>2320740</b>	<b>2092635</b>	<b>2017420</b>	<b>2017420</b>

Note: Exponentiated coefficients; Standard errors in parentheses. The estimations control for district and time fixed effects. \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

As can be observed from the table, we find that the presence of an appropriate public school significantly improves the probability of a child going to school. The coefficient is strong and positive across all specifications through column (1) to (4). This result highlights the importance of having access to a public school within the village as it reduces the direct financial cost of attaining education as well as the associated indirect

costs of time and effort. This is in line with the main predictions of our theoretical model. Further, when we introduce the interaction between the presence of an appropriate public school with the child's age, we find that for older age cohorts, there is a dampening effect of the presence of an appropriate public school, however, the net effect still stays significant and positive. The dampening effect implies that the opportunity cost for children in older cohorts is higher. It could be because of an increase in household responsibilities in the form of childcare or other household chores. Alternatively, children in the older age cohorts may also need to contribute to the household income through participation in the labour market, which reduces the probability of these children going to school (Shah and Steinberg 2019).

In the model, we have also considered the presence of a private school in the village, which we find to have an effect of significantly improving the probability of a child attending a school. Private schools may provide an alternative to public schooling which can be construed as an effect of either a perceived higher quality of private education or sometimes simply due to lack of access to a public school within the village (French and Kingdon 2010; Muralidharan and Kremer 2006).

We also find a host of other factors playing a significant role in determining a child's probability of attending a school. Amongst the child-specific controls that have been included in the model - child's sex plays a negative role that is, the probability of going to school is significantly lower for a female child than it is for a male child. This is in line with our theoretical model and a possible explanation for these differences comes from the patriarchal norms wherein a girl is supposed to leave her parent's house post marriage. This then implies that returns to education, in terms of better-earning potential, would also get transferred post her marriage. This makes investment in girl's education less beneficial than the investment in boy's education, who is supposed to take care of them in their old age. There exist several studies that support this argument (Kingdon 2002; Pal 2004)<sup>4</sup>. Additionally, among child-specific factors, we also look at the effect of having a school-going elder sibling, wherein we find a significantly positive effect on a child's

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<sup>4</sup> Further, we have also tested for the gender differences in the efficacy of having an appropriate public school within the village using an interactive model. We find that there is a significantly positive effect of the presence of an appropriate public school for the girl child as it accentuates their odds of attending the school vis-a-vis that of boys. The results reinforce the predictions of our theoretical model.

probability of going to school. This indicates the chaperoning of younger siblings to schools, by elder siblings.

Amongst the household level factors, we find significant and positive effects of mother's education, wealth index of the household and the information index. The effect of mother's education is aligned with the extant literature in this area. The literature argues that this is on account of higher autonomy that a woman enjoys as a result of her education, giving rise to an improvement in intergenerational transfers (Behrman et al. 1999; Kingdon 2002). As in the case of wealth index, a higher value is associated with a higher level of affluence and hence more resources with the household to be allocated to the education of children. Further, a higher level of wealth index may also correspond to a higher overall level of education in the household which further contributes to better educational outcomes for the children. Lastly, the inclusion of information index takes into account if the household has access to any source of information either via television or newspaper or magazines etc., in addition to anyone having operating knowledge of a computer. A positive effect in this case, therefore, indicates positive information transfers through these mediums.

Another household-specific factor in our model is the one that captures the total number of children in the household. This has a significant negative effect on the probability of a child attending the school as a higher number of children puts pressure on the limited resources of the household, thereby forcing some of these children either to drop out or to never enrol in the school.

We have also controlled for various village level factors indicative of their level of infrastructure. We find that improved infrastructure, in particular the access to *pucca* roads, significantly enhances the probability of a child going to school through better and safer connectivity.

Next, we discuss results from our sub-sample estimations, depending on the level of an appropriate public school, presented in **Table 2**. Column (1) presents the results for children whose appropriate public school is at the primary-level. Similarly, column (2) shows the results for the middle-level school and column (3) for secondary-level school.

Overall, we find that the presence of an appropriate public school within the village matters at all the three levels of education, which reinforces our findings from the aggregate analysis. For a child, the odds of going to school in the presence of an appropriate public primary school is 52% higher than in its absence. Likewise, the odds for the presence of an appropriate public middle school and secondary school stand to be 17% and 14% higher respectively, than in its absence. These results are indicative of a stronger effect of the presence of an appropriate public school at primary level, vis-a-vis the higher levels of education.

Further, when we observe the interaction between the presence of an appropriate public school with a child's age, we find that for higher ages the presence of appropriate public school matters all the more for a middle or for a secondary level school. This is in contrast to the results from table 1 where we observed that for higher ages the effect was getting lower. This lower aggregate effect at higher ages (in **Table 1**) was possibly driven by the strength of the effects at the primary level as can be seen in **Table 2** (column (1)). These results emanate from the various types of direct and indirect costs associated with attending a school, specifically at higher levels of education. The direct cost could simply be on account of the increase in the cost of transportation (including the cost of time and effort) when the child has to travel to some other village to attend school or the higher cost of attending a local private school. The indirect costs includes the psychological cost of the well-being of the children travelling a significant distance. These notional costs might become more prominent due to the added safety concerns in case of a girl child (Siddhu 2011). Further, we also find that a girl child is successively at a higher level of disadvantage as the level of schooling increases, possibly because of either the caregiving responsibility on girls or the gender discriminatory practices such as early marriages, skewed resource allocation in favour of male siblings or younger siblings (Muralidharan and Prakash 2017).

Additionally, we find that while the presence of a private school within the village significantly improves the probability of a child attending school, at the secondary level of education, which aligns with the aggregate effect of a private school, as reported in table 1. However, as can be seen in **Table 2**, we find that the presence of a private school does not affect the probability of a child attending a school at the primary and middle levels of education. These results highlight a possible preference for private schools for

being the graduating school of choice given. This might be supported by the fact that private schools have been shown to have better learning outcomes for English which can substantially improve the job market (Singh 2015).

All the other explanatory variables in the sub-sample analysis are aligned with our findings from the aggregate analysis in **Table 2**.

**Table 2: Modelling the decision of going to school at different levels of schooling**

Going to school	(1) Primary level	(2) Middle level	(3) Secondary level
	<i>Child-specific characteristics</i>		
Appropriate public school	1.521*** (0.085)	1.175*** (0.057)	1.145*** (0.039)
Child age			
6 years	3.192*** (0.221)		
7 years	14.778*** (1.729)		
8 years	16.879*** (1.943)	18.985*** (3.754)	
9 years	24.146*** (3.176)	13.424*** (1.888)	
10 years	16.868*** (2.001)	16.145*** (1.411)	
11 years	13.725*** (1.854)	28.621*** (2.675)	1.929*** (0.269)
12 years	6.841*** (0.810)	18.773*** (1.156)	1.450*** (0.087)
13 years	3.679*** (0.523)	16.185*** (1.050)	1.732*** (0.069)
14 years	1.660*** (0.214)	6.719*** (0.353)	2.464*** (0.084)
15 years	0.707** (0.102)	2.298*** (0.103)	1.753*** (0.038)
16 years	0.453*** (0.078)		
Appropriate public school *			
Child age			
6 years	1.060 (0.072)		
7 years	1.094 (0.123)		
8 years	1.229* (0.137)	2.419*** (0.728)	
9 years	1.138 (0.148)	2.472*** (0.456)	

10 years	1.035 (0.119)	1.642*** (0.172)	
11 years	1.122 (0.151)	1.783*** (0.176)	1.052 (0.410)
12 years	0.710*** (0.082)	1.537*** (0.094)	1.698*** (0.249)
13 years	0.603*** (0.085)	1.345*** (0.089)	1.517*** (0.142)
14 years	0.539*** (0.066)	1.278*** (0.075)	1.295*** (0.087)
15 years	0.672*** (0.092)	1.056 (0.058)	1.151*** (0.056)
16 years	0.834 (0.141)		
Female child	0.960*** (0.015)	0.823*** (0.025)	0.782*** (0.024)
Elder sibling going to school	2.467*** (0.046)	3.278*** (0.098)	2.582*** (0.097)
<i>Household specific characteristics</i>			
Mother went to school	1.435*** (0.023)	2.426*** (0.067)	2.250*** (0.047)
Total children	0.843*** (0.005)	0.873*** (0.006)	0.911*** (0.006)
Wealth index	1.142*** (0.008)	1.243*** (0.011)	1.220*** (0.010)
Information index	1.048*** (0.007)	1.276*** (0.016)	1.330*** (0.012)
Public secondary school	1.010 (0.021)	1.035 (0.032)	
Constant	3.223*** (0.220)	3.282*** (0.192)	9.990*** (0.437)
Village Specific Characteristics	Yes	Yes	Yes
<b>N</b>	<b>1110742</b>	<b>515102</b>	<b>340040</b>

Note: Exponentiated coefficients; Standard errors in parentheses. The estimations control for district and time fixed effects. \*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

## 6 Conclusion

Despite the adoption of wide-ranging schemes for promoting educational development, the school participation (dropout) rates remain dismal and unsavoury. Our paper contributes to the literature by analysing the significance of the most fundamental factor – the presence of appropriate public school within the village in determining schooling

participation. The findings show that the supply of school makes a difference over and above the demand factors that have been analysed in the literature (Filmer and Pritchett 2001; Huisman, Rani, and Smits 2010).

We find that the presence of appropriate public school within the village significantly increases the probability of a child going to school. While the need for a primary school within the village is felt obvious, there is not much cognizance to the importance of having a middle as well as a secondary school within accessible limits. Our results suggest that due to the various types of direct and indirect costs, as discussed, the presence of higher levels of schools can have substantial effects on improving the educational outcomes of children. Further, given patriarchal norms and additional concerns associated with girls' safety, we observe that the girls are benefited more with the presence of the public school within the village.

Our results offer direct and important insights for the government authorities that making the public schooling at all levels accessible within the village can help in bridging gender gaps and enhancing the educational outcomes, although a more rigorous analysis establishing the causation relation is needed to draw conclusive policy implications.

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## A. Mathematical Appendix

The household decision making problem is as follows:

$$H = \theta u_w + (1 - \theta) u_h$$

subject to:

$$x_w + x_h + e = I$$

Setting up the Lagrangian,

$$L = \theta[(1 - \alpha) \ln x_w + \alpha \ln e] + (1 - \theta)[(1 - \alpha) \ln x_h + \alpha \ln e] \\ + \lambda[I - x_w - x_h - e]$$

The first order conditions with respect to  $x_w$ ,  $x_h$  and  $e$  are as follows:

$$\frac{\delta L}{\delta x_w} = 0 \Leftrightarrow \frac{\theta(1-\alpha)}{x_w} = \lambda \quad (1)$$

$$\frac{\delta L}{\delta x_h} = 0 \Leftrightarrow \frac{(1-\theta)(1-\alpha)}{x_h} = \lambda \quad (2)$$

$$\frac{\delta L}{\delta e} = 0 \Leftrightarrow \frac{\theta\alpha + (1-\theta)\alpha}{e} = \lambda \quad (3)$$

$$\frac{\delta L}{\delta \lambda} = 0 \Leftrightarrow x_w + x_h + e = I \quad (4)$$

Equating pairwise equations 1 and 2 with 3 :

$$\frac{\alpha}{e} = \frac{\theta(1-\alpha)}{x_w} \Leftrightarrow x_w = \frac{\theta(1-\alpha)e}{\alpha} \quad (5)$$

$$\frac{\alpha}{e} = \frac{(1-\theta)(1-\alpha)}{x_h} \Leftrightarrow x_h = \frac{(1-\theta)(1-\alpha)e}{\alpha} \quad (6)$$

Replace  $x_w$  and  $x_h$  from equations 5 and 6 in the budget constraint and solve for  $e$ .

Plugging the value of  $e$  in equations 5 and 6 we get  $x_w$  and  $x_h$ :

$$x_w = \theta(1 - \alpha)I$$

$$x_h = (1 - \theta)(1 - \alpha)I$$

$$e = \alpha I$$

\*\*\*\*\*