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RELATION BETWEEN ROAD AVAILABILITY AND ENROLMENT TO PRIMARY SCHOOL ALONG WITH OTHER FACTORS – A STUDY OF THE THREE DISTRICTS OF WEST BENGAL

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ABSTRACT

Access to school is seen through the available road network. Road availability plays a crucial role for enrolment to primary schools. Enrolment to Primary schools is dependent on available road network along with other factors. Dependency of Road availability can be analysed with enrolment, teacher-pupil ratio and total teachers. For this, Multiple Regression is performed to predict the value of dependent variables based on the value of several independent variables. Further instrumental variables and (2SLS) estimation is done. The outcome variable is number of teachers per thousand students and independent variable is all weather road and enrolment which are the endogenous variable. Instrumental variable taken is teacher pupil ratio and all-weather road.Results indicate that, access to all-weather road is necessary for the number of teachers per thousand students to access primary schools. This helps in improvement of attendance of students as well as teachers. Access to bank is positively related to teacher-pupil ratio but negatively related to enrolment, number of teachers per thousand students. Work-Force participation is positively related to number of teachers per thousand students. As participation of teachers increase, enrolment of students will increase as it is positively related to number of teachers per thousand students. Distance from the District Headquarters is positively related to number of teachers per thousand students. All weather road is positively related to number of teachers to travel to school but availability of road is negatively related to number of teachers per thousand students.

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INTRODUCTION

There exists inter-district disparity in terms of the important determinants of learning – accessibility, human infrastructure, physical infrastructure etc. Education can facilitate the achievement of different personal and social goals. In the year 2000, the 'Dakar Framework for Action' developed by UNESCO put forward quality of education as a fundamental determinant of enrolment, retention and achievement. (Mukherjee, 2014) finds that states that have achieved success in enrolment, have been successful in expanding school access but fail to provide the necessary physical and human infrastructural facilities in those schools. This applies to different districts of West Bengal, where our study concentrates on the different villages of the concerned district. In almost all the states of India, there has been an increase in gross enrolment ratio (GER) at the primary level across all social groups between 2004–5 and 2007–8. The net enrolment ratio (NER) at the primary level also increased from 84% in 2005–6 to 96% in 2007–8 for the country as a whole (Planning Commission, 2010).

Government has undertaken different initiatives to achieve Universalisation of Elementary Education (UEE) by Sarva Sikha Abhiyan and Right to Education (RTE). Presence of accessible roads determine enrolment to primary schools. Access includes the spatial density of schools as well as the availability per thousand child population because more children will come to schools when schools are accessible (Mukherjee, 2014). Distance to school has more influence on primary school non-attendance (Shehu, 2018). Longer distance to school might negatively affect primary schooling. This negative effect is severe for the schooling of female children due to safety concerns. One of the features for an educational environment suitable for learning are easy accessibility of school which can be created by presence or availability of road network. Observation shows that in many states, access to school is not related to physical and human infrastructural facilities but better access facilitates enrolment. Better access helps in bringing more children to school (Mukherjee, 2014). In the past, in the rural areas low educational achievement and enrolment was due to lack of schools. But now the Government has succeeded in building a school within a km in every village of the country (Bhandari, 2008).

Impact of Road Availability on Enrolment: The level of accessibility depends on the level of mobility which in turn depends on the quality of the roads, travel time, all of which are determined by the availability of roads as well as the type and efficiency of available transport. The well-being of these households depends on their ability to access the available road. Demand and supply issues are recognized as being critical to problems of access to primary schools. The distance of schools from the habitation was found to be inversely related to enrolment and participation levels (Govinda & Bandyopadhyay, 2008). A well-developed road network is an indicator of development. Roads help individuals grow socially and to improve social access and mobility. It also increases school enrolment and attendance. Road improvement has an impact on labour supply both male and female as well as the decision of the parents to enrol their children to school. This can be seen by lower transport cost brought out by (Khandker *et al*., 2006) as it provides access to school. Rural roads provide access to socio-economic activities leading to equity and poverty –reduction. The Ministry of Rural Development was to ensure that every habitation with population exceeding 1000 and tribal areas with population exceeding 500 are connected with an all-weather road by 2009 (Lalvani, 2010). Several measures have been taken like establishing new schools, improving school infrastructure, which would lead to increase in enrolment and participation rate. Unsurfaced road under Gram Panchayat and Panchayat Samiti lead to the development of a smaller number of Government Primary schools as unsurfaced roads in the rural areas lead to water logging during rainy season which led to deterioration of roads. Again, with the construction of Prime Minister's Gramin Sarak, development of surfaced road led to development of a smaller number of primary schools. The reason is that for new connectivity of Prime Minister's Gramin Sarak, it is only 62% and for habitation to be covered the achievement rate is under 60% (Lalvani, 2010). An improvement in the physical accessibility plays an important role in the improvement of enrolment in primary schools in the rural areas (Karmakar, 2016). According to (Asian Development Bank, 2019), improved connectivity will result in socio-economic benefits for rural women and girls thereby increasing the enrolment of girls in school. This will enhance economic opportunities and safe mobility for women and girls. In order to show the relationship between available road network and enrolment of students to primary school, we conducted a three-stage sample procedure. On the basis of it, we want to see the impact of road availability on teacher-pupil ratio, on enrolment and on total teachers. In our study, secondary data was collected from three districts namely North 24 Parganas, South 24 Parganas and Hooghly. Each district under our study comprises four blocks i.e 12 blocks in total and 59 villages. Selection of the blocks were done randomly and data on villages and primary school were selected from that respective block. These data of villages and primary school were collected from UDISE+ Know Your School (Know Your School, n.d).

Table 1. District performance index

District	DPI	Rank of DPI
Howrah	0.304	15
North 24 Parganas	0.23	17
Bardhaman	0.604	2
Darjeeling	0.482	5
Medinipur	0.53	4
Hooghly	0.42	9
Cooch Behar	0.479	6
South 24 Parganas	0.261	16
Uttar Dinajpur	0.426	8
Dakshin Dinajpur	0.362	13
Nadia	0.361	14
Malda	0.384	12
Jalpaiguri	0.661	1
Murshidabad	0.577	3
Birbhum	0.417	10
Bankura	0.412	11
Puruliya	0.438	7

Source: West Bengal Development Report 1998-1999

Locate School option shows the different categories like State, District, Block, Village, Category and Management. For our study we selected the State: West Bengal, 3 Districts namely North 24 Parganas, South 24 Parganas and Hooghly. These districts were selected based on District Performance Index (DPI) of 1998-1999. Districts are ranked based on performance. DPI was higher for the better endowed district (Planning Commission, 2010). Among the 17 districts, North 24 parganas rank 17 in DPI with DPI 0.23. South 24 Parganas rank 16 in DPI with DPI 0.261. Hooghly rank 9 in DPI with DPI 0.42. Our study is based on the rural areas of these districts. We selected these districts near to Kolkata because we want to see whether there is any kind of spill-over effect of development on other areas of these three districts. The rural area of North 24 Parganas is 3468.22 sq km, rural area of Hooghly district constitutes 2819.97 sq km and rural area of South 24 Parganas district constitute 9541.28 sq km. Howrah, though it ranked 15th in DPI was skipped from our analysis as the area of rural region of Howrah district is 1035.43 sq km which is less than other rural areas of the selected districts. To see the spill over effect spreading over a large area of the districts, the respective districts were selected. For each district, 4 blocks are selected randomly. Again, from each block villages are selected randomly taking 5 villages on an average, so the number of villages total to 59. Each village has varied number of Gram Samsad and each Gram Samsad has a primary school or more than one which are considered for our analysis. Unique identification number is given for the said villages. So, each Gram Samsad under each village has several primary schools, considering Government-aided primary schools by mentioning school id and it comprises 751 primary schools in total. For each school, school id is given. So, our observations stand at 59 villages and 751 primary schools.

Cross-section data is collected from secondary sources. Data for the independent variables like characteristics of the village, distance of other locations from the primary school are collected from Census of India 2011 West Bengal (District Census HandBook Part XII A & Part XII B) (Census of India 2011 Series 20 Part XII B) & (Census of India 2011 Series 20 Part XII A). Number of students enrolled and number of teachers per thousand students are collected from U DISE+ Know Your School (Report Card 2019-2020). Road Availability is tracked through Google Map (https://maps.google.com) to see whether there is a road network near the respective primary school. Road Route is collected from Pradhan Mantri Gram Sadak Yojana (PMGSY) (PMGSY, n.d). Data on All Weather Road from each primary school of the respective Gram Sansad under respective villages are collected from U DISE+ Know Your School (Locate School Report Card 2019-2020). The dependent variable of our analysis are total students enrolled, total teachers in the school, of the respective village collected from U DISE+ School report Card (2019-2020). Teacher-Pupil ratio calculated is also taken as the dependent variable. The independent variables are literacy which covers number of persons in the village who are literates showing separately number of male literate and number of female literates, number of people as agricultural labour, Work Force Participation level in the said village, and Households with access to Banking, Distance of the Block from District Headquarters, Distance of the Bank, Road Availability, Road Route and Approachable by All-weather Road.

Besides the other variables are population of the village, Number of people comprising SC population constituting number of males who are SC and number of females who are SC are considered. ST population of the village is considered taking number of ST males and ST females separately. Access to school is seen through the available road network. We need to look at the Road Availability which is near to the primary school. The roads in each district corresponding to each primary school are of various types is divided into five categories: National Highway, State Highway, Major District Road, Other District Road and Village Road. According to, IRC Classification of Roads, Roads are classified as 1) National Highways (NH) 2) State Highways (SH) 3) Major District Roads (MDR) 4) Other District Roads (ODR) 5) Village Roads (VR). National Highways (NH), The National Highways Network of India is a network of highways that is managed and maintained by Government of India. State Highways (SH), the state highways are the roads which link important cities, towns, district headquarters within the state and

connecting them with national highways or highways of the neighbouring states. Major District Roads (MDR) These are important roads within a district connecting areas of production with markets and connecting these with each other or with the State Highways & National Highways. It also connects Taluk headquarters and rural areas to District headquarters.

Classification of Rural Roads: The rural roads are commonly classified as: 1. Other District Roads (ODR) 2. Village Roads (VR), which is further classified as Panchayat Union roads and Panchayat roads.

Other District Roads (ODR) Other District roads are the roads serving rural areas and providing them with outlet to market centres, Taluk headquarters, block headquarters or major district roads, and would serve to connect villages with a population of 1000 and above or a cluster of villages.

Village Roads (VR) Village roads are roads connecting villages or cluster of villages with each other to the nearest road of a higher category (Technical Handbook Roads 20-01-13) (Rural Development & Panchayat Raj Department, n.d). Data found out that type of road available is labelled numerically as National Highway (1), State Highway (2), Major District Road (3), Other District Road (4) and Village Road (5). Type of Road Route is described as Through Route, Link Route and Village Route. Road Route is numerically categorized as Through Route (1), Link Route (2) and Village Route (3). Now whether the road is approachable by all-weather road or not is represented by binary variables as Approachable (1) and Not Approachable (0). Now Regression analysis is done to find the relationship between the variables; dependent variable(Y) and independent variable(X). It is used for estimation of relationship between dependent variable and a set of independent variables. It can be utilized to assess the strength of the relationship between the variables.

Ho= No relationship between X and Y.
H_1= Relationship exists between X and Y.

where the dependent variables, Yi are:

- Teacher - Pupil ratio
- Enrolment of students in a particular primary school.
- Total Teachers in the said primary school

And the independent variables, Xi are:

- population of the village,
- literacy of the village
- number of male literates
- number of female literates
- Number of people comprising SC population
- Number of SC males
- Number of SC females
- Number of people comprising ST population
- Number of ST males
- Number of ST females
- Number of people as agricultural labour
- Work Force Participation level in the said village,
- Distance of the Block from District Headquarters,
- Distance of the Bank from residence
- Households with access to Banking
- Road availability
- Road Route
- All- weather route

Investigating this hypothesis, we are under-going regression analysis. For estimation process, Ordinary Least Square Method (OLS) is used. Multiple Regression is performed to predict the value of a dependent variable based on the value of several independent variables. It also allows to determine the overall fit of the model and the relative contribution of each of the independent variables to the total variance explained.

This inter-dependence of dependent variable on independent variable can be represented by the following equations:

$$Y_1=\alpha_3+\beta_{31}X_1+\beta_{32}X_2+\beta_{33}X_3+\varepsilon_3 \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$$Y_1=\alpha_4+\beta_{41}X_1+\beta_{42}X_2+\beta_{43}X_3+\beta_{44}X_4+\varepsilon_3 \quad \ldots\ldots\ldots\ldots\ldots (2)$$

$$Y_2=\alpha_{12}+\delta_{21}X_1+\delta_{22}X_2+\delta_{23}X_3+\varepsilon_{12} \quad \ldots\ldots\ldots\ldots\ldots (3)$$

$$Y_2=\alpha_{13}+\delta_{31}X_1+\delta_{32}X_2+\delta_{33}X_3+\delta_{34}X_4+\varepsilon_{13} \quad \ldots\ldots\ldots\ldots\ldots (4)$$

$$Y_3=\alpha_{14}+\gamma_{11}X_1+\varepsilon_{14} \quad \ldots\ldots\ldots\ldots\ldots (5)$$

$$Y_3=\alpha_{15}+\gamma_{21}X_1+\gamma_{22}X_2+\gamma_{23}X_3+\varepsilon_{15} \quad \ldots\ldots\ldots\ldots\ldots (6)$$

$$Y_3=\alpha_{16}+\gamma_{31}X_1+\gamma_{32}X_2+\gamma_{33}X_3+\gamma_{34}X_4+\varepsilon_{16} \quad \ldots\ldots\ldots\ldots\ldots (7)$$

where βii, δii,, γii co-efficient explain the relationship.

Y_1: Teacher-Pupil Ratio
Y_2: Enrolment of students
Y_3: Total Teachers per thousand students
X_1: All Weather Road
X_2: Road Availability
X_3: Access to bank
X_4: Work Force Participation

The model has pattern heteroscedasticity. Multicollinearity is present as variance inflation factor (vif) is greater than 10 and presence of omitted variable bias.

For Omitted variable bias, we use instrumental variable (2SLS) regression. An instrumental variable is a third variable, used in regression analysis when you have endogenous variables—variables that are influenced by other variables in the model. By using an instrumental variable to identify the hidden (unobserved) correlation allows us to see the true correlation between the explanatory variable and response variable, Y.

We want to see the relationship between road availability with enrolment, teacher-pupil ratio and total teachers by using instrumental variables and 2SLS estimation. We have considered two instruments that are exogenously affecting the outcomes. Here the outcome variable is number of teachers per thousand students and independent variable is all weather road and enrolment which are the endogenous variable. Instrumental variable taken is teacher pupil ratio and all-weather road. Instrumental variables: First (Z_{ijk}^1) is dummy of teacher pupil ratio, and second (Z_{ijk}^2) is all weather road. The p value for F test is p>0.05, which is above 5%; the regression does not have explanatory power. For all-weather road the instrument is teacher pupil ratio.

Independent variables: See Appendix A-1 for Summary Statistics.

- Control(θ): Apart from these above defined variables we have also considered vector of controls like population, Number of people comprising SC population, Number of SC males, Number of SC females, Number of people comprising ST population, Number of ST males, Number of ST females, See Appendix A-1 for Summary Statistics.

We have performed analysis on Stata 14 SE. We have first run the two sets of instrumental variables regression. For analysing the effect on number of teachers per thousand students as effect induced from the cause all weather road (can be considered as the proxy of teacher pupil and all-weather road) we propose the following hypothesis

$$H_0 : \beta^1, \qquad H_1 : otherwise$$

where β^1 represents the coefficients of estimated effect of teacher pupil ratio to all weather road.

In the First-stage, regress number of teachers per thousand students where all weather road is taken as endogenous variable. Here p for t

value >0.05, the regression model does not have explanatory power. We need to see the statistical significance of the new instrument teacher-pupil ratio. So, the instrumental variable is not correlated with endogenous variable. Let us call X_{ijk} as an endogenous variable, i.e., X_{ijk} will be correlated with error term ε_{ijk} if (a) there are omitted variables that are correlated with Y_{ijk} and X_{ijk}, (b) X_{ijk} is measured with errors, and (c) Y_{ijk} and X_{ijk} are simultaneously determined. After running the simple OLS model, the results are omitted variable biased, using ovtest (Ramsey RESET test) package of Stata. Considering all these problems we identified few instruments like (Z^1_{ijk},Z^2_{ijk}) where Z^1_{ijk} is teacherpupil ratio and $Z^2_{ijk}$is all – weather road. In practice, it is true that finding a proper instrument is very difficult. We are aware that by applying instrumental variables (IV) estimations, one can remove correlations between the error term and independent variables. We are assuming that our IVs are uncorrelated with the error terms ε_{ijk} and along with that the IVs are partially and sufficiently strongly correlated with X_{ijk} once the other independent variables are controlled. For the estimation in our research, we have relied on the extended version of twice use of OLS (ordinary least square) i.e., 2SLS (two-stage least square). 2SLS estimator gives us the BLUE (best linear unbiased estimator) by solving the problem of identification. In this method, we will have to first estimate the endogenous variables X^1_{ijk} and X^2_{ijk} using the instruments Z^1_{ijk} and Z^2_{ijk}. After that, we will store the estimated value of X^1ijk and X^2ijk and in second stage using that estimated endogenous variable we will estimate the outcomes. Equations below reflects the regression specifications used in our study for the estimation process:

Instrumental variable regression, using 2SLS (two-stage least square) estimation.

First Stage estimation

$X^1_{ijk}=a^0_{jk} + a^1_{jk}Z^1_{ijk} +\mu^1_{ijk}$ ……. (0')

$X^2_{ijk}=a^1_{jk} + a^2_{jk}Z^2_{ijk} +\mu^2_{ijk}$ ……. (0'')

Using the equation (0'), (0''), we have tried to explain the primary model specification. Based on that we have derived model (1), (2) and (3). Equation (0') and Equation (0'') shows the first stage estimation for the relationship between the endogenous variable and instruments used. In our study, we have all weather road and enrolment as our endogenous variable, and we have used two instruments Z^1_{ijk} is teacherpupil ratio and $Z^2_{ijk}$is all – weather road. For establishing the relationship between number of teachers per thousand students with all-weather road and enrolment we have considered the variables as below:

Dependent/Outcome variables (Y_{ijk}): Here number of teachers per thousand students is the dependent variable where i= no of teachers & j= school under consideration, k= village under consideration.

Instrumental variables: We have considered two instruments that are exogenously affecting the outcomes. First (Z^1_{ijk}) is dummy of teacher pupil ratio and second (Z^2_{ijk}) is all weather roads.

Independent variables: The variables (X^1_{ijk}), all weather road is the independent variable where (i=1,0), i=1 presence of all-weather road, i=0 absence of all-weather road, j= school under consideration, k= village under consideration.

$X^2_{ijk}= enrolmentwherei = (1,2 \dots\dots n) forvillagejanddistrictk.$

Instrumental variable regression, using 2SLS (two-stage least square) estimation

In our study, we have all- weather road and enrolment as our endogenous variable, and we have used instruments teacher pupil and all-weather road.

Here, X^1_{ijk}= all weather road (i=1,0) for village j and district k $X^2_{ijk}= enrolmenti = (1,2 \dots\dots n)\ forvillagej\ and\ districtk Z^1_{ijk}$= teacher pupil where i= no of teachers, j= no of students, and k= school under consideration. In (0')$\alpha^0_{jk}$is the intercept, in (0'')$\alpha^1_{jk}$is the slope coefficient for the instrument used respectively and μ^1_{ijk}& μ^2_{ijk}represent the usual error terms.

$\widehat{X^1_{ijk}} = \widehat{\alpha^0_{ij}} + \widehat{\alpha^1_{ij}} Z^1_{ijk}$ – (0''')

After running (0'), we obtained the estimated regression as in Equation (0'''). Here$\widehat{X^1_{ijk}}$, is the estimated endogenous variables of our interest.

In (0'') $\alpha^1_{jk}$is the intercept,$\alpha^2_{jk}$is the slope coefficient for the instrument used respectively and μ^2_{ijk} represent the usual error terms.

$\widehat{X^2_{ijk}} = \widehat{\alpha^1_{ij}} + \widehat{\alpha^2_{ij}} Z^2_{ijk}$ – (0'''')

After running (0''), we obtained the estimated regression as in Equation (0''''). Here$\widehat{X^2_{ijk}}$, is the estimated endogenous variables of our interest.

Second Stage estimation

$Y_{ijk} = \beta^0_{ij} + \beta^1_{ij} X^1_{ijk} + \theta + \varepsilon_{ijk}$ – (0''''')

$Y_{ijk} = \beta^2_{ij} + \beta^3_{ij} X^2_{ijk} + \theta + \varepsilon_{ijk}$– (0''''''')

As we have obtained the estimatedX^1_{ijk},&X^2_{ijk}so, in the second stage we will simply run that estimated endogenous variable against the outcome variables. HereY_{ijk}= teacher per students is the outcome variable where i= no of teachers & j= school under consideration, k= village under consideration. In the same fashionβ^0_{ij}&$\beta^2_{ij}$is the intercept terms or constant,β^1_{ij}&$\beta^3_{ij}$is the slope coefficient, θ represents the vectors of controls and ε_{ijk} represents the usual error terms.

RESULTS

With 751 observations, the dependent variable is teacher pupil, and the independent variables are all weather road, road availability, access to bank, work force participation. There are three models. In the models given below, co-efficients are stated and standard errors are given in parenthesis. If the relations are significant, co-efficient need to be checked. In the model, access to bank, is significant to teacher pupil ratio at 95% level of significance with a positive impact (Refer to Table 2). If access to bank increases by 1 unit teacher pupil ratio increases by 0.006 unit.

Table 2. Regression result showing the effect of thevariables on teacher-pupil ratio

VARIABLES	teacherpupil	teacherpupil	teacherpupil
all_weather_road	0.000	0.000	0.000
	(0.004)	(0.004)	(0.004)
RoadAvailability	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)
access_bank		0.006**	0.006**
		(0.003)	(0.003)
wfp			0.000**
			(0.000)
Constant	0.048***	0.044***	0.041***
	(0.010)	(0.010)	(0.010)
Observations	751	751	751
R-squared	0.001	0.007	0.012
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Source: Author's calculation			

Access to Bank is significant to Enrolment at 99% level of significance with a negative impact (Refer to Table 3). Literature by (Habyarimana & Jack;2018) shows that parents of final year primary school children in Kenya had access to financial service can generate

a higher level of savings and helps in promoting enrolment to high school. Parents financed the enrolment cost by drawing from the financial savings. Through access to bank parents financed the educational expenditure. It might be that parents enrol their younger child to primary school and get the facility of Capitation grant for their child. These grants are obtained through access to bank. On the other hand, the older child of the family might not be enrolled in school in order to look after the younger siblings and do household chores, if the child is a girl child and if the child is a boy child, he would be engaged in agricultural or allied activities. For all these reasons, enrolment falls for the older children of the family.

Table 3. Regression result showing the effect of the variables on enrolment

Variables	Enrollment	Enrollment	Enrollment
all_weather_road	10.907	10.578	10.528
	(9.566)	(9.505)	(9.512)
RoadAvailability		-4.209	-4.165
		(3.794)	(3.798)
access_bank		-23.372***	-23.134***
		(6.107)	(6.143)
wfp			-0.068
			(0.181)
Constant	92.167***	131.389***	132.612***
	(9.216)	(21.289)	(21.548)
Observations	751	751	751
R-squared	0.002	0.023	0.024
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Now the dependent variable is number of teachers per thousand students and the independent variables are enrolment, all weather road, distance from district headquarters, distance of the bank, access to bank, road availability, work force participation, male literacy, female literacy.

In all the models, all weather road is significant to number of teachers per thousand students at 95% level of significance (Refer to Table 4). If all weather road increases by 1 unit, teacher per student increases by 0.605. In the fourth model, all weather road is significant to number of teachers per thousand students at 99% level of significance. (Bell & Dillen, 2012) brings out that the provision of an all-weather road should improve the attendance not only of pupils, but also of their teachers. The provision of an all-weather road connection to schools has a variety of effects, depending on their location in relation to the village. If the teachers live elsewhere, they should suffer fewer forced absences due to poor weather, especially in the monsoon season. The same applies to those children who have to travel to a school outside their village. An easier trip for teachers and pupils alike will normally affect the attendance conditional on enrolment. This will be possible by the presence of all-weather road.

Table 4. Regression result showing the effect of the variables on teacher per thousand students

VARIABLES	Teacher per student	Teacher per student	Teacher per student	Teacher per student
Enrolment				0.019***
				(0.001)
All_weather_road	0.605**	0.594**	0.600**	0.395***
	(0.235)	(0.233)	(0.233)	(0.146)
Dist_from_disthq				
Dist_bank				
Access_bank		-0.565***	-0.593***	
		(0.150)	(0.150)	
Road availability		-0.118	-0.123	
		(0.093)	(0.093)	
Wfp			0.008*	
			(0.004)	
Lit_female				
Lit_male				
Constant	3.778***	4.805***	4.659***	2.002***
	(0.226)	(0.523)	(0.528)	(0.149)
Observations	751	751	751	751
R-squared	0.009	0.030	0.035	0.619
Enrolment	0.021***	0.021***	0.021***	0.021***
	(0.001)	(0.001)	(0.001)	(0.001)
All_weather_road	0.343**	0.323**	0.308**	0.302**
	(0.136)	(0.137)	(0.137)	(0.137)
Dist_from_disthq	0.017***	0.017***	0.018***	0.018***
	(0.002)	(0.002)	(0.002)	(0.002)
Dist_bank	-0.050	-0.048	-0.033	-0.038
	(0.049)	(0.053)	(0.054)	(0.055)
Access_bank		-0.066	-0.005	-0.008
		(0.094)	(0.102)	(0.102)
Road availability		-0.096*	-0.090	-0.090
		(0.055)	(0.055)	(0.055)
Wfp		-0.002	-0.001	-0.001
		(0.003)	(0.003)	(0.003)
Lit_female			0.000	0.000
			(0.000)	(0.000)
Lit_male				-0.000
				(0.000)
Constant	0.833***	1.368***	1.138***	1.135***
	(0.182)	(0.327)	(0.359)	(0.359)
Observations	751	751	751	751
R-squared	0.670	0.672	0.673	0.673

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Author's calculation

Access to bank is significant to number of teachers per thousand students at 99% level of significance. But the impact is negative (Refer to Table 4). As access to bank increases, teachers might be encouraged to shift their account to banks located in urban areas and enjoy the facilities of urban areas. In that case they would leave the job in the respective school located in rural areas and search for a job in urban areas. (Mulkeen, 2006) shows that in many African countries, teachers prefer to teach in urban areas. Rural teachers often have less access to support services than their urban counterparts. Female teachers are less willing to accept a rural posting compared to males and rural areas have fewer female teachers than urban areas. Again, for single female teacher it might be unsafe for them to stay in rural areas and for married female teacher in rural areas it might be a separation from her family.

Work-force participation level is significantly positive at 90% significance level to total teachers per thousand students (Refer to Table 4). Improved work opportunities of the parents have a positive effect on the education of the child for which number of teachers increase. (Heath, Jayachandran; 2017) shows Jobs for women in the labour market have led to an increase in investment in human capital for which teacher participation increases. Investment in human capital might create awareness and lead to increase in number of people taking up jobs as teachers, so number of teachers might increase. (Jayachandran; 2002) brings out that higher female work-force participation raises the economic returns to girl's education. So, educating girls would mean higher income as educated girls after completing their education would take up the job as teacher and teacher participation increases.

In the fourth to Eighth model, Enrolment is significant to total teachers per thousand students at 99% level of significance with a positive impact (Refer to Table 4). (Bell, Dillen; 2012) conducted a survey in Orissa, aim to undertake a program where an easier trip for teachers and pupils will normally affect not only attendance conditional on enrolment, but also enrolment and graduation rates. Analysis given by (Handa, 2002) from the rural region of Mozambique of the impact of school characteristics on primary school enrolment indicates that dimensions of school quality and access both work to stimulate enrolment, although the effects are small and differ somewhat by gender of child. School quality, measured by the number of trained teachers in the administrative post, has a positive and significant impact on enrolment, but it is the gender composition of the trained teaching staff that is even more important in determining the household decision to send children to school. The reason might be that increase in enrolment in the primary schools leads to an increase in the deployment of teachers to maintain the norm of primary school regulation i.e standard pupil teacher ratio and to maintain the quality of the school.

In the fifth to eight model, Distance from District Headquarters, is significantly positive to number of teachers per thousand students at 99% significance level (Refer to Table 4). If the school is located near the District Headquarters, which is a developed area, teachers will be interested to work near a developed area and teacher participation will increase. Road availability is significantly negative to teacher per student at 90% significance level on an average keeping other variables constant with a negative impact (Refer to Table 4). If there is road available near the schools but teachers do not feel inclined to go to school depending on the terrain of the land, i.e hilly or rough terrain and the villages are isolated from the rest of the areas, then teacher participation falls. Type of roads matter for teacher participation. If road availability increases by 1 unit, number of teachers fall by -0.096 units. The study shows that (Rawat & Sharma; 1997) conducted a study in Almora District of Central Himalaya shows that the impact of isolation of educational institutions is visible in terms of functioning and the number of teachers employed. Schools have fewer teachers and the overall number of teachers is declining. About 5% of schools employ four teachers, 13% of schools have three teachers, 63% have two teachers, and 19% of schools have only one teacher. The distance of a junior basic school from a road is negatively related to the number of teachers. So, it might be that if the available road to reach primary school is a forested terrain or hilly terrain then number of teachers fall.

CONCLUSION

Access to roads can alter rural household's opportunity cost of human capital investment. Better transport connectivity can reduce travel cost to school, facilitate children's travel to school on one hand and on the other it can expose students to more job opportunities, as they can now drop out of school and can join the labour market. In this study, it is seen that better access helps in bringing more children to school. Villages have been successful in expanding school access. In some villages, schools were at a far distance from their home and parents could not send their children long distance by walking and insecurity was a hindrance. Having primary school closer to communities in rural areas, will reduce the rate of primary school non-attendance. Results indicate that, access to all-weather road is necessary for the number of teachers per thousand students to access primary schools. This helps in improvement of attendance of students as well as teachers. Access to bank is positively related to teacher-pupil ratio but negatively related to enrolment, number of teachers per thousand students. Work-Force participation is positively related to number of teachers per thousand students. As participation of teachers increase, enrolment of students will increase as it is positively related to number of teachers per thousand students. Distance from the District Headquarters is positively related to number of teachers per thousand students. Availability of Road is negatively related to number of teachers per thousand students. The striking part of this analysis is that access to bank is positively related to teacher-pupil ratio and negatively related to total enrolment of students to primary schools and number of teachers per thousand students. All weather road is positively related to number of teachers to travel to school but road availability near primary schools is negatively related to total teachers. Thus, for a revision of this analysis, U-DISE Raw data will supplement the study with physical infrastructure of schools and total enrolment of students to bring out the supply-side analysis.

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