Determinants of Foundational Literacy and Numeracy in India

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Abstract

The foundational literacy and numeracy are the fundamental pillar in the production of knowledge or human capital which enhances productivity of labours and promotes economic growth. Though the public schools are supposed to impart foundational literacy skills at the primary level but the recent ASER reports state very gloomy pictures. The widening socio-economic inequalities in India, is expected to exacerbate differential learning outcomes, and restrict the educational trajectories of those children from the weaker socio-economic backgrounds. In this context, the present paper, based on IHDS 2011-12 dataset, analyses the status of foundational literacy skills of the children in India and its determinants in terms of their socio-economic, demographic and school level characteristics. The findings of fixed effect models suggest that households' educational background, socio-economic status, and the school choice play key roles in achieving the foundational literacy and numeracy. Furthermore, a child's self-effort like homework hours (positively) and absenteeism in school (negatively) influence the attainment of foundational literacy and numeracy.

Key words: *Foundational literacy & numeracy, socio-economic status, school-choice, human capital, fixed effects models, India.*

1. Introduction

The foundational literacy and numeracy (FLN) can be commonly defined as the comprehensive ability of an individual to read and write and perform basic arithmetic (such as addition and subtraction). From the theoretical perspective, attainment of FLN skills can be understood as a part of cognitive development[1] process of a child. Such skills are the indispensable prerequisite for future schooling and fundamental pillars in the production process of knowledge or human capital, which in turn, promotes economic growth by enhancing productivity of labour. National Education Policy 2020, GOI, has envisioned that critical thinking and and creativity of an individual are strongly associated with these skills, which are significantly important for a country's progress. Furthermore, the return to investment in human capital is increasing in

[1]Child development process also involves non-cognitive behaviour that can be refered as a set of behavioural skills such as attitude, interest, motivation, self-confidence, self-efficacy etc.

human capital stock due to the expansion of quality work hours, education-intensive research and development industry, facilitation, and better absorption of technological innovations (Becker, Murphy and Tamura, 1990). Being the first step of human capital formation, foundational literacy and numeracy should be embedded to all. In this regard Millennium development goals (MDGs) has emphasized on scaling up of school years through mandatory enrolment in elementary education. It is evident now that merely bringing the children into classes were not sufficient to enable their basic learning but resulted in a learning crisis. According to an UNESCO 2014 report, less than half of the children of 21 out of the 85 countries (where full data are available) have learnt the basics. Of these, 17 countries are in sub-Saharan Africa; the others are India, Mauritania, Morocco and Pakistan. The international assessments around the developing world in terms of widespread learning deficit of children already in school has been also reflected in the World bank documents and has been coined as *'learning poverty'*, '*learning crisis'* (World Bank, 2019), and these terms gained lot of popularity in the recent years. Moreover, this learning crisis is likely to be worsened due to Covid 19 and the prolonged lock downs and inequitable access to internet facilities. This depressing scenario (across the developing world) has compelled the United Nations to design the thrust of the Sustainable Development Goals (SDGs) towards inclusive and equitable quality education and promotion of lifelong learning opportunities for all (SDG 4, UN 2016).The SDG 4.1 states - *" all girls and boys to complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes by 2030."* The SDG 4.2 advocates the importance of pre-primary education (at least of one year) on children learning outcomes, that can compensate the low endowment effects of the children from poorer socio-economic status (SES). The other SDG goals widen the coverage beyond the children and basic literacy to adults and skills; these goals propagate the inclusive, equitable and life-long learning for jobs and civil life. Various institutions are instrumental in the formation of cognitive skills of children such as families, schools, neighborhood environment and others. In the light of SDGs, every individual as a child is supposed to attain the basic literacy in reading writing and numeracy in due course of the free and compulsory elementary education.

Unfortunately, in India a concerted focus on school enrolment through introduction of some critical interventions like the Right to Education (RTE, 2009), SarvyaSikhshya Abhiyan, Mid-Day Meal schemes etc., in the past, have largely compromised a simultaneous thrust on the quality of schooling. The severe decline is the quality of schooling in India is clearly evident from the ASER reports, especially of children studying in government schools (Pratham, 2014). The incremental increase in the proportion of children (of same cohorts) who can read standard II texts are declining in each successive grade (Pratham, 2020). The concern has been reflected by the focus set by the National Education Policy (NEP), 2020, as an *"urgent national mission"* towards the attainment of FLN for all Indian children. The Ministry of Education of the Government of India has introduced the National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN-Bharat -2021 programme to formalize the guidelines and targets towards the achievement of universal FLN to standard III level children by 2026-27[2]. Given that the schooling system in India is one of the largest in the world (with more than 1.49 million schools, 9.5 million teachers, and over 265 million students of pre-primary to

[2]For practical purpose the learning outcomes of children enrolled in preschool to grade III and within 3-9 years are defined for evaluating the FLN outcomes.

higher secondary level from varied socio-economic backgrounds across 28 States and 8 Union Territories (UTs)) along with the present learning deficit, it goes without saying it is going to be indeed a hercules task to achieve[3].

In this paper, we attempt to present the various aspects related to children's foundational literacy and numeracy and empirically analyse the determinants of FLN in terms of socio-economic, demographic and school level characteristics.. Based on IHDS 2011-12 dataset, our analyses of the fixed effect models suggest that households' educational background, socio-economic status, and the school choice play key roles in achieving the foundational literacy. Furthermore, a child's self-effort like homework hours (positively) and absenteeism in school (negatively) influence the attainment of foundational literacy and numeracy skills.

Role of Family

Family contributes to child's human capital formation in multiple ways- through inheriting genes, providing better conducive environments from pre-birth to childhood. Researches show that pre- birth (effect of low birth weight on test score; Currie and Hynson,1999) to early childhood interventions (childhood environment have strong impact on educational attainment; Currie and Almond, 2011) play major role in children learning outcomes through the development of cognitive as well as non-cognitive skills (Fironi& Keane et al ,2014). The early emergence of skill gaps might be interpreted as the manifestation of genetics. Turkheimer et al. (2003) show that estimated heritability is higher in families of higher socioeconomic status (SES). Genes need sufficiently rich environments to fully express themselves and deprivation or resource constraints restricts the genetic development. Thus, genes are important, but skills are not solely genetically determined. Smart parents earn more, achieve more, and have smarter children. Further, higher levels of parental permanent income are positively associated with higher levels of educational attainment, through the channels of better awareness, better peers, better networks, more engaged parenting, and better schooling etc. Educational aspiration also differs across socio-economic strata and reflects in various educational decisions related to pre-schooling, age at entry in schools, school choice, fertility choice, participation in private tuition etc, which all promote quality learning. The delay in the age of starting school has been found positively associated with the learning outcomes at the lower levels but vanishes with the successive higher grades (Lubotsky and Kaestner, 2016). However, the difference in learning outcomes is largely attributed to home endowments effects i.e., the pre-acquired skills of children in their respective homes (Zhang, Zhong and Zhang, 2017). Furthermore, concept of quality-quantity tradeoff, related to thenumber of siblings, or the number of children in the households, often negatively affects the intellectual development (Downey, 2001) and educational outcomes (Feng, 2020) due to shrinking of per capita availability of resources. In such a scenario, girls bear relatively more deprivation of educational resources than boys and have lower educational outcomes, as commonly evident in India (Ruther and Kahn, 2016). The parents belonging to higher socio-economic status are more likely to provide private tutoring to their children (Kumar and Roy Chowdhury, 2021), which is likely to contribute towards their learning outcomes (Dongre and Tewary, 2015). To sum up, parents with higher socio-economic status are endowed with other enabling factors which contribute towards the cognitive development of children directly and indirectly and in turn influences their learning outcomes.

[3] Source: UDISE+ 2021-22. The enrolment data excludes Anganwadi pre-primary enrolment in ECCE centres and privately run kindergartens.

Role of School Accountability and Autonomy

A positive difference in learning outcomes is evident if the stakeholders are held accountable. Koning and van der Weil (2012) in their study find that once school quality scores are published, the lowest ranked schools attempt to improve performance substantially through targeted improvement in the selected parameters on which schools' rankings are calculated. But in such cases, pedagogy learning often suffers neglect; as the schools start focusing on those areas which are considered for meeting the given targets/standards in schools by shifting more teaching hours to high stake subjects. Reback et al, (2014) find the positive impact of diverting such resources on high-stake subjects (targets/goals) but surprisingly, they don't find a significant reduction in the children's performance in non-high-stake subjects/non-targets in Unites States. Although it is argued that autonomy gives necessary freedom to educational institutions to utilize its resources in an efficient way. But if an external evaluation system is imposed, schools tend to divert their scarce resources on those testable parameters, not necessarily through only academic interventions, but through rent seeking and other non-monetary manipulations to achieve higher ranking of the respective schools. In such cases, school's functionality seems similar to private coaching centres. On the positive side, accountability has substantial positive effects on low performing students because schools cannot afford to largely neglect those students as their performances also matter (in pushing up the average performances) in meeting the ranking/performance of the schools (Reback, 2008). So, it can be conceptualized that fixing accountability and giving autonomy to schools to manage their resources lead to better performance at least in the short run. In Indian case too, private schools enjoy more autonomy than government schools, and are accountable to parents. Because of the risks of losing students to some competing schools, they do take extra attention to the academically poorer students and thus they tend to have higher learning outcomes (NCERT, 2015).

Teacher/ Mentor Role

There is a strong body of experimental evidence based on the critical role of parenting supplements, including mentors and teachers, in shaping the skills and the learning of students. Given that a school going child spends a considerable amount of active time in school, the role of teacher as a mentor is enormous influence in shaping students' character, imagination, knowledge, wisdom, and vision. The role is much more important in the primary schooling as compared to the higher levels. Apart from his (her) academic role in imparting cognitive skills through sharing knowledge, information, passion for learning, imagination etc. a fruitful teacher-student associations inside and outside the class are very effective mechanisms to impart noncognitive skills like discipline, diligence, integrity, confidence, showing up the work, cooperation, peer competition, determination towards the completion of any tasks etc. Rivkin et al. (2005) find a significant negative effect of inexperienced Mathematics teachers, and a smaller negative effect for English teachers on the respective subjects' learning outcomes. Similarly, Singh and Sarkar (2015) find teachers' qualification, attitude towards schools, and teaching practices such as regular checking of books are more effective in raising students' performance rather than teachers' experience, gender and content knowledge. Thus, the methods on which a lecture is delivered matter more than the knowledge of teachers. Chetty et al (2014b) find that pupils taught by highly effective teachers earn more, are more likely to go to university. Successful interventions like quality class room delivery, ensuring students' classroom participation etc. are more than just subsidies to the children belonging to disadvantaged families. ASER report, 2011 also suggests that discussion with students with local language, including the local examples etc. invoke attention and improve their

understanding of the subjects (Pratham, 2011). In our analysis we have taken two proxy variables which would capture to a large extent the teachers' role that may have impact on children learning achievement. However, the data limitation does not allow us to consider many of these indicators just discussed. Firstly, the participation of children in parents-teacher meeting (PTA) is an effective learning tool, where a teacher discusses the child's performance with parents and make comments and suggestions to children as well as to the parents. Secondly, students often get demoralized in terms of class room bias, abusive or derogatory teachers' remarks etc., which may have a negative impact on the child's learning outcomes.

Pupil Effort

Pupil own 'effort' is a reflection of commitment towards the study and is a determinant of co-producing human capital. The self-commitment on tasks is related to the psychological traits, particularly conscientiousness, with the related traits of self-control, and a strong work ethic (Heckman, 2006). But these traits are not observable, so measuring such qualitative dimensions are rather difficult. In quantitative term, the time allocation of a child on study is mostly used as a proxy measure for their academic effort through the variables like homework hours per week and regular school attendance etc. In the field of economics of education, most of the studies and reports in India have focused on the universal enrollment in elementary education, school choice and expenditure on education. Contemporary literature has also focused on the impact of a single policy instrument on literacy skills or academic achievement, like, private tuition, gender, school choice etc. as mentioned in the previous section. In this light, the present study focuses on a wide range of factors influencing the foundational literacy in terms of reading and numeracy skills of children by using rigorous econometric methodology. The study will evoke some critical thoughts for policy intervention.

2. Data Source and Methodology

The study is based on the secondary data from the Indian Human Development Survey – second round 2011-12 (IHDS-2, Desai et al 2018) database . The IHDS is unique dataset which provides information of various socio-economic and demographic dimensions of 42152 households (204,569 individuals) regarding human development with modules on health, education, economic status, occupation, social capital, gender relations, marriage, and fertility. The school children in the sample of 8-11 years old who are supposed to be in class III to VII in general are considered in the analysis. The IHDS measures the mathematics and reading and writing level of children between aged 8 to 11. From these age cohort, IHDS -2 has tested reading level and mathematical skills of 10551 and 11786 children respectively. For reading level, it takes five categories - don't recognize letter (0), recognize letter (1), reads words (2), read paragraph (3) and read story (4). In case of Mathematics level, it takes four categories- don't recognize number (0), recognize number (1), do subtraction (2), and do division (3). Here the scale has been treated as continuous and termed as Xi. For example, if a child has score zero (0) in reading outcomes i.e., he doesn't recognize letter, then Xi = 0. The same process is adopted for mathematical outcomes. Then, the learning score of children has been normalized, by the formula, $Zi = (Xi - \mu)/\sigma$. Thus, the obtained standardized Z score is treated as the dependent variable in our analysis. We have performed the applied Ordinary Least square (OLS) and the same with state and school level fixed effects.

$$Z_{ijk} = (\boldsymbol{\beta X})_{ijk} + e_{ijk} \ \ldots\ldots (1)$$

Where $Z_{ijk}$is the standardized learning score, X_{ijk}isthe vector of various individual, family and school characteristics, and $e_{ijk}$is the residual terms of i^{th}student in the j^{th}school of the k^{th} state.

Normally, when dealing with stratified data as in the case of India, and considering the hierarchical structure of the data, the eq. (1) can be written as

$$Z_{ijk} = (\boldsymbol{\beta X})_{ijk} + Sch_{jk} + St_k + e_{ijk} \ldots\ldots(2)$$

where Sch_{jk} and St_k capture the control for the fixed effects corresponding to the j^{th} school of k^{th} state.$(\boldsymbol{\beta X})_{ijk}$ and e_{ijk} are same as in eq. (1). The eq. (2) can be estimated through fixed effect or random effects[4] models. Multilevel regression generally corrects the standard errors and efficiently weights the between and within variation to estimate the effects based on the residuals within and between individuals. In other words, the variation between students can be divided in terms of variation between schools, between states and residual variation to control for the observed heterogeneity at those cluster levels. Thus, the distribution of e_{ijk} would be much narrower in eq. (2) than in eq. (1). OLS regression in such cases gives biased standard error because of not taking account of clustering of observations at various level. The problem of multilevel model is that it does not consider that variation between clusters/groups and unobserved confounding variables. On the other hand, fixed effects model addresses the unobserved (time invariant) confounders and not the time-varying unobserved confounders. So, we estimate the both model and applied the Hausman test to decide the appropriate model between the afore mentioned two models.

3. Descriptive Results

Table 1 presents the descriptive results of FLN in terms of reading and arithmetic skills of children across the various socio-economic characteristics. Clearly, percentage of children who can only read paragraph or story or can only perform subtraction or division are 52 and 45 percent respectively at the national level. However, this proportion reduces to 37 percent in case of those children who have achieved the foundational literacy (captured by the combined achievement of both the skills). Now, it can also be observed that the proportion of children having basic skills of reading is larger than the proportion of children having basic skillsof arithmetic across the disaggregate samples, under the various socio-economic parameters, except for the other minorities. Further, along the disaggregated samples, the disparity lies across all the attributes considered here. In case of gender, on average, 53 percent of the male children can read paragraph or story which is 2 percent more than same from female. This figure is marginally increased for arithmetic and overall learning skills. Furthermore, learning differential is more drastic across the rural-urban, social, economic, educational level of households and type of schools of the children. For example, 32 percent of the children in rural area have achieved the foundational learning level as compared to 52 percent in the urban counterpart, i.e., difference of 20 percentage points. Now, turning to the income groups, the learning level of the children are observed to be monotonically increasing with income. Similar pattern can be witnessed across the social class (except other minorities) and by education level of the highest educated person in the household (HHEA). More distressing situation can be seen for the STs and the illiterates, where one out of four and one out of five children have respectively achieved the foundational literacy skills. Lastly, despite that the children of private schools have better performance than the government counterpart, one-third of the children

[4] The model's nomenclature varies in different fields of studies such as hierarchical lineal model, multilevel models or mixed effect models etc.

cannot read the paragraph or story well and half of them can't do both basic reading and arithmetic calculations in the private schools.

Table 1: Proportion of students having literacy and arithmetic skills

Characteristics		Reading	Arithmetic	Both
Sex	Male	53	48	40
	Female	51	43	35
Region	Rural	47	40	32
	Urban	65	61	52
Income	Poorest	42	34	28
	Poorer	49	38	32
	Middle	54	49	40
	Richer	59	54	44
	Richest	70	67	59
Social Groups	ST	40	29	24
	SC	45	39	31
	OBC	52	46	37
	General	63	57	49
	Others	45	53	32
Education of highest educated person in the household (HHEA)	Illiterate	31	25	19
	≤ primary	43	34	27
	Secondary	55	48	39
	H. Sec.	67	59	51
	HE	76	75	67
School Types	government	45	39	31
	private	66	59	51
India		52	45	37

Source: Authors' calculation from IHDS-II 2011-12. All the estimates are calculated by applying appropriate sample weights given in the dataset. The variable 'Others' - includes those who did not report religion or caste.

4. Results and Discussion

The fixed effect regression results presented in table 3 shows the factors associated with foundational literacy in terms of reading and arithmetic skills estimated through fixed effects models[5]. For analytical clarity, the results of OLS and multilevel regressions are also presented in appendices (tables 4 & 5) that slightly vary from our fixed effects models. Now turning to the observed control variables, most of the coefficients are significant and their signs are as per our expectations. However, a few exceptions are income and SC class. Among the significant factors, 1 percent increase in the educational expenditure is associated with .157 standard deviation (SD) in overall literacy achievement of a child and approximately half of this amount in reading and numeracy levels. Obviously, the contribution of income variation towards the achievement of foundational skills is largely subsided by the inclusion of educational

[5]The selection of fixed effects model has been taken on the basis of the Hausman test as well as relatively unbiased nature of fixed effects model.We have estimated the multilevel and fixed effects and applied Hausman test considering only schools as group for the overall literacy, reading and numeracy skills; the Stata software didn't provide the results of Hausman test for two or higher dimensions models. The Hausman test statistics for overall, reading and numeracy are 45.3 (p value=.008), 57.5.7(p value=.002), 53.8(p value=.001) respectively rejecting the multilevel regressions in favour of fixed effect models.

expenditure. The concerned variable captures the affordability of the parents towards various supplementary inputs pertaining to the learning outcomes of the children (discussed in the earlier section). The increasing number of children in a family tends to reduce the learning outcomes due to the competition of resources, as dictated by the quantity-quality tradeoff. Moreover, the years of schooling of the highest educated person in a household demonstrates positive and higher magnitude of association with literacy skills than any other covariates, and it is more predominant in the case of reading skills than the numeracy level. Along the caste categories, a child belonging to OBC and General categories have higher literacy skills than a comparable child from ST background. Furthermore, the caste hierarchy seems to be more inducive in the achievement of acquiring arithmetic skills of children. The finding of gender-based variations in learning outcome as mentioned is not significant in the overall literacy and reading score but lower than the male in only arithmetic score. White et al (2010) also finds significant difference in mathematical outcome at higher level of assessment (subtraction and division) in IHDS-I which is partially supported in our analysis.

Table 2: Determinants of foundational literacy & numeracy

Z score	Literacy & Numeracy		Reading		Math	
	Coef.	P>t	Coef.	P>t	Coef.	P>t
Log per capita income	.012	.42	.009	.46	.005	.74
Log educational expenditure	.157**	0.00	.086**	0.00	.074**	0.00
No of children	-.073**	0.00	-.024*	.037	-.02#	.07
EHHEA (None@)						
Primary	.196**	.002	.139**	.001	.056#	.1
Secondary	.329**	0.00	.197**	0.00	.133**	0.00
Higher secondary	.48**	0.00	.272**	0.00	.214**	0.00
Higher Education	.666**	0.00	.334**	0.00	.33**	0.00
Social groups (ST@)						
SC	.028	.83	-.009	.90	.039	.58
OBC	.25*	.035	.097	.13	.152*	.017
General	.288*	.021	.136#	.07	.15*	.016
Others	-.112	.65	-.049	.72	-.064	.70
Female	-.07	.24	-.008	.79	-.062#	.057
Age at entry in school	-.065**	.002	-.037**	.009	-.029*	.026
Private coaching (yes)	.208**	0.00	.056#	.067	.149**	0.00
Current age	.099**	0.00	.047**	.001	.052**	.002
Class/grade/standard of a child	.344**	0.00	.185**	0.00	.159**	0.00
Type of school (Government @)						
Private school	.268*	.038	.131*	.037	.131#	.07
Others	-.367*	.026	-.236*	.035	.139#	.057
School hours/week	.003	.53	-.001	.96	.002	.18
Caste biased behaviour of teacher	-.255**	.005	-.156**	.003	-.01*	.043
Attends Parents-teacher meeting	.103#	.087	.044	.26	.059*	.027
Medium of instruction (Hindi@)						
English	.114	.25	.016	.69	.103	.12
Other regional languages	.253#	.074	.074	.31	.183*	.03
Home works hours/week	.021**	.001	.008*	.02	.013**	0.00
Absentee per month	-.019*	.039	-.012*	.02	-.007*	.01
Constant	-3.78**	0.00	-1.83**	0.00	-1.97**	0.00
Fixed Effects (state Level)	Yes		Yes		Yes	
Fixed Effects (school Level)	Yes		Yes		Yes	
R-sq.	.46		.56		.57	
F(25,30)	6074		2279.2		1776	
Within R sq.	.23		.19		.18	

Observations	7504	7549	7515

Source: Authors' calculation based on IHDS II database,@ reference group, **p>.01, *p>.05, #p>.1
Note: (1) standard errors are clustered robust at the state and the school levels. (2) (HHEA) is the highest education person in the household. (3) The coefficient of urban category is not retrieved due to non-variation of rural/urban residence of children of a school. (4) Others category in school type includes Madarssa and Other open learning cenrtes; in social class, it includes those who don't reported specific religion or caste.

The negative and significant sign of *age at entry in school* across all the three models (literacy & numeracy, reading, and maths) shows embedding of FLN is lesser for children starting late than in the early age, i.e., the earlier the children getting to school, have better mathematical learning than starting late. In India, this may be attributed to the delayed school entry of children with poor endowment of pre-acquired skills. Attaining FLN skills is critical to early age interventions as the critical growth of brain takes place at the very early age of a child. Thus, a conducive environment at the pre-school stage is critical for the growth of congnitive and comprehensive ability of a child. A significant stand of literature thus advocates for the outside residence preschool interventions as an enabling impetus and claim that comprehensive learning outcomes in introductory reading, writting and maths are significantly better with preschool training than without that (Murlidharan and Kaul 1999; Laosa and Ainsworth 2007). The New Education Policy 2020 also shares the similar concern and advocates the attainment of FLN skills at the dearly age and emphasizes the mandatory preschool training of children towards the attainment of FLN target. However, this finding is contrary to the findings of Lubotsky and Kaestner (2016) and Zhang, Zhong and Zhang (2017). . A children participation in private tuition or coaching is found to have a positive bearing on literacy skills and its magnitude is almost thrice in numeracy than reading skills. This result confirms the findings of Dongre and Tewary (2015) based on ASER dataset. Further, class or the years of schooling of the children is positively related with the learning outcomes and is found to be more effective in the reading level. It means the children gradually achieve the foundational literacy with more years of schooling. As expected, studying in the private schools is more fruitful in terms of learning outcomes than that from the public schools. It should be rationalized with not only school autonomy, rigorous curriculum, better teaching methods, stringent class hours with lesser teachers' absentee along with the better infrastructure of the private schools. Hence, higher association in reading score may be accounted for school autonomy. The finding that children studying in private schools are reflecting better achievement in all three models is consistent with the study by (Kingdon, 2007). It is not puzzling that school hours do not significantly contribute to the learning levels, though its sign is consistently negative in all the models. This result seems plausible and may be largely attributed to poor quality of schooling in India, especially the government schools. In this context, The Delhi Government introduced the *'Chunauti*[6]*'* scheme in 2016, to reduce the drop out and improve the learning outcomes of children belonging to the grade 6 – 8. The scheme is argued to substantially improve the fundamental literacy and numeracy skills of the children in Delhi government schools in the following year (Aiyar et al.,2021). Furthermore, a teacher caste based biased attitude towards a child adversely affects the learning outcomes. Since such children may feel humiliation and may get demotivated towards study. On the other hand, a child participation in PTA is positively associated with overall literacy achievement though it is insignificant in the reading

[6] Students are divided into groups on the basis of the learning abilities. Those who can read and write Hindi and English, and solve mathematical problems and those who cannot. The weaker students are provided with special classes, in govt and MCD schools.

level. Again, turning to medium of instruction, surprisingly children studying in the regional language have better mathematical achievement than those from Hindi medium students. The variables – monthly home work hours and absenteeism per month are taken as proxy measure of a child's own efforts and are found to be positively contributing to the learning outcomes; greater home works hours per week significantly contribute to learning level and absenteeism in school (in a month) hampers reading outcomes. However, these two variables may be influenced by parental pressure which remains outside of scope of the paper.

5. Conclusion

Foundational literacy is the base of the human capital formation. There is a dire need to address this issue for gearing the knowledge economy, as it is critically important in shaping a country's growth and development. In addition, the socio-economic disparity in learning outcomes is also against the principle of equity, which is enshrined in the directive principles of India's constitution and is set as a goal for UN's Sustainable Development Goals (SDGs).In this paper we examine the determinants of attaining foundational literacy skills of the children in India by using the second round of India Human Development Survey (IHDS II) data base. The findings of fixed effect models suggest that family's educational background, socio-economic status, and the school choice play key roles in achieving the foundational literacy in terms of reading and numeracy skills of a child. Furthermore, a child self-effort like homework hours (positively) and absenteeism in school (negatively) influence the attainment of foundational literacy. Government of India is mandated to deliver free education to every child within the 6 to 14 years of age through the introduction of Right to Education Act, 2009. India has shown a steady and impressive progress towards universal school enrolment. However, several national and international documents have reflected a grave concern regarding the learning crisis in the Indian school education. The change in thrust from quantity of schooling (in terms of mandatory enrolments) to quality of delivery (in terms of comprehensive learning outcomes) has induced both the central and state governments to explore various innovative mechanisms that can improve the quality of delivery of the government schools. The New Education Policy (NEP) 2020 has acknowledged the learning deficit and thereby outlined the goals of achieving foundational literacy and numeracy as *'An Urgent & Necessary Prerequisite to Learning'.* and has drawn an innovative framework to achieve this goal. This is also in the line to integrate the Sustainable Development Goals – specially the agenda 2030 and, in particular, aligning with the SDG 4, which envisaged inclusive and equitable quality education and conducive environment for promoting human development for all. The Ministry of Education of the Government of India has introduced the National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN-Bharat -2021 programme) to formalize the guidelines and targets towards the achievement of universal FLN to standard III level children by 2026-27. Given that the schooling system in India is one of the largest in the world (with more than 1.49 million schools, 9.5 million teachers, and over 265 million students of pre-primary to higher secondary level from varied socio-economic backgrounds and along with the present learning deficit, it goes without saying that it is going to be indeed a daunting task. However, it would depend on how effectively NEP 2020 will be implemented and to what extent the infrastructure and teaching quality of the schools get improvised. The role of DIKSHA (Digital Infrastructure for Knowledge Sharing) which is a nationwide digital platform for Indian scooling system is critically important in this regard. Moreover, the recommendations laid down by the FLN guidelines in terms of sensitizing the parents in terms of prioritising FLN, constructive interactions, information dissipation, coordinations among the stakeholders and policy makers are also some important interventions to be simultaneously pushed to achieve

the FLN outcomes. The emphasis on quality monitoring and improvement of the monitoring tools to track the quality of classroom delivery, redesigning the teachers' training and capacity building programmes and evaluating the efficacy for quality teaching are some important steps in this direction.

The paper has certain limitations. The dataset is a decade old but still relevant because the successive ASER reports have consistently reflected a sluggish improvement in the learning outcomes of the children despite various government interventions including RTE, SarvasikshyaAvighyan, Mid-Day Meal etc., to scale up primary schooling. Further, we could not incorporate some additional school characteristics, while merging the school facilities schedule. Merging it with individuals file would have resulted in further loss of observations. So, we relied on school level fixed effects model to address the unobserved heterogeneity.

Appendices

Table 3: Sample statistics

Characteristics		Mean / proportion	std. error	95% Class Interval	
Z score in arithmetic		0.028	0.011	0.007	0.049
Z score in Read skills		0.057	0.011	0.036	0.078
Log of PCI		9.41	0.01	9.39	9.43
Log of Edu. Exp.		7.12	0.016	7.09	7.15
No of children (0-14 years)		2.91	0.015	2.88	2.94
Education of highest educated person in the family	Illiterate	19.5	0.4	18.7	20.2
	Primary	15.7	0.37	15	16.4
	Secondary	39.6	0.49	38.6	40.5
	Higher Secondary	11.9	0.33	11.3	12.6
	Higher Education	13.4	0.34	12.7	14.1
Social groups	ST	8.7	0.28	8.1	9.3
	SC	23.4	0.43	22.6	24.2
	OBC	41.9	0.5	40.9	42.9
	General	25.2	0.44	24.3	26.1
	Others	0.9	0.09	0.7	1.1
Urban		0.3	0.005	0.29	0.31
Female		0.477	0.005	0.467	0.488
Current age		9.51	0.012	9.49	9.54
Age at entry in schools		4.87	0.012	4.84	4.89
Private coaching		0.224	0.004	0.216	0.233
Class/standard of child		3.54	0.016	3.51	3.58
Home works hours per week		7.84	0.06	7.72	7.95
Class hours per week		32.93	0.083	32.77	33.09
Absentee in month		3.41	0.051	3.31	3.506
Teacher Caste Bias		0.081	0.003	0.075	0.087
Attends PTA		0.44	0.005	0.43	0.45
Type of schools	Government	62.8	0.49	61.9	63.8
	Private	35.7	0.48	34.8	36.7
	Others	1.5	0.12	1.2	1.7
Medium of Instruction	Hindi	50.8	0.5	49.8	51.8
	English	17.6	0.38	16.9	18.4
	Other regional languages	31.6	0.47	30.7	32.5

Source: Authors' calculation from IHDS II database

Table:4 Determinants of learning outcomes- OLS model

Z score OLS	Literacy		Reading skills		Numeracy skills	
	Coef.	P>t	Coef.	P>t	Coef.	P>t
Private coaching (yes)	.223**	0.00	.082**	0.00	.139**	0.00
Log per capita income	.044*	.022	.006	.61	.040**	0.00
Log educational expenditure	.181**	0.00	.091**	0.00	.092**	0.00
No of children	-.073**	0.00	-.038	0.00	-.035**	0.00
Highest educated person in Households (None@)						
Primary	.264**	0.00	.190**	0.00	.074**	0.00
Secondary	.463**	0.00	.276**	0.00	.186**	0.00
Higher secondary	.723**	0.00	.395**	0.00	.328**	0.00
Higher Education	.828**	0.00	.435**	0.00	.390**	0.00
Social groups (ST@)						
SC	.150*	.019	.032	0.4	.118**	0.00
OBC	.242**	0.00	.116**	0.00	.125**	0.00
General	.310**	0.00	.134**	0.00	.175**	0.00
Others	-.221	.153	-.143	0.16	-.078	.4
Urban	.019	.61	.014	0.52	.004	.9
Current age	.125**	0.00	.062**	0.00	.062**	0.00
Age at entry in school	-.073**	0.00	-.037**	0.00	-.036**	0.00
Female	.050	.117	.006	0.73	-.055**	0.00
Class/grade of a child	.323**	0.00	.170**	0.00	.153**	0.00
Type of school (Government @)						
Private school	.379**	0.00	.234**	0.00	.141**	0.00
Others	-.113	.443	-.135	.11	.022	.8
School hours/week	-.004#	.066	-.003*	.02	-.001	.4
Caste biased behaviour of the teacher	.219**	0.00	-.171**	0.00	-.052**	.1
Attends parents-teacher meeting	.155**	0.00	.066**	0.00	.088**	0.00
Medium of instruction (Hindi@)						
English	-.095#	.076	-.156**	0.00	.062#	.1
Other regional languages	.153**	0.00	.035	.13	.117**	0.00
Home works hours/week	.023**	0.00	.008**	0.00	.015**	0.00
Absentee per month	-.027**	0.00	-.018**	0.00	-.009**	0.00
Constant	-4.51**	0.00	-1.9**	0.00	-2.36**	0.00
F	F(26,8685) = 220.2		F (26, 8727) = 160.8		F (26, 8692) = 182.5	
R2	.34		0.29		.31	
Observation	8712		8729		8719	

Source: Authors' calculations based on IHDS II database, @ reference group, **p>.01, *p>.05, #p>.1

Table 5: Determinants of foundational literacy & numeracy-multilevel model

Z score	Literacy		Reading skills		Numeracy skills	
	Coef.	P>t	Coef.	P>t	Coef.	P>t
Log per capita income	.017	.315	.002	.85	.017	.134
Log educational expenditure	.173	0.00	.091**	0.00	.082**	0.00
No of children	-.073	0.00	-.038**	0.00	-.035**	0.00
EHHEA (None@)						
Primary	.224**	0.00	.158**	0.00	.066*	.029
Secondary	.443**	0.00	.254**	0.00	.190**	0.00
Higher secondary	.672**	0.00	.362**	0.00	.317**	0.00
Higher Education	.822**	0.00	.408**	0.00	.416**	0.00
Social groups (ST@)						
SC	.071	.613	.027	.51	.044	.276
OBC	.255#	.065	.129**	0.00	.124**	.001
General	.238#	.089	.121**	0.00	.114**	.006
Others	-.120	.489	-.072	0.50	-.053	.615
Urban	.090	.145	.034	.19	.052*	.041
Female	-.057#	.062	.002	.91	-.058**	.001
Age at entry in school	-.065**	.001	-.037**	0.00	-.027**	.003
Private coaching (yes)	.155	.001	.045#	.1	.109**	0.00
Current age	.110**	0.00	.052**	0.00	.058**	0.00
School class	.337**	0.00	.180**	0.00	.157**	0.00
Type of school (Government @)						
Private school	.367**	0.00	.203**	0.00	.164**	0.00
Others	-.169	.133	-.175*	.04	.009	.917
School hours/week	.001	.98	-.001	.47	.001	.487
Caste biased behavior of the teacher	-.199**	0.00	-.142**	0.00	-.062#	.078
Attends parents-teacher meeting	.140**	.001	.061**	.004	.079**	0.00
Medium of instruction (Hindi@)						
English	.060	.443	-.023	.57	.080*	.033
Others	.369**	0.00	.16**	00.00	.206**	0.00
Home works hours/week	.020**	0.00	.007**	0.00	.014**	0.00
Absentee per month	-.022**	0.00	-.014**	0.00	-.009**	0.00
Constant	-4.27**	0.00	-1.93**	0.00	-2.11**	0.00
Unobserved random effects						
State level S.D	.347	.075	.164** (ICC$ = .039)		.22** (ICC = .0758)	
State /School level S.D	.569	.032	.319 **(ICC = .179)		.303**(ICC = .196)	
S.D. (residual)	1.33	.034	.772		.764	
Wald chi2(26)	220429		2847.4		2861	
Observation			8729		8694	
LR test of independence			383.4, p=0		464.2; p=0	

Source: Authors calculations based on IHDS II database, @ reference group, S.D.=standard deviation, **p>.01, *p>.05, #p>.1

Note: (1) $ICC is intra-class correlation (ICC) at school and state levels that shows the proportional variation in $\boldsymbol{Z_{ijk}}$ due to school and state level unobserved heterogeneity respectively. ICC is measure of reliability of clusters and can be defined as ICC (state level) $=\frac{\boldsymbol{state\ level\ variance}}{\boldsymbol{total\ variance}}$. The likelihood ratio (LR) test clearly rejects the OLS model in favour of hierarchical linear models (p>chi2=0) in both cases. The moderate vales of intra-class correlation (ICC) of variances also indicate more suitability of MLM models. The values of ICCs show 16.4 (22) percent and 17.9 (30.2) percent variation in reading outcomes (arithmetic) is attributed to state and school level unobserved heterogeneity respectively. Thus, it is indicating stronger influence of school level unobserved factors (pupil teacher ratio, quality of teacher and school infrastructure which are not included in models) than that from the state level.

(2) Cluster robust standard error at the state level,

(3) Others category in school type includes Madarssa and Other open learning cenrtes; in social class, it includes those who don't reported religion or caste.

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