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Private School Growth and Universal Literacy in India – A Panel District-Level Analysis

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Abstract: Starting in the early 1990s, there has been a rapid growth of private schooling in India. However, the implications of school privatisation for universal education (in terms of universal literacy) as well as gender gaps in literacy, corollaries of two of the key millennium development goals, MDGs), have not yet been examined. Using district-level panel data for the period 1992-2002, this paper aims to bridge this gap of the literature. While higher share of recognised private unaided schools boosts levels of literacy, other things equal, it is also associated with lower gender gap in literacy, especially at secondary levels. It is argued that the latter could be attributed to unobserved preferences of parents who choose to send both boys and girls to private schools at the secondary level.

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Key words: Poverty, Public Infrastructure, Quality of government schools, School Privatisation, Universal education, Gender Bias, Upper primary and secondary level of schooling.

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1. INTRODUCTION

In an era of stagnating public budgets for education (as well as other accounts), private financing of education has gradually gained increased importance across the world. While the state sector still dominates the schooling market in India, an important feature of the 1990s was a significant growth of private schools in India (PROBE, 1999; Muralidharan and Kremer 2008; Kingdon, 2007; Desai et al. 2008). This has given rise to a policy debate as to whether growth of private schools could be compatible with universal education (Tooley, 2004; Watkins 2004). There is however very little direct evidence about the possible effects of school privatisation on universal education in India. To a large extent, this can be attributed to the lack of reliable official data on private schools (recognised and/or unrecognised) in India. Most available studies focus on relative effectiveness of private and government schools using information from small scale surveys in particular regions of India. For example, Kingdon (1996) found that students in private unaided (PUA) schools performed significantly better than in government schools in urban Lucknow district, after controlling for student background and sample selectivity. Bashir (1994) indicated that students in PUA schools had better Mathematics achievement, but less achievement in Tamil language, compared to government school students in Tamil Nadu.[1] Using recent IHDS and ASER data from

[1]Many PUA schools emphasise English or specialise in English as a medium of instruction, and thus may have fewer hours devoted to Tamil teaching. There is however no consensus in the literature about the effect of school type on school quality. For example, for Indonesia Newhouse and Beegle (2005) found that

major Indian states, Desai et al (2008) and French (2008) respectively found that among children from the same household, i.e., who are likely to share similar characteristics in terms of ambition, ability and motivation – those who attend private school performed better in language and maths than those who attend government school. Two further studies have analysed the causes of private school growth at a broader level. Considering a nationally representative sample from major Indian states, Muralidharan and Kremer (2008) argued that private schools are more likely to be set up in areas where state schools are failing. Using PROBE data from five north Indian states, Pal (2008) found that private schools are more likely to be present in villages with better off households and better infrastructural facilities.

The present paper goes beyond this existing literature. Using a two-period district level data-set for 1992 and 2002 from 17 major Indian states (compiled from various official sources), we examine the link between private schooling growth on the one hand and universal education (measured by literacy rates) and the associated gender gap, on the other, two of the key millennium development goals (MDGs). In doing so, we focus our attention on children aged 10-19 years old. We also consider the difference, if any, between the upper primary school aged children (10-14 years old) and the secondary school aged children (15-19 years old) in this respect.

Our analysis focuses primarily on three arguments. First, the rise of private schools in a district has been argued to be a response to the poor quality of local government schools (a la Muralidharan and Kremer, 2008; also PROBE, 1999). Our first

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students from public secondary schools perform better than comparable privately schooled students but Bedi and Garg (2000) argued that graduates of private secondary schools perform better in the labour market in the same country.

hypothesis thus accounts for the possible effects of government schools quality in the district. In particular, in the light of available information we examine the effects of proportion of female teachers and vacant teaching positions in local government schools on shares of private schools in the district at different levels of schooling (primary, upper primary and secondary). Given that there is no prior as to how these teaching inputs could affect rate of privatisation, it remains an open empirical question that we explore in the paper. Similarly, we consider the possible effects of government school non-teaching inputs including type of government school building (pucca or not) and school's access to drinking water on the shares of private schools in the district. The effect may however vary somewhat according to the level of schooling; e.g., presence of female teachers in government schools may be more beneficial at a lower level of schooling. Second, we explore the role of local public infrastructure in the rise of private schools in a district (a la Pal, 2008). The underlying idea is that the presence of certain local public infrastructure may encourage the rise of private schools in the district, as it saves on private school production costs, boosting the profitability of private capital. Following Pal (2008), we thus hypothesize that the share of private unaided schools will be higher in districts with more infrastructural facilities. In this respect, we consider a district's access to public transport (e.g., access to bus, railways and navigable water) as well as public communication (e.g., access to post, telegraph and telephone) services, and assess their possible effects on growth of private unaided schools. Finally, unlike government schools, affordability is a key consideration if parents are to choose fee-paying private schools (as against tuition-fee free state schools) for their children. Thus the poverty or prosperity of the district may play an important role; in particular, we envisage that the

share of private schools at any given level (upper primary, secondary) will be lower in poorer districts, those characterised by higher poverty head count ratio.

More importantly, other things being equal, we analyse the implications of the presence of private schools for universal education. Privatisation could affect literacy through affecting demand and/or supply. On the one hand private schools are directly accountable to parents and children and could thus solve the incentive problems commonly present in the management of government schools (incentive effect). On the other hand, greater efficiency of private schools may be linked to unobserved characteristics of students attending private schools (selection effect). The pertinent issue here is to explore whether an increased share of private unaided schools could boost literacy for all in the aggregate (at the district level). If it did not, then in a sense private school growth fails to be compatible with the objective of attaining universal literacy by 2015 – a tacit corollary of the education related Millennium Development Goal. In principle, private school growth could either raise or lower literacy rates, or indeed have no effect on literacy. It may raise literacy if private schools impart higher learning than government schools, as has been supported by some micro-level studies. It may lower literacy rates if the presence of private schools causes the closure of or deterioration in the quality of government schools. If, however, the positive and negative effects of school privatisation cancel each other, the total effect could even remain insignificant. If, for example, those who choose private schooling are relatively better-off and/or more motivated towards schooling and would have become literate even in the absence of private schooling (e.g. via enrolment in government schools with/without private tuition), privatisation would not have a significant impact on literacy rates.

A related issue is the implication of school privatisation for gender bias in literacy rates. This is particularly important for a country like India where pronounced gender difference in literacy persists well into the Millennium, especially in the large north Indian states like Bihar, UP and Rajasthan. Private school growth could potentially have an adverse effect on gender difference in literacy rates if there is pro-male gender bias and parents (especially those who are resource constrained) choose to send boys to private and girls to government schools. There is however no existing evidence that suggests parental wealth is associated with gender difference in literacy in India (e.g., see Pal, 2004). In fact, the literature highlights the altruistic nature of parental preferences (e.g., see Becker, 1981). Accordingly, one could argue that parents who choose to send their children to private schools are also more likely to send both boys and girls (also see Kingdon 2005), especially when parents send both boys and girls to secondary schools. If the unobserved preferences of parents who choose to send their children to private schools is associated with a preference for lower gender difference, then greater privatisation could be associated with lower gender bias in literacy. Whether the growth of private schooling has a negative, positive or neutral association with gender gap in literacy rates, even after controlling for other possible covariates, remains an open empirical question that we explore here.

Existing studies analysing different aspects of private schooling growth in India primarily use single cross-section data. Consequently, existing estimates are likely to suffer from unobserved heterogeneity among market participants (schools/parents/children), which in turn could lead to possible endogeneity bias. We attempt to generalise these findings using district-level panel data from 17 major states

over a period of 1992-2002. To do so, we link the all India school education survey (AISES) data (6th and 7th rounds, dated 1992 and 2002)[2] with the Indian Census (1991 and 2001). We address the relevant issues using a district fixed effects approach that allows us to net out the effect of any district-specific unobserved characteristics (i.e., time-invariant aspects of the district's culture, institutions, e.g., labour markets, and gender and caste relations) affecting district literacy rates (see further discussion in section 3).

The paper is developed as follows. Section 2 describes the data while section 3 explains the methodology. Results are discussed in section 4. The final section concludes.

2. DATA

Data has been compiled from various sources: This includes the Sixth (1992-93) and Seventh (2002-03) All India School Education Survey (AISES) data and also Census data (1991 and 2001). District-level AISES data cover information on the number of *recognised* schools (by management type, i.e., private/public, etc.), enrolment by gender and caste (scheduled castes, SC); scheduled tribes, ST), and characteristics of teachers (gender/caste), and physical facilities at primary, upper primary and secondary levels of schooling. 1991 and 2001 district-level Census data provide information on population composition (classified by gender/caste) and literacy rates for different age categories of the population (male/female and total), and access to various infrastructural facilities. We merge 1991 Census data with the 6th AISES to generate district-level information for 1992. Similarly, we merge 2001 Census data with 7th AISES data to generate the

[2] AISES data provides information on recognised schools only.

corresponding district-level information for 2002. This allows us to build up a two-period panel data for the period 1992-2002.

There are three broad types of *recognised* schools in India, namely, (a) government schools, (b) private aided schools (PA) and (c) private unaided schools (PUA) schools.[3] Government and aided schools are invariably 'recognised', i.e. they have the government stamp of approval. They are similar in many respects since aided schools are almost entirely financed by the government and have little control over staffing (hiring/firing), curricula, teaching materials and budget allocation. The main difference between government and PA schools is that the latter are nominally privately managed, though there could be some inter-state variation in the management of PA schools.[4] PUA schools can be recognised or non-recognised but either way they are more autonomous than aided schools and are totally self-funded. Recognised PUA schools differ from the unrecognised PUA schools in that students from the former can appear for board examinations since only recognised schools can be affiliated to an examination board[5]. Our analysis in this paper focuses on the recognised PUA schools in relation to the purely government schools. This is an unfortunate but an inevitable data limitation since there is no source that provides information on unrecognised PUA schools for all districts of

[3] In order to receive recognition, however PA and PUA schools must fulfil several requirements that are prohibitively expensive for many schools, especially those serving the poor (e.g., hold a sizeable cash bond with the government, provide sizeable playgrounds, etc.).

[4] For example, PA schools in UP have no control over hiring/firing of own teachers (who are appointed by the UP School Service Commission). In contrast, PA schools in Tamil Nadu have some autonomy to select and hire their own teachers.

[5] However, in most states, there are no board examinations at the primary of upper primary levels so there is no strong incentive for private schools to seek government 'recognition' except if the school wishes ultimately to become a secondary school and affiliate with an exam board.

India going back to early 1990s[6]. However, in general, there is likely to be a positive correlation between the share of recognised PUA schools and the share of all PUA schools (recognised and unrecognised) since districts that have more recognised PUA schools are also likely to be the districts that have more unrecognised PUA schools. In the rest of the paper whenever we refer to PUA or 'private' schools, we mean the recognised private schools only.

Table 1 compares the quality of PUA and government schools at the district level over the decade 1992-2002, using some commonly used quality measures. In general, PUA schools tend to have better infrastructure, e.g., pucca building, access to drinking water and toilets than government schools; however, government schools have significantly closed the gap in this respect over the decade. Compared to recognised PUA schools, Government schools however have significantly higher pupil-teacher ratio (more than double at the primary level) and the situation does not change much over the decade under consideration. Furthermore, recognised PUA schools employ a higher proportion of female teachers and also younger teachers who often do not have any teacher's training; there are also less vacant teaching positions in PUA schools. Thus despite significant government interventions to close the gap, input differences between recognised PUA and government schools tend to persist over the decade 1992-2002.

2.1. Growth of school privatisation

Using 6th and 7th AISES data, we first calculate the average share of recognised PUA

[6] Even the District Information System on Education (DISE) data collection exercise – introduced in the late 1990s – does not have the mandate/authority to collect information on all unrecognised PUA schools. Thus, even today there is no way of reliably knowing the number of unrecognised PUA schools in India, though see Kingdon (2008) for various estimates.

schools in total schools at a given level (primary, upper primary and secondary) in a district and also the corresponding literacy rates, as summarised in Table 2. For a given year, compared to share of private schools at primary level (e.g., 4.4% in 1992) that for secondary level (e.g., 15% in 1992) is significantly higher. Over the course of the decade 1992-2002, however, the pace of privatisation has gathered momentum for schools at all levels while the pace of privatisation has been more pronounced at the secondary level.

We also examine the nature of school privatisation at primary, upper primary and secondary levels across the regions in our sample. This is shown in Table 3. As shown in Table 2, the share of recognised PUA schools is significantly higher at the secondary level (relative to primary and upper primary levels) for the overall sample period 1992-02. More interestingly Table 3 highlights the pronounced inter-regional variation in rate of privatisation. We classify the districts into five regions, namely, east (Assam, Bihar, Orissa, West Bengal), west (Gujarat and Maharashtra), north 1 (Punjab and Haryana), north 2 (Madhya Pradesh, Rajasthan and Uttar Pradesh) and south (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu). In general, the rate of privatisation is relatively lower in the eastern states, especially at the primary and the upper primary levels. At the secondary level, the highest share of PUA schools is found in the relatively prosperous western and the southern states; interestingly, these shares are also high in some of the worse performing northern states like MP, Rajasthan and UP, generally known for failing government schools.

Note however that our analysis of private schools only pertains to recognised private schools. There has however been significant growth of unrecognised PUA schools at all levels in many regions of the country. As such our result would provide only a

lower bound of the growth of private schools in the Indian districts, especially since they are restricted to the recognised private schools only.

2.2. Literacy rates and gender gap

Unfortunately AISES data do not provide information on any learning outcomes. Hence we combine 1992 and 2002 AISES data with age/gender specific literacy data available from the 1991 and 2001 Census data respectively. Our analysis focuses on children aged 10-19 years. This choice has been guided by the fact that we could not obtain literacy rates for primary school age children 5-9 years old. While 10-14 literacy rates correspond broadly to literacy rates for upper primary level of education, those for 15-19 correspond to that for the secondary level. We also analyse the rate of growth of literacy rate for 10-19 years old taken together, and we do so for both male and female children. As before, we classify our sample into five regions, namely, east (Assam, Bihar, Orissa and West Bengal), west (Gujarat and Maharashtra), north1 (Punjab, Haryana), north 2 (Uttar Pradesh (UP), Madhya Pradesh (MP) and Rajasthan) and south (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu); this allows us to provide school privatisation and literacy rates not only for the whole of India, but also for the Indian sub-regions in our sample.

Table 2 shows the literacy progress at primary, upper primary and secondary levels between 1992 and 2002, while Table 3 presents the male and female literacy rates for 10-14 and 15-19 age groups across the regions. Not surprisingly, literacy rates are lower for female children, both 10-14 and 15-19 age groups, in our sample. The gender difference is significantly higher in the worse performing regions, e.g., see eastern

(comprising of Assam, Bihar, WB and Orissa) and northern zones 2 (comprising of UP, MP and Rajasthan). In particular, age/gender specific literacy rates are lower than the national average in these two regions while these rates are higher than the national averages in west, south or north 1 (Punjab and Haryana) regions.

3. EMPIRICAL ANALYSIS

As indicated earlier, our analysis focuses on children aged 10-19 years old - we develop our analysis in three steps. First we identify the factors determining shares of recognised private unaided schools at upper primary and secondary levels in each district. Second, other things being equal, we explore the role of school privatisation on literacy rates and also gender gap in literacy rates for 10-19 years old children. We also split 10-19 years old children into upper-primary (10-14 years) and secondary (15-19 years) school age groups and repeat the aforementioned analysis separately for each age group. The latter allows us to explore the difference, if any, in the results between upper-primary and secondary school age group children.

3.1. Determination of private school shares

Our first objective pertains to determination of private school shares at level l (l = upper primary, secondary or both together) in the i-th district (i = 1,2,…,N) in year t (t=1992, 2002). The most general specification of our interest could be written as follows:

$$P_{ilt} = \beta_1' X_{1ilt} + u_{1il} + u_{2ilt} \qquad (1)$$

The set of explanatory variables X_1 includes characteristics of local government schools (S), household (H) and also those of the community (C). Among the government school characteristics (S), we include proportion of government schools with pucca building, access to drinking water, vacant teaching positions and also proportion of female teachers (as a share of total teachers) at the relevant level. Household (H) characteristics refer to the proportion of scheduled caste and scheduled tribe population as well as the poverty head count rates in the district. Finally we include a composite index of community infrastructure to indicate community's access to public transport and communications. Note that u_1 refers to the district specific time-invariant unobserved factors, which would, e.g., control for the effects of unobserved local culture or labour market institutions/conditions that could influence the shares of private schools at the particular level. We assume that $u_1 \sim N(0, \sigma_{v1})$ where σ_{v1} is the standard deviation of u_1. All other residual variation is captured by the district-specific time-varying error term u_2, with $u_2 \sim N(0, 1)$; unlike u_1, u_2 could be correlated with other covariates.

We not only analyse the case for the upper primary and secondary levels of schooling (PPUAHIGH) taken together, but also individually consider that for the upper primary (UPRIM) and the secondary levels (SEC) of schooling. Differences in the results, if any, could reflect how the same set of factors (S, H and C) could exert differential effects for different levels of schooling.

3.2. Determination of literacy rates and gender gap

Our second objective pertains to the determination of literacy rates L_{ilt} and gender gap in literacy rates G_{ilt} for a particular schooling level l in the i-th district in year t. As before,

we start with the most general specification as follows:

$$L_{ilt} = \beta_2' X_{2ilt} + v_{1il} + v_{2ilt} \quad (2)$$

$$G_{ilt} = \beta_3' X_{3ilt} + w_{1il} + w_{2ilt} \quad (3)$$

The sets of explanatory variables X_2 and X_3 in equations (2) and (3) are nothing but an augmented version of X_1, i.e., (X_1, P_1), as we attempt to assess the role of school privatisation (P_{ilt}) on literacy rates and also gender gap in literacy rates; in particular P_l is defined as the share of private unaided school for the *l*-th level in district *i* at time *t*. The vectors X_2 and X_3 also include district school enrolment rate (at the relevant level of education in each equation) since being enrolled in school is *a priori* an important determinant of learning outcomes such as literacy. It is an important control variable in our equations. As with equation (1), we include two error terms – one time invariant (v_1, w_1) and other time-varying iid error terms (v_2, w_2) – respectively in equations (2) and (3).

Endogeneity could arise from the inclusion of a potentially endogenous explanatory variable(s) in (1)-(3). For example, private school share in the district (P_{ilt}) is an important explanatory variable in both equations (2) and (3) directly linked to one of our central hypotheses. One could however argue that it is a potentially endogenous variable; just as private school shares could affect literacy rates, literacy too influence private school shares at a given schooling level in a district. Another common source of endogeneity is the exclusion of unobserved factors e.g., labour market conditions and returns to education, which could influence the particular relationship of our interest. Generally a fixed effect model is estimated to reduce the endogeneity/simultaneity bias. While the fixed effects model addresses the 'omitted variable bias' version of endogeneity bias (effectively getting rid of the biases arising from the time-invariant

unobserved factors of the district that affect both PUA shares and literacy rates), it cannot address those biases arising from unobserved time-varying covariates.

4. RESULTS

4.1. Estimates for 10-19 years old

Both random and fixed effects estimates of private school shares (PPUAHIGH), literacy rates and gender gap in literacy rates for children aged 10-19 years old are summarised in Table 4.[7] Columns (1)-(3) show the random effects estimates while columns (4)-(6) show the corresponding fixed effects estimates. Since fixed effects provide a more stringent approach than random effects for dealing with the potential endogeneity of the private school share variable, we couch our discussion in terms of these fixed effects estimates.

There is evidence that private school shares in a district (a measure of the extent of privatisation of schooling in a district) tend to be lower in poorer districts, i.e. where the Head Count Ratio (HCR) of poverty is higher. Conversely, privatisation rate is significantly higher in districts with better access to public transport and communication facilities (TRANSC) (see column (4)). District privatisation rate is also higher when the proportion of female teachers in government schools is higher. There is however no evidence of a significant effect of non-teaching inputs in local government schools on the local school privatisation rate.

In the next column, ceteris paribus, presence of private upper primary and secondary school in a district appears to have a significant positive effect on literacy rates for 10-19 years old. Literacy rates also tend to respond positively to presence of local

[7] Corresponding pooled OLS estimates are shown in Appendix Table A2.

transport and communications infrastructure. Among various government school inputs, access to drinking water in the local government school premise tends to boost literacy rate while effects of other school inputs remain in significant.

In the final column under the Fixed Effects equations, districts with higher proportion of private unaided upper primary and secondary schools (PPUAHIGH) are associated with lower gender gap in literacy, suggesting that greater school privatisation is conducive to greater gender equality in education outcomes. This would be the case if, for example, households who choose private schools tend to send both boys and girls to private school. The implication that unobserved household preferences for private schooling tend to be associated with lower intra-household gender bias in our sample is in line with Kingdon (2005). The gender gap in literacy rates for 10-19 years old is significantly lower if government schools have access to drinking water. As expected, poorer districts tend to have significantly higher gender gaps in literacy rate.

4.2. Estimates for 10-14 and 15-19 years old

In this section, we examine whether and to what extent privatisation, literacy and gender gap estimates obtained for 10-19 years children differ for children aged 10-14 years (upper primary school age) and 15-19 years (secondary school age). Estimates for 10-14 years old are summarised in Table 5 while those for 15-19 years olds are in Table 6.[8] As before, we focus on the fixed effects estimates summarised in columns 4-6 of both Table 5 and Table 6.

In general estimates for school privatisation remain rather similar for 10-14 and

[8] Corresponding pooled OLS estimates are shown in Appendix Table A3.

15-19 years old: generally poorer districts and districts deprived of public transport and communications tend to have lower school privatisation rate at all levels. Second, districts with higher share of recognised private schools have significantly higher literacy rates for both 10-14 and 15-19 years old, thus confirming the positive effects of school privatisation on literacy rates. Note that the scheduled caste dummy is significant for school privatisation for 15-19 years old only while access to drinking water in government schools is associated with higher literacy for 10-14 years old only. Finally, we consider the effects of privatisation on the gender gap in literacy for 10-14 (Table 5) and 15-19 years old (Table 6) vis-à-vis 10-19 year olds (Table 4). As with 10-19 years old, there is evidence of a significant negative effect of privatisation on gender gap in literacy for 15-19 years old; the effect is however not significant for 10-14 years old. Among various government school inputs, access to drinking water in the school premise is significantly important for both age groups: access to drinking water tends to boost literacy and also to lower gender gap in literacy.

A comparison of our estimates for 10-14, 15-19 and 10-19 years old children also highlight the fact that the same set of covariates tend to have different impacts on literacy and gender gap in literacy at different levels. For example, higher poverty rates tend to widen gender gap in literacy for 10-14 years old while better access to transport and communications boost literacy for 15-19 years old. When we pool 10-14 and 15-19 years old children together, these effects tend to persist in the overall sample.

To summarise, while the effect of privatisation on gender bias depends on the particular age group we consider, that on literacy exists for both junior and secondary age groups; school privatisation is associated with significantly higher literacy for 10-19

years old children in our sample. The corresponding effect of privatisation on gender bias in literacy rate is significant for 15-19 years olds but not for 10-14 year olds. This appears to be consistent with a sample selectivity story. In general many Indian families keep sons in secondary school and let daughters drop out at the secondary stage. Thus, families that value education enough to retain both daughters and sons in school at the secondary age (15 – 19) are not a random draw from the population; they are more than averagely enlightened in terms of attitudes to gender equality. If such families are also more likely to choose private school for their children, increased privatisation at the secondary school age in a district will be associated with lower gender gap in schooling outcomes. In other words, the unobserved preferences of parents who choose to send their children to private schools seem to be also associated with a preference for lower gender difference.

4.3. Non-linear Effects of Privatisation on Educational outcomes?

The final question that we raise here is whether the relationship between privatisation and on the one hand and literacy and the gender gap in literacy on the other is non-linear. It is an important issue in itself as it has an inherent policy implication. In order to pursue this empirical scrutiny, using the distribution of private school shares in total schools across the sample districts, we generate (for each level of schooling) two binary variables pertaining to *medium* and *high* pace of privatisation. In particular, medium pace of privatisation at a given schooling level would correspond to second and third quartile of its distribution while high pace of privatisation correspond to the observations above the third quartile of its distribution (the reference category is 'low' pace of privatisation

corresponding to those observations that fall below the median value of privatisation at any level).

First we examine the evidence of non-linearity for the effects of privatisation on literacy for different age groups and did not find any (for brevity, we do not show these results; but these results would be available on request). In other words, the effect of privatisation on literacy is rather robust and the nature of the effect does not change from 'medium' to' high' degree of privatisation.

Second, we consider the effects of privatisation on gender gap in literacy. These results as summarised in Table 7 highlight some degree of non-linearity, especially for the secondary education level. In particular, medium level of privatisation is insignificant, while high level of privatisation is associated with lower gender bias in literacy for 15-19 year olds in our sample; as before, the effect is insignificant for gender bias among 10-14 year olds (also see Table 5). Non-linear effect persists when we consider 10-19 year olds together. These results further strengthen the validity of the selectivity hypothesis discussed in section 4.2.

5. CONCLUDING COMMENTS

Since early 1990s, there has been a rapid growth of private schooling in India. Despite some recent attempts to compare the efficiency of public and private schools in certain regions in India in recent years, the implications of growing privatisation for universal education and gender gap in literacy rates, two key educational MDGs, remain rather unexplored. Using two period district-level panel data (1992-2002), compiled from

various official sources, the present paper attempts to bridge this gap in the literature.

We raise two questions in this paper: (a) what determines the pace of school privatisation (at primary, upper primary and secondary levels) in India in the period 1992-2002 and also (b) whether there is a link between school privatisation on the one hand and literacy level and gender gap in literacy, on the other. Our analysis focuses on children aged 10-19 years in our sample, i.e., those who are likely to attend upper primary and secondary schools. Among all possible alternatives, we consider the fixed effects estimates of private school shares, literacy and gender gap in literacy with a view to minimise the endogeneity bias arising from the exclusion of time-invariant unobservable factors in our sample.

There is evidence that school privatisation could be attributed to household prosperity, infrastructural advantage of the locality and poor quality of existing government schools (especially at the secondary level) in our sample. More interestingly, school privatisation is associated with higher literacy at all levels while its effect on gender gap in literacy depends on the particular level of schooling; its effect remains insignificant for 10-14 year olds, but is significant for 15-19 year olds. We then explore the possible non-linearity in the relationship between school privatisation and gender difference in literacy, if any and find that school privatisation is associated with lower gender difference in literacy in districts experiencing a high pace of privatisation, but not otherwise.

It has often been argued that the necessity of being accountable to parents causes private schools and teachers to apply more effort. The notion that private management of schools leads to more effective learning is supported in Indian district level data, in that a

higher share of private schools in total schools in the district increases literacy and lowers gender bias in literacy in our sample, after controlling for other covariates and for all district level observable and unobservable characteristics that are time-invariant. One possible drawback has been that the paper uses information on recognised private schools only while recent evidence suggests a faster growth of unrecognised private schools catering to children from relatively less well off households (Desai et al. 2008). It would be interesting to see whether and how results of this paper hold when one takes account of both recognised and unrecognised private schools in India.

References

Bashir, S. (1994) 'Public versus Private in Primary Education: Comparison of School Effectiveness and Costs in Tamil Nadu', PhD Dissertation, London School of Economics.

Becker GS (1981) 'Altruism in the family and selfishness in the market place', *Economica* 48(189):1–15

Bedi, A.S. and A. Garg. (2000) 'The Effectiveness of Private versus Public Schools: The Case of Indonesia', *Journal of Development Economics* 61 pp. 463-94.

Beegle, K and D. Newhouse. 2006. The Effect of School Type on Academic Achievement: Evidence from Indonesia', *Journal of Human Resources* XLI(3):529-557.
Brown, D. 1979. 'The Location Decision of the Firm: An Overview of Theory and Evidence' *Papers in Regional Science*, 43(1), 23-39

Census of India. (2001) 'Data Highlights: Migration Tables D1, D2 and D3', Office of the Registrar General, India, Government of India.
www.censusindia.net/results/dseries/data_highlights_D1D2D3.pdf.

Desai, S., A. Dube, R. Vanneman and R. Banerji. 2008. 'Private Schooling in India – A New Landscape', mimeo NCAER.

Drèze, Jean and Geeta Kingdon. (2001) "School Participation in Rural India", *Review of Development Economics*, 5, No. 1: 1-33.

Epple, D. and R. Romano. (1998) 'Competition between Private and Public Schools, Vouchers and Peer Group Effects', *American Economic Review* 88(1) pp. 585-610.

French, Rob. (2008) "Schooling participation and pupil achievement in rural India", MSc. Economics of Education Thesis, Institute of Education, University of London.

Hansen, N. (1965). 'Unbalanced Growth and Regional Development', *Western Economic Journal* 4, pp. 3-14.

Hoxby, C. (1994) 'Do Private Schools Provide Competition for Public Schools?' NBER working paper No. 4978d.

Kingdon, Geeta. (1996) "The Quality and Efficiency of Public and Private Schools: A Case Study of Urban India", *Oxford Bulletin of Economics and Statistics*, 58, No.1: 55-80.

Kingdon, Geeta (2005) "Where Has All the Bias Gone? Detecting Gender Bias in the Household Allocation of Educational Expenditure in India", *Economic Development and Cultural Change*, 53, No. 2, 409-451. January.

Kingdon, G. (2007) 'The progress of school education in India', *Oxford Review of Economic Policy*, 23, No. 2: 168-195, Summer 2007.

Kingdon. G. (2008) "School-Sector Effects on Student Achievement in India", Chapter 6 in Chakrabarti, R. and P. Peterson (eds.). *School Choice International: Exploring Public-Private Partnerships*, MIT Press

Munshi, K. and M. Rosenzweig. (2006) 'Traditional Institutions Meet the Modern World: Caste, Gender and Schooling Choice in a Globalizing Economy', *American Economic Review*, pp. 1225-1252.

Muralidharan, K. and M. Kremer. (2006) 'Public and Private Schools in Rural India', Chapter 5 in Chakrabarti, R. and P. Peterson (eds.). *School Choice International: Exploring Public-Private Partnerships*, MIT Press.

Newhouse, D. and K. Beegle. (2005) 'The Effect of School Type on Academic Achievement-Evidence from Indonesia', *Journal of Human Resources.*

Pal, S. (2004). 'How Much of the Gender Difference in Child School Enrolment Can Be Explained? Evidence from Rural India', *Bulletin of Economic Research* 56(2), pp. 133-158.

Pal, S. 2008. 'Public Infrastructure, Location of Private Schools and Quality of Schooling in India' CEDI discussion paper, Brunel University, West London.

PROBE Team. (1999) '*Public Report on Basic Education in India*', Oxford University Press.

Psacharopoulos, George, 1988. "Education and Development: A Review," *World Bank Research Observer*, Oxford University Press, vol. 3(1), pages 99-116, January.

Reinikka, R. and J. Svensson. (2002) 'Coping with Poor Public Capital', *Journal of Development Economics*, 69, pp. 51-69.

Tooley, J. 2004. 'Private Education and Education for All', Economic Affairs, December, Blackwell publishing.

Vickerman, R.W. 1990. '*Infrastructure and Regional Development'*, Pion: London.

Watkins, K. 2004. Private Education and Education for All – Or How Not to Construct an Evidence Based Argument: A Reply to Tooley', Economic Affairs, December, Blackwell publishing.

Table 1. A comparison of government and private unaided schools, 1992-2002

	PUA schools		Govt. schools	
	1992 Mean (SD)	2002 Mean (SD)	1992 Mean (SD)	2002 Mean (SD)
% of female teachers in total				
Primary	0.55 (0.26)	0.55 (0.24)	0.35 (0.23)	0.38 (0.15)
Upper primary	0.50 (0.27)	0.50 (0.24)	0.30 (0.21)	0.32 (0.17)
Secondary	0.45 (0.26)	0.44 (0.22)	0.28 (0.20)	0.24 (0.19)
% of schools with low caste teachers				
Primary	0.09 (0.13)	0.11 (0.13)	0.22 (0.19)	0.24 (0.19)
Upper primary	0.08 (0.13)	0.10 (0.12)	0.17 (0.14)	0.23 (0.17)
Secondary	0.07 (0.11)	0.08 (0.08	0.15 (0.13)	0.17 (0.12)
% of schools with pucca building	0.78 (0.17)	0.77 (0.39)	0.66 (0.24)	0.79 (0.34)
% of schools with lavatory	0.66 (0.23)	0.71 (0.22)	0.33(0.26)	0.41 (0.27)
% of schools with drinking water	0.84 (0.17)	0.91 (0.13)	0.58 (0.24)	0.78 (0.17)
Pupils per teacher				
Primary	30.7 (12.5)	34.3 (31.6)	39.1 (16.2)	67.1 (70.5)
Upper Primary	30.8 (11.2)	20.6 (50.0)	31.5 (11.5)	39.1 (82.3)
Secondary	29.1 (10.9)	13.7 (23.0)	28.1 (8.4)	41.6 (53.4)

Table 2. Pace of private school growth and of youth literacy in the Indian districts

	Average share of recognised PUA schools Mean (sd)		10-19 literacy rates			
	1992-93	2002-03	1992-93		2002-03	
			Male	Female	Male	Female
Primary	0.044	0.08	---	---	---	---
	(0.07)	(0.10)				
Upper primary	0.11	0.17	0.77	0.58	0.87	0.77
	(0.14)	(0.18)	(0.13)	(0.21)	(0.11)	(0.17)
Secondary	0.15	0.28	0.74	0.51	0.84	0.69
	(0.15)	(0.22)	(0.12)	(0.21)	(0.11)	(0.18)

Table 3. Regional variation in literacy and privatisation – Means and standard deviations for the pooled data

Level	East	West	North1	North2	South	All
			Mean share (sd) of recognised private schools (in total schools)			
Primary	0.003(0.007)	0.084 (0.11)	0.05(0.07)	0.12(0.09)	0.047(0.07)	0.07(0.09)
Upper primary	0.023 (0.04)	0.058 (0.08)	0.16 (0.17)	0.28(0.15)	0.096(0.11)	0.15 (0.16)
Secondary	0.10 (0.12)	0.22(0.12)	0.18 (0.15)	0.35 (0.23)	0.22 (0.15)	0.22 (0.20)
			Mean literacy (sd) rates			
Female 10-14	0.53 (0.17)	0.82 (0.12)	0.81 (0.11)	0.55 (0.20)	0.80 (0.17)	0.66 (0.21)
Male 10-14	0.71 (0.13)	0.910.05)	0.89 (0.06)	0.78 (0.13)	0.89 (0.09)	0.81 (0.13)
Female 15-19	0.47 (0.17)	0.74 (0.14)	0.73 (0.14)	0.46 (0.19)	0.72 (0.20)	0.59 (0.21)
Male 15-19	0.70 (0.12)	0.88 (0.07)	0.85 (0.08)	0.76 (0.12)	0.84 (0.12)	0.79 (0.13)
Female 10-19	0.54(0.17)	0.78 (0.13)	0.77 (0.13)	0.51 (0.19)	0.76 (0.18)	0.63 (0.21)
Male 10-19	0.72 (0.12)	0.89 (0.06)	0.87 (0.07)	0.77 (0.13)	0.86 (0.11)	0.80 (0.13)

Note: Indian regions: south=AP, TN, Kerala, Karnataka; West: Gujarat, Maharashtra; East: Assam, Bihar, Orissa, WB; North1=Punjab, Haryana; North2=MP, Rajasthan, UP.

TABLE 4. ESTIMATES OF PUA SHARES, LITERACY RATE AND GENDER GAP 10-19 YEAR OLDS

	Random effects						Fixed effects					
	1		2		3		4		5		6	
	PpuaH		lit1019		gap1019		PpuaH		lit1019		gap1019	
Variables	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t
PPUAH			0.257**	6.71	-0.343**	-10.03			0.37**	5.75	-0.48**	-6.61
hcr	-0.154**	-3.41	-0.135**	-3.28	0.212**	5.34	-0.21**	-3.98	-0.015	-0.3	0.14*	2.36
sc	0.352**	4.37	0.022	0.29	0.049	0.78	0.19	1.16	0.163	0.95	0.06	0.31
st	-0.084*	-1.89	-0.0008	-0.02	0.011	0.34	-0.12	-1.03	-0.006	-0.06	0.009	0.08
pgdw	0.073**	3.31	0.179**	8.84	-0.104**	-5.2	-0.015	-0.6	0.233**	9.96	-0.12**	-4.51
pgpucca	-0.041	-1.12	-0.107**	-3.21	0.144**	4.61	-0.072	-1.46	0.019	0.43	0.04	0.85
pghtvac	-0.0006	-0.93	0.0005	0.9	-0.0001*	-2.01	-0.0005	-0.59	0.0009	1.28	-0.0002*	-2.57
pghtfem	0.0002**	2.78	-0.0004	-0.51	0.0008	1.17	0.0001*	1.74	-0.0008	-0.89	0.0002*	1.85
transc	0.0015**	3.18	0.0022**	5.03	-0.0006	-1.55	0.004**	6.94	0.0018**	2.95	0.0005	0.66
henrt1	0.004	0.11	0.109**	3.7	0.032	1.12	0.037	0.88	0.0105	0.28	-0.014	-0.33
east	0.037	1.18	-0.041	-1.46	-0.0263	-1.09						
west	0.104**	3.02	0.048	1.55	-0.0428	-1.63						
south	0.069*	2.12	0.012	0.43	-0.032	-1.29						
north2	0.259**	9.19	-0.105**	-3.89	0.0945**	4.11						
Intercept	-0.0136	-0.27	0.607	13.34	0.096*	2.42	0.4302		0.7022		0.4944	
R-square	0.3619		0.6649		0.468							
Wald	413.55		724.59		406.8							
F-stat							16.94		46.7		19.65	
F(361, 202)							5.24		5.4		2.75	

NOTE: NOTE: Significance: *= 10%; **=1%;
Variable labels: PPUAH: Share of middle or higher PUA schools in total schools in the district; HCR: Poverty rates; SC/ST: share of SC/ST population in the district; PGDW: share of govt. schools with drinking water (out of total govt. schools) in the district; PGPUCCA: share of govt. schools with Pucca building in the district; PGHVAC: share of vacant teaching positions in middle or higher schools in the district; PGFEM: share of female teachers (out of total teachers) in middle/higher schools in the district: TRANSC: % of villages in the district has access to public transport and communication (PO, PTO); HENRT1: enrolment rate for 10-19 years old; East, West, South, North2: regional dummies.

TABLE 5. ESTIMATES OF PUA SHARES, LITERACY RATE AND GENDER GAP 10-14 YEAR OLDS

	Random effects						Fixed effects					
	Ppuaupri 1		lit1014 2		gap1014 3		Ppuaupri 4		lit1014 5		gap1014 6	
Variable	Coef.	t	Coef.	t	Coef.	t	Coef.	**t**	Coef.	t	Coef.	t
sc	0.170*	2.64	0.0768	0.97	-0.065	-1.04	0.152	1.11	0.2231	1.11	-0.226	-1.22
st	-0.096*	-2.68	0.0274	0.66	-0.02	-0.59	-0.098	-1.08	0.0658	0.55	-0.014	-0.11
hcr	-0.087*	-2.51	-0.15**	-3.28	0.19**	4.79	-0.096*	-2.27	-0.028	-0.5	0.139*	2.4
pgdw	0.055**	3.24	0.178**	7.93	-0.12**	-5.87	0.0222	1.09	0.242**	9.00	-0.15**	-5.6
pgpucca	-0.023	-0.79	-0.13**	-3.72	0.18**	5.73	-0.0085	-0.23	0.046	0.93	0.0673	1.34
pguptvac	0.0097	0.67	0.026	1.51	-0.052**	-3.63	-0.0375	-1.29	0.087*	2.26	-0.16**	-4.01
pguptfem	0.0324	1.2	0.11**	3.25	-0.064*	-2.21	0.0234	0.63	0.0591	1.15	0.092*	1.83
transc	**0.0009***	**2.4**	0.002**	3.58	-0.0006	-1.44	**0.002****	**4.36**	0.0018**	2.78	-0.002*	-2.52
upenrt1	0.0005	0.03	0.067**	2.84	0.0241	1.17	0.0108	0.4	0.0257	0.72	-0.0347	-0.95
ppuaupri			**0.197****	**3.86**	**-0.17****	**-4.01**			**0.3694****	**3.78**	-0.0572	-0.59
east	-0.0204	-0.78	-0.081*	-2.72	-0.0374	-1.52						
west	-0.0108	-0.36	0.0503	1.5	-0.09**	-3.24						
south	-0.00233	-0.09	0.0119	0.39	-0.06**	-2.29						
north2	0.1958**	8.6	-0.12**	-4.19	0.0311	1.39						
Intercept	0.0197	0.51	0.66**	14.19	0.104*	2.71	0.076*	1.65	0.369**	5.95	0.237**	3.79
sigma_u	0.0937		0.0948		0.0706		0.1521		0.1571		0.1158	
sigma_e	0.0463		0.0608		0.0625		0.0463		0.0608		0.0625	
rho	0.8038		0.7087		0.5607		0.9151		0.8699		0.7745	
F(9, 191)							11.19**		5.24**		2.78**	
F(355,191)							90.54**		37.06**		17.43**	
R-sq	0.5453		0.5232		0.3558		0.1201		0.1737		0.1287	
Wald	465.04		637.22		315.58							

NOTE: Significance: *= 10%; **=1%; Variables: PPUAUPRIM: Share of middle schools in total schools in the district; HCR: Poverty rates; SC/ST: share of SC/ST population in the district; PGDW: share of govt. schools with drinking water (out of total govt. schools) in the district; PGPUCCA: share of govt. schools with Pucca building in the district; PGUPVAC: share of vacant teaching positions in middle schools in the district; PGFEM: share of female teachers (out of total teachers) in middle schools in the district: TRANSC: % of villages in the district with public transport and communication ; UPENRT1: enrolment rate for 10-14 years old; East, West, South, North2: regions.

TABLE 6. ESTIMATES OF PUA SHARES, LITERACY RATE AND GENDER GAP 15-19 YEAR OLDS

	Random effects						Fixed effects					
	Ppuasec		lit1519		gap1519		ppuasec		lit1519		gap1519	
	1		2		3		4		5		6	
Variable	**Coef.**	**T**	Coef.	t	Coef.	t	**Coef.**	**t**	Coef.	t	Coef.	t
sc	0.487**	4.43	-0.0487	-0.65	0.0978	1.45	0.695*	2.45	0.245	1.34	-0.133	-0.7
st	-0.0323	-0.55	-0.03955	-1.02	0.047	1.32	-0.236	-1.31	-0.065	-0.64	0.072	0.6
hcr	-0.152*	-2.23	-0.114**	-2.77	0.197**	4.68	-0.268**	-3.06	-0.0004	0.555	0.079	1.34
pgdw	0.060*	1.77	0.168**	8.23	-0.085**	-4.02	-0.044	-1.06	0.239**	10.25	-0.15**	-5.29
pgpucca	-0.038	-0.72	-0.127**	-3.87	0.155**	4.75	-0.099	-1.29	-0.015	-0.35	0.049	0.97
pgstvac	0.0132**	5.45	-0.002	-1.43	-0.003*	-1.9	0.034**	4.87	0.003	0.72	-0.008	-1.6
pgstfem	0.214**	4.27	0.089**	2.79	-0.139**	-4.51	-0.106	-1.16	0.009	0.17	0.141*	2.32
transc	**0.001***	**1.7**	0.0021**	4.99	-0.0003	-0.74	**0.007****	**6.88**	0.002**	3.51	0.0005	0.64
secenrt1	-0.061	-1.39	0.115**	4.28	0.0021	0.08	0.057	0.85	0.009	0.25	-0.0137	-0.3
ppuasec			**0.17****	**6.38**	**-0.260****	**-9.98**			**0.181****	**4.33**	**-0.352****	**-7.39**
east	0.081*	1.81	0.0007	0.02	-0.019	-0.69						
west	0.213**	4.59	0.099**	3.24	-0.023	-0.81						
south	0.123**	2.8	0.029	1.02	-0.011	-0.4						
north2	0.282**	6.83	-0.0418	-1.5	0.091**	3.52						
Intercept	-0.074	-1.04	0.563**	12.22	0.122**	2.82	0.1589	1.69	0.406**	7.4	0.263**	4.18
sigma_u	0.124		0.091		0.074		0.2471		0.142		0.1380	
sigma_e	0.0964		0.054		0.064		0.0964		0.0545		0.0643	
rho	0.621		0.734		0.570		0.8678		0.871		0.822	
F(357,196)							16.76**		45.6**		21.11**	
F(9, 196)							4.67**		5.87**		3.3**	
R-sq:	0.4193		0.5514		0.4538		0.0475		0.249		0.0621	
WALD	334.46		743.9		448.41							

NOTE: Significance: *= 10%; **=1%; Variable labels: PPUASEC: Share of secondary schools in total schools in the district; HCR: Poverty rates; SC/ST: share of SC/ST population in the district; PGDW: share of govt. schools with drinking water (out of total govt. schools) in the district; PGPUCCA: share of govt. schools with Pucca building in the district; PGSVAC: share of vacant teaching positions in secondary schools in the district; PGSFEM: share of female teachers (out of total teachers) in secondary schools in the district: TRANSC: % of villages in the district has access to public transport and communication (PO, PTO); SECENRT1: enrolment rate for 15-19 years old; East, West, South, North2: regional dummies.

Table 7. Non-linearity in the effects of school privatisation on the gender gap in literacy, Fixed effects estimates

	gap1019			gap1014			gap1519	
Variables	Coef.	t		Coef.	t		Coef.	t
henrt1	-0.0467	-0.99	upenrt1	-0.039	-1.08	secenrt1	-0.016	-0.32
ppuah_med	**0.0053**	**0.35**	**ppuaup_med**	**0.020**	**1.15**	**ppuas_med**	**0.008**	**0.5**
ppuah_high	**-0.057***	**-2.56**	**ppuaup_high**	**0.0151**	**0.55**	**ppuas_high**	**-0.056***	**-2.46**
hcr	0.222**	3.68	hcr	0.1405*	2.44	hcr	0.151*	2.36
sc	-0.084	-0.44	sc	-0.245	-1.32	sc	-0.277	-1.33
st	0.0752	0.58	st	0.0028	0.02	st	0.215	1.61
pgdw	-0.107**	-3.71	pgdw	-0.16**	-5.78	pgdw	-0.13**	-4.23
pgpucca	0.078	1.42	pgpucca	0.0729	1.44	pgpucca	0.078	1.39
pghtvac	-0.0002*	-2.42	pguptvac	-0.16**	-4.0	pgstvac	-0.02**	-3.01
pghtfem	0.0001	1.33	pguptfem	0.0935*	1.85	pgstfem	0.185**	2.76
transc	-0.0013*	-1.78	transc	-0.002**	-2.95	transc	-0.001*	-1.66
Intercept	0.174**	2.7	Intercept	0.228**	3.66	Intercept	0.184*	2.67
sigma_u	0.1059		sigma_u	0.1145		sigma_u	0.140	
sigma_e	0.069		sigma_e	0.0625		sigma_e	0.0705	
R-square	0.4145		R-square	0.4814		R-square	0.426	
F-stat	12.87**		F-stat	15.95**		F-stat	13.1**	
Obs	573		Obs	573		Obs	573	

NOTE: Significance: *= 10%; **=1%; See Notes to Tables 4-6.

ppuah_high: 1 if ppuah is greater than its third quartile value; ppuah_med =1 if ppuah is greater than its 2nd quartile but less than its third quartile value. ppuaup_high: 1 if ppuaupri is greater than its third quartile value; ppuaup_med =1 if ppuaupri is greater than its 2nd quartile but less than its third quartile value. ppuas_high: 1 if ppuasec is greater than its third quartile value; ppuas_med =1 if ppuasec is greater than its 2nd quartile but less than its third quartile value.

Appendix Table A1. List of variables

Variable Name	Description	Source of data
PPUAUPRIM	Share of PUA upper primary schools (in total schools) in the district	AISES
PPUASEC	Share of PUA secondary schools (in total schools) in the district	AISES
PPUAHIGH	Share of PUA upper primary and secondary schools (in total schools) in the district	AISES
UPENRT1	Enrolment rate 10-14 years old	AISES & Census
SECENRT1	Enrolment rate 15-19 years old	AISES & Census
HENRT1	Enrolment rate 10-19 years old	AISES & Census
LIT1014	Literacy rates for 10-14 years old (upper primary level)	Census
LIT1519	Literacy rates for 15-19 years old (secondary level)	Census
LIT1019	Literacy rates for 10-19 years old (upper primary and secondary level together)	Census
PGFEM	Share of female teachers among all govt school teachers (variables for upper primary and secondary levels)	AISES
PGVAC	proportion of vacant teaching posts among all sanctioned posts (variables for upper primary and secondary levels)	AISES
PGPUCCA	proportion of govt schools with pucca building in the district	AISES
PGDW	Proportion of governments schools with access to drinking water in the district	AISES
HCR	District poverty head count ratio	NSS 50th and 55th rounds
SC	% of SC population in the district	Census
ST	% of ST population in the district	Census
TRANSC	% of villages in the district with access to bus, rail, waterways, post office, telegraph office and phone	Census

Table A2. Pooled OLS estimates: 10-19 years old

VARIABLES	(1) Privatisation (ppuah)	(2) lit1019	(3) gap1019
ppuah		0.1101***	-0.0106
		[5.486]	[-0.614]
sc	0.3328**	0.0673	-0.0051
	[2.422]	[1.005]	[-0.0906]
st	0.3764***	-0.1018***	0.0711**
	[5.216]	[-2.933]	[2.342]
hcr	-0.3973***	-0.1973***	0.1485***
	[-4.412]	[-4.478]	[3.948]
pgdw	0.0256	0.0749***	-0.0516**
	[0.445]	[2.648]	[-2.186]
pgpucca	0.2230***	-0.0815**	0.0964***
	[2.944]	[-2.256]	[3.076]
pghtvac	-0.0003*	-0.0000	-0.0001
	[-1.653]	[-0.403]	[-0.875]
pghtfem	0.0002	0.0001	0.0000
	[1.276]	[0.640]	[0.165]
transc	0.0014*	0.0019***	-0.0008***
	[1.869]	[5.261]	[-2.617]
henrt1	0.1202**	0.2967***	-0.0896***
	[1.984]	[10.39]	[-3.588]
year02	-0.0261	-0.0732***	0.0886***
	[-1.077]	[-6.269]	[8.907]
Constant	0.6707***	0.5639***	0.0813***
	[10.24]	[16.12]	[2.774]
Observations	573	556	573
R-squared	0.136	0.561	0.379

Robust t-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A3. Pooled OLS estimates: 10-14 and 15-19 years old

VARIABLES	(1) ppuauprim	(2) lit1014	(3) gap1014	(4) ppuasec	(5) lit1519	(6) gap1519
ppuaupri		0.0112	0.0350		0.1026***	-0.0528**
		[0.274]	[1.188]		[3.405]	[-1.992]
sc	0.2989***	0.0828	-0.0075	0.4642***	-0.1619**	0.1189**
	[4.033]	[1.124]	[-0.145]	[5.035]	[-2.403]	[2.025]
st	-0.0337	-0.0318	0.0292	0.0283	-0.0871**	0.0851***
	[-0.861]	[-0.854]	[1.082]	[0.576]	[-2.526]	[2.780]
hcr	-0.3453***	-0.2240***	0.1161***	-0.1337**	-0.1411***	0.0809**
	[-7.017]	[-4.534]	[3.279]	[-2.150]	[-3.132]	[2.081]
pgdw	-0.0130	0.0660**	-0.0294	-0.1927***	0.0189	0.0011
	[-0.404]	[2.045]	[-1.334]	[-4.805]	[0.627]	[0.0435]
pgpucca	0.2659***	-0.0948**	0.1030***	0.4736***	-0.0390	0.1026***
	[6.326]	[-2.273]	[3.434]	[9.142]	[-0.988]	[2.964]
pguptvac	0.0028	0.0030	-0.0280**	0.0100***	-0.0028*	-0.0036**
	[0.148]	[0.167]	[-2.135]	[4.402]	[-1.774]	[-2.468]
pguptfem	-0.0134	0.2178***	-0.1634***	0.3381***	0.1175***	-0.2236***
	[-0.360]	[6.144]	[-6.349]	[7.660]	[3.614]	[-7.739]
transc	-0.0022***	0.0021***	-0.0003	-0.0024***	0.0021***	-0.0005
	[-5.020]	[5.048]	[-1.047]	[-4.662]	[5.670]	[-1.376]
upenrt1	-0.0581**	0.1322***	-0.0106	-0.1038***	0.2413***	-0.0940***
	[-2.579]	[6.110]	[-0.676]	[-2.905]	[9.629]	[-4.195]
year02	-0.0862***	-0.0609***	0.0918***	-0.2161***	-0.0749***	0.0856***
	[-6.476]	[-4.498]	[9.652]	[-12.60]	[-5.273]	[7.071]
Constant	0.0825**	0.6724***	0.0503**	0.0154	0.6411***	0.1144***
	[2.350]	[19.14]	[2.068]	[0.350]	[19.90]	[4.170]
Observations	556	539	556	563	546	563
R-squared	0.317	0.509	0.427	0.461	0.556	0.453

Robust t-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1