AARHUS UNIVERSITY

Coversheet

This is the accepted manuscript (post-print version) of the article.

Contentwise, the accepted manuscript version is identical to the final published version, but there may be differences in typography and layout.

How to cite this publication

Please cite the final published version:

Gupta, N. D., Dubey, A., & Simonsen, M. (2018). Rising school attendance in rural India: an evaluation of the effects of major educational reforms. *Education Economics*, 26(2), 109-128.
<https://doi.org/10.1080/09645292.2017.1387887>

Publication metadata

Title:	Rising school attendance in rural India: an evaluation of the effects of major educational reforms
Author(s):	Gupta, N. D., Dubey, A., & Simonsen, M.
Journal:	<i>Education Economics</i>
DOI/Link:	10.1080/09645292.2017.1387887
Document version:	Accepted manuscript (post-print)

General Rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

If the document is published under a Creative Commons license, this applies instead of the general rights.

ABSTRACT:

We evaluate the impact of educational reforms starting from the mid-1990s in India on the school attendance rate of low-income rural children aged 6-14 (target group) compared to high-income counterparts (ineligibles) employing 5 waves of NSSO data, 1983-2004/2005. We estimate a DDD (triple difference) model allowing for differential (linear) trends and find strong causal effects of school reforms on the school attendance rate of rural low-income children . For both girls and boys, the increase in attendance rate is higher in the 6-11 age group and among children of scheduled tribe or scheduled caste background. However, the effect appears to be stronger for girls.

Word Count: 104

1. INTRODUCTION

For decades developing countries have focused their efforts on improving and investing in tertiary education at the expense of basic education. In part this was due to the competitive pressures to produce highly skilled professionals at a time of skill-biased technological change; in part for national prestige reasons. In the last few decades, there has been growing focus on (universal) primary education, which studies have found to give even higher returns (Psacharopoulos and Patrinos, 2004; Self and Grabowski, 2004). Giving all children access to basic schooling remains an area of public intervention since poverty constrains a large segment of their populations from making the necessary investments. However, guaranteeing access and investing large sums in standard school inputs may not be sufficient to achieve good learning outcomes; recent work shows more targeted investments in pedagogic interventions may be more cost-effective in that regard (Glewwe and Muralidharan, 2015).

With dismal rates of literacy in 1951 (18.3%), India subsequently made steady progress in providing basic education to its population. According to the 2001 Census, the literacy rate increased to 64.8% in 2001 up from 52.2% in 1991, after having risen steadily but more slowly since 1951 (GOI, 2016).¹ . In an effort to increase the literacy rate, the Government of India, besides making provision for adult literacy through various programmes, focused its attention on providing basic minimum education to children in the age group of 5-14 years of age. This was done by undertaking the Universalisation of Elementary Education (UEE) programme (since 1993-94 under its District Primary Education Programme (DPEP) in 42 districts in five states). This programme was gradually and steadily expanded. By 2000-2001, under UEE, the Sarva Shiksha Abhiyan or SSA was launched. Under SSA, one of the key provisions has been to make schooling accessible to children in the remote rural areas.

School attendance has risen in India in recent decades also. Raw NSSO data show that while in 1993/1994, 68.4% of rural children in the age group 6-11 attended school, by 2004/2005 this had risen to 86.5%, i.e. an 18 percentage point increase (13.8 percentage points for boys, 23.1 percentage points for girls). A much smaller increase was seen among urban children in the same age group for whom attendance rose over the same period from 86.3% to 92.8% (6.5 percentage points for boys, 5.7 percentage points for girls).⁴⁵ Concurrent with these trends, between 1950 and 1990 the number of primary schools increased more than threefold, even exceeding the growth rate of the school-age population (Dougherty and Herd, 2008). The number of teachers also increased in this period, from 600,000 to over 3 million (Dubey et al., 2006). At the same time, after 1991, India experienced an unprecedented rate of growth following liberalization, and between 1983 and 2004 the rural poverty rate was nearly halved from 46.9% to 28.4% (Lanjouw and Murgai, 2009).

The question of whether these gains in literacy and school attendance are in part caused by various initiatives such as DPEP and subsequently SSA after taking into account differential trends due to rising demand for education among the poor has not been systematically addressed. This paper fills this gap by evaluating the impact of these reforms on rural school attendance using 5 waves of household data from the NSSO. We apply a triple difference estimation framework that enables us to isolate the causal impact of reforms enacted in the middle of the period while controlling for trends due to a rapidly changing economy over the same period that plausibly affect rich and poor households differently. These educational policy reforms involved massive investments in school infrastructure and the extension of universal access to all children in the 6-14 age group. We ask whether the better infrastructure and expanded school access causally affected low-income rural children's school attendance over this period even after controlling for the confounding effect of any differential trends due to rising incomes and falling poverty post-liberalization? ⁶ The answer is

expected to be important from a public policy point of view to learn whether government initiatives to substantially boost school attendance can be effective.

We exploit five rounds of NSSO data and estimate a difference-in-difference-in-difference model incorporating differential linear trends. We compare the rise in school attendance over this time period of rural poor children (the main target group of the reforms) to those of a group of non-eligibles, i.e., rural rich children. Rich rural children are assumed to remain unaffected since they have the means to attend school even if it is located further away in the next village, for instance. Our data and quasi-experimental methodology allow us to examine trends in educational participation both before and after a period of rapid school expansion. Since the reforms involved massive outlays on school building in the rural-sectors and tribal areas, we can infer using this methodology the extent to which rising rural educational attainment was supply-driven.

The paper unfolds as follows: section 2 gives an overview of the evolution of basic education in India including major recent reforms and section 3 surveys the recent literature in this area. In section 4 we present the identification strategy and the empirical model and in section 5 we describe the NSSO data and provide some descriptive evidence on attendance patterns. Section 6 presents the main results, section 7 considers some potential confounders and, finally, section 8 discusses implications of the findings and concludes.

2. EVOLUTION OF BASIC EDUCATION IN INDIA

(a) Overview

Modern education in India evolved around the Macaulay system during the British period. The traditional Indian system of education debarred a large segment of the population from formal

education on the grounds of caste and gender. Post-independence (1947), the emphasis has been on the expansion of education as the means for eradicating persistent differences by socioeconomic group and gender. A number of policies were launched post-independence⁷, however, the investments made were on a smaller scale or at the state level and yielded little result particularly in the rural areas. Starting in the 1990s, efforts at improving primary education were intensified even further leading to three ambitious and far-reaching initiatives, the District Primary Education Programme (DPEP) introduced in the mid-1990s, the *Sarva Shiksha Abhiyan* (SSA) launched in 2000 following the MDG declaration and the Mid-day Meal Program (MDM) universalized in 2001. Our empirical strategy allows us to speak about the effects of this package of programs.

(b) DPEP, SSA and MDM

In 1994, the government of India launched the DPEP providing access for all children to primary school or its equivalent. The focus was to construct facilities and improve infrastructure, i.e., on improvement of quality. Massive investments were undertaken assisted in part by the World Bank to improve school infrastructure, textbook development and making textbooks available in tribal languages, improving classroom practices, teacher professional development, early childhood education, reform of education management and practices and strengthening the involvement of the community (see World Bank, 2003; Jalan and Glinskaya, 2013).

Over this period ‘Education for all’ became a major global initiative and was declared a fundamental right in Jomiten in 1990. A formal declaration was signed in Dakar in 2000. Signing countries committed to “ensuring that by 2015, children in the age group 6-14 years, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to complete free and compulsory education of good quality” (UNESCO, 2000). Accordingly, India launched its flagship

program, the Campaign for Universal Education or *Sarva Shiksha Abhiyan* in 2000, a central government-sponsored scheme to be funded out of revenues from a new cess, equal to 3 percent of all taxes. This was the most ambitious initiative to date imposing clear time frames and involving large-scale investments in infrastructure; i.e., building of new schools, hiring teachers and para-teachers, giving out textbooks, and universalizing the schemes launched earlier (for instance, the Mid-day Meal Scheme). The focus was to improve school and teacher quality to reach the remaining out-of-school students and to re-enrol dropouts. The stated goals were that all children in the relevant age group should complete five years of primary education by 2007, and eight years of schooling by 2012. Gender and socioreligious gaps at the primary and elementary levels would be closed and special efforts in this area were made to provide free textbooks, special facilities and grants to these vulnerable groups. Clearly, the SSA reform shared many similar features with the DPEP, in fact, in many instances it was just the continuation of the DPEP except implemented on a national scale.

There are several theoretical linkages between such initiatives and higher school attendance. For many rural children living in remote areas, the distance to school is reduced when more schools are built. Another mechanism is the provision of a mid-day meal that attracts in particular the poorest children and may increase attendance and reduce dropout through its positive effects on enhancing concentration and learning in the classroom. Other infrastructural investments in schools such as water, sanitation and health can also be expected to increase attendance by reducing the spread of sickness and making the school environment a more pleasant one (Glewwe and Miguel, 2007). Girls, in particular, are more likely to increase enrollment where there are adequate sanitation facilities (Adukia, 2014). Finally, increased teacher training and textbook provision enhance the quality of education, thereby raising the return to investing in education.

Although universal in nature, these educational programs were targeted to boost student enrollment and enhance school quality in areas that were still lagging behind, i.e., the rural areas of India. Special focus was to be given to vulnerable groups in these areas such as children of minorities and tribal groups who tend to be located in border regions. The 10th five-year plan of the Government of India explicitly stressed the educational needs of girls, children from scheduled caste (SC) and scheduled tribe (ST) low caste groups and other children in difficult circumstances. The Annual Status of Education Report (Pratham, 2006) surveyed only the rural areas underscoring the unmet need for education in this segment of the population. Earlier, the PROBE survey of 1999 also focused solely on rural India, covering all schooling facilities and a sample of households in 234 randomly selected villages of Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Himachal Pradesh.

Until recently, therefore, the main thrust of the school reforms had been on raising enrollment in rural areas. Civil works (building of schools and infrastructure) comprising about a third of total outlays in the SSA program were mainly carried out in rural areas where schools were lacking. Even in 2006-07, 76% of the outlays went to out-of-school children and the SC/ST minority districts. Mid-day meal programs, similarly, were rolled out in districts according to poverty level, meaning again that low-income rural areas would receive first priority. One of the main targeted groups of the reforms, as mentioned earlier, was tribal children living in remote parts of the country. In 2001, there were 14 million tribal children enrolled in elementary schools out of a total of 20.24 million in the 6-14 age group. Thus 6.24 million were still out of school in 2001. The drop-out rate among tribal children was extremely high – 52.3% for primary and 69.5% for upper primary. For example, most of the 133,000 primary schools and 106,000 upper primary schools (Seventh All India Survey, 30th September 2002) which were opened in the SSA I were provided to unserved tribal habitations. Apart

from this, there were about 100,000 Education Guarantee Scheme (EGS) centers (alternate schools) established for providing education in unserved habitations.⁸

Monitoring the progress made in achieving the goal of universal primary education has usually been based on indicators such as school enrollment rates, which appear to have risen substantially in recent years in India.⁹ Enrollment, however, is not the same as attendance. While children may be registered as being enrolled, that does not mean that they actually attend school and attendance is surely the pre-condition for learning to occur. The interventions mentioned earlier include both schooling expansions via the opening of new schools and alternate schooling facilities but also investment in school quality such as construction of additional classrooms, toilets and drinking water, provisioning for teachers, providing training and academic resource support, free textbooks and uniforms and support for improving learning achievement levels/outcome. In addition under the RTE (Right to Education Act) a new vision and approach to primary education emerged encompassing holistic teaching and curriculum, equity concerns, access for traditionally excluded groups and children with special needs and a changed culture in the classroom. While expansion and greater access to school may affect enrollment and attendance alike, we expect that investments in school quality and pedagogic methods are much more likely to be observed on attendance.

In the National Survey Sample (NSSO) data used in this study current school attendance is observed. As mentioned, in India, dropout behaviour is frequently observed even at the primary level so that many children who are observed attending at the start of the school year may discontinue as the year proceeds. However, since the survey is conducted at different points in time throughout the year, the problem of inflated school attendance measured at the start of the school year is minimized¹⁰. Along with the figures reported in Section I that mainly rural enrollments have increased in recent years, the

identification strategy in this paper is based on a difference-in-difference strategy that compares rural children in the bottom two quintiles of the family income distribution (based on household equivalized monthly expenditure) after the initiation of the school reforms starting with DPEP with similar rural children before the implementation. To gauge post-treatment trends in the absence of treatment we exploit high-income (top quintile) rural children.

3. PREVIOUS LITERATURE

Previous literature finds primary education to be a normal good in developing countries. Although price elasticities for the demand for schooling tend to be low, Gertler and Glewwe (1990) develop a model of the willingness to pay for new secondary schooling and find that rural Peruvian households are willing to pay high fees to cover the operating costs of new schools in their villages. In the rural Indian context as well, we would expect that higher incomes would raise the demand for education. First, a rise in household income lowers the relative budget share of the out-of-pocket costs of education.¹¹ Furthermore, sustained growth in the economy raises the expected future benefits of obtaining education if the probability of obtaining a well-paid job after graduation becomes higher. Indeed, evidence shows that the returns to education in India have risen over time (Duraismy, 2002).

At lower levels of child education, it is mainly the parents who decide whether or not to send a child to school, and conditional on being enrolled whether the child should continue studying. A channel through which higher household incomes could lead poor families in developing countries to demand more education for their children would be if higher incomes for the adult workers of the family release children from the obligations of supplementing family income through work outside the home. Within the home, rising incomes would enable parents to purchase domestic help and thereby free girls from their domestic chores and allowing them to attend school instead. Of course, if better

economic conditions mean that the wages children can obtain on the labor market also increase, then this raises the opportunity cost of going to school. The seminal work on the economics of child labor (Basu and Van, 1998) shows that child labor is a possible equilibrium outcome when adult wages are low. That is, poor households are forced out of reasons of survival to send their children to the labor market. When families move beyond subsistence level, the luxury axiom states that children would be debarred from working outside the home. Cross-sectional evidence has generally found mixed results when it comes to the relationship between economic status (poverty) and child labor (see the survey article by Edmonds, 2007, p. 58). One study that follows the same households over time and allows for nonlinearities in the correlation between economic status and child labor finds that economic status improvement is the main reason for the dramatic decline in child labor in Vietnam in the 1990s (Edmonds, 2005). A longer-term effect of an increased standard of living could be that families begin to transit to lower fertility, lower child mortality regimes and begin to substitute child quality for child quantity by having fewer children and investing in their education (Becker and Lewis, 1973).

The empirical evidence on the importance of supply-side factors is so far mixed. Dreze and Kingdon (2001) formalize the channels through which both demand and supply factors affect school participation in a rural context. Their empirical analysis shows that parental background factors and some elements of school quality (especially mid-day meal for girls) as well as village development significantly affect school participation in rural India. On the other hand, Borooah and Iyer (2005) present some survey-based evidence from unit record data from the Human Development Survey (1993/94) that supply-side factors are less important. The reasons parents gave for their childrens' non-enrollment showed that reasons such as "school too far" or "school dysfunctional" did not play a large role. Rather, demand-side factors such as family financial constraints and child work either

within or outside the home were much more important. The weight given to demand-side factors also varied significantly by community. 34% of Dalit parents cited such factors compared to 29% of Hindus and 22% of Muslims. A large share of surveyed parents (16-23% depending on community) also cited as a reason for non-enrollment of their children that they did not consider education as being an important goal.

Another approach has been to look at the factors affecting educational transitions. Bhaumick and Chakrabarty (2010) examine the relative impacts of government policies (including % state expenditure on education) versus family background on the likelihood of transiting from one level of education to the next. They set up a sequential model of educational attainment that is estimated on a single cross section, the NSSO 61st round data. Their results show that while personal and household characteristics are the most important factors driving these transitions, government policies play a significant role as well, especially for the transitions occurring from primary to middle school.

Bhalotra and Zamora (2008) compare educational attendance and completion data for children in the NFHS between 1992/93 and 1998/99 surveys. Their results show that while primary school attendance grows for the 6-11 age group, in fact more rapidly for girls, completion for the 12-year-old children in this time period deteriorates. Decomposing the growth in these variables due to changes in characteristics that determine schooling and changes in responsiveness of the characteristics that determine schooling, they caution that model parameters may not in fact remain stable over time. Still, their simulation results point to the likely achievement of universal attendance of primary school in the near future, but not that of completion. They suggest that factors such as poor child health, an irrelevant curriculum, interference with the peak agricultural season and economic or

health shocks to the family may be important reasons why children do not appear to complete primary education in India.

Only a few systematic evaluations of government educational reforms in India exist so far, although none have considered the issue of differential trends. Jalan and Glinskaya (2013) is the first paper to study the effect of DPEP on current enrollment in a structured manner. They exploit the fact that Phase I of the District Primary Education Project (DPEP) was implemented in 42 districts across 7 states allowing them to identify a group of non-treated districts. Since program placements were not random, they use propensity score methods to adjust for observed differences across treatment and control districts. Their results show overall small impacts of the program (a 4.6 percentage points increase in current primary school enrollment over six years). They found more impressive impacts for minority children and in the state of Madhya Pradesh, but no impacts on the gender gap or on other indicators. As mentioned earlier, measuring educational attainment as enrollment is not optimal, as enrollments may be unresponsive to policy changes e.g. if children remain in the ‘books’ but do not in fact go to school.

Schmid (2006) uses a treatment intensity approach to evaluate the DPEP. Unlike Jalan and Glinskaya (2013), Schmid exploits all three phases of the reform by using a treatment intensity approach where the intensity of the treatment is measured as the number of years the program was in place and the number of years the age group under consideration was exposed to the program, i.e. were of school-going age. This study finds substantial program impacts for low-caste children, even for girls, although in terms of schooling access and not actual attendance.

An evaluation of the National Program of Nutritional Support to Primary Education (also referred to as the Mid-day Meal or MDM Scheme) on school participation and school attendance has been made

by Afridi (2011) using school-level panel data collected in the state of Madhya Pradesh. The reform, introduced in 1995, sets up one of the largest school meal programs in the world. Comparing treatment and control schools before and after the reform, Afridi finds a strong positive effect on the school attendance rate of girls in lower grades.

The DPEP was the predecessor of the Campaign for Universal Education or the Sarva Shiksha Abhiyan (SSA) reform and, as mentioned earlier, shared many similar features. In the data from the 55th and 61st rounds of NSSO, we will not, in general, be able to sort out the separate effects of one reform from the other. Our approach is instead to collectively consider all the variation in educational supply from the mid-1990s and on encompassing the DPEP, SSA and MDM reforms. We consider the target group of children that the reform was intended to help the most as the treatment group and then identify a control group that in principle should remain relatively unaffected by the reforms. Since we do not directly observe whether a particular child in the treatment group received the treatment (e.g. was enrolled in an SSA school or received some other element of SSA investment), we identify intention-to-treat (ITT) estimates.

We use comprehensive data from 5 rounds of the National Sample Survey (NSSO) spanning the period from 1983 up to 2004/2005. Our data at the time of embarking on this study was limited to 5 rounds spanning 20 years; however, we hesitated to add more recent rounds because of other concurrent changes that make the pre and post periods difficult to compare, for instance the large, confounding effect of the financial crisis etc. Using difference-in-difference-in-difference methods incorporating differential linear trends, we investigate whether rising school attendance among poor children at the primary and middle school levels in the early 2000's in rural India is in part caused by educational policy initiatives which, although being universal by design, mainly impact rural children

in the bottom quintiles of the household income distribution. At the same time, it is important to control for any differential trend reflecting the economic growth experienced during the last two decades that predated (and perhaps formed the basis for) the reforms, if e.g. rising incomes increased in particular poor families' demand for education.

As discussed in this section, while other papers have analyzed the impact of educational reforms in India on school enrollment rates, our paper is one of the first to do so using the full longitudinal aspect of the NSSO data, thereby being able to control for plausibly differential trends reflecting the disparate effects of economic growth on poor vs. rich. By being able to control for any differential demand-side factors, we are able to infer whether supply-side factors also explain rising attendance. This is a clear contribution to the literature as most evaluation studies rely on a common trend assumption.

4. EMPIRICAL MODEL

(a) Treatment and control groups

We estimate a difference-in-difference-in-difference model comparing the difference in school attendance rates of treated and control children aged 6-14 before and after the 99/00 NSSO wave. The treatment group is rural, low-income children (according to bottom two quintiles of household monthly equivalized expenditure) and the comparison group is rural high-income children (top quintile of household monthly equivalized expenditure). Thus, the pre-period consists of the 1983, 1987/88 and 1993/94 waves and the post-period consists of 1999/00 and 2004/05 waves. Note that even though the DPEP was introduced at the end of 1994, it was first piloted in 42 districts in 7 states and universalized only after that. So 1993/94 is here considered a pre-reform year since the survey

ended in June 1994. Furthermore, as we shall show later, dropping the DPEP pilot states from the analysis hardly changes the results.

It is instructive to discuss how rural sector is operationalized in the NSSO data. In India, rural (country-side) is defined indirectly or as a residual. Thus, a population is considered rural if is not living in the urban areas. The characteristics of an urban area are discussed by Bhagat (2005): “The 1961 census, however, applied the following criteria of urban settlement: All those places having urban bodies (Municipal Corporation, Municipality, Notified Area Committee and so on); and all those places having a population not less than 5,000, a population density of 400 persons per km² and 75 per cent of the workforce employed in the non-agricultural sector. In addition to these, the Director of Census Operations, in consultation with state governments and the Census Commissioner of India, has the power to declare a settlement urban.” Thus, any population settlement that does not fall under the category, urban, is treated as rural.

Rural high-income children are assumed to have access to schooling already; for instance they have the financial means to travel to distant schools or to attend private schools if local government schools are not available. Information on how far children travel to reach school is generally not available, however, NSSO 2004-05 does collect information on whether the children are not going to school because the school is too far. We cannot exploit these data in the analysis because it is not available in the pre-reform years. However, we provide some descriptive evidence here that rural rich children are not as constrained in terms of school access as rural poor children. Table 1 shows the proportion of children not attending school according to economic status. Of the total number of children that do not attend school because school is too far, about 48% are from the bottom two quintiles of the rural population. There are no significant differences between boys and girls in this respect.

{TABLE 1 HERE}

Urban very low-income children in principle should resemble the treated children potentially more in terms of their background characteristics and are presumably not substantially affected by the programs because of easier availability of schooling in urban areas and the greater efforts made up to now of the government programs in raising school accessibility in rural areas. The urban trend, however, has been higher and, as we show later, quite different than that in the rural areas.

While poor rural children mainly access government or government-aided schools, rich rural children have more educational options in terms of private and non-formal schools. The figures cited in Section 2 showed that over the observation period of this study, the bulk of the educational investments had been allocated to rural areas serving poorer children. However, if high-income rural children also received some elements of the reform (say, teacher training components or higher teacher salaries), what we will uncover will be a lower bound of the treatment effect. Table 2 shows primary school attendance rates for the treated and control groups from 38th to 61st rounds (over the period 1983 to 2004/05). Treated girls (boys) increase attendance between 49 (34) percentage points over the period while control girls (boys) start the period at a higher level and increase attendance by about 34 (21) percentage points over the same period.

{TABLE 2 HERE}

(b) Difference-in-difference-in-difference with linear trends

The model estimated in the paper is a difference-in-difference-in-difference model with (differential) linear trends (DDD). However, for exposition purposes, we start by showing the simple DD model. Then, we move to the model estimated.

Assuming for the moment a common time trend between treatment and control groups in attendance, the basic difference-in-difference model estimated via linear probability (LP)¹³ is given by:

$$Attendance_i = \alpha + \beta_1 treated_i + \beta_2 after_i + \beta_3 (treated_i \times after_i) + \gamma X_i + \varepsilon_i$$

where i indexes individuals, the ‘before’ period goes from 1983 to 1993/1994 and the ‘after’ period is from 1999/2000 to 2004/2005. Thus, independent cross sections are pooled together in the analysis. *Attendance* is a 0-1 indicator for whether the child in the 6-14 age group is currently attending school and X is a set of covariates including parental education, number of children aged 0-5, religion and caste¹⁴ groupings. Standard errors are clustered at the level of the state.

To relax the assumption of a common time trend in attendance between rural poor children and rural rich children, we incorporate differential (linear) trends.¹⁵ As mentioned earlier, children from the most well-to-do families in the rural-sector are presumably already attending school on a regular basis and therefore should not be affected by the programs. With five rounds of data at our disposal, we are able to relax the assumption that they (rich rural children) share a common time trend with their treated counterparts and still estimate both a common jump and a change in slope following the reform, both in levels and interacted with treatment status. An example of a (modified) triple difference estimator incorporating differential trends is found in Francesconi and van der Klaauw (2007)¹⁶. The model we estimate is a full triple-difference model with all interactions and is given by:

$$Attendance_i = \alpha + \beta_1 treated_i + \beta_2 after_i + \beta_3(time_i) + \beta_4(treated_i \times after_i) + \beta_5(treated_i \times time_i) + \beta_6(time_i \times after_i) + \beta_7(treated_i \times after_i \times time_i) + \gamma X_i + \varepsilon_i$$

(c) Falsification exercises

As a falsification exercise we re-estimate the same model above but using bottom and top quintile urban children as treated and control. Such a pseudo comparison of urban poor vs urban non-poor among which there should be no differential impact of the reforms will further show if there is a policy-induced causal effect. In a second falsification test we utilize the pre-reform years only, treating the 38th and 43rd rounds as before and the 50th round as after.

(c) Robustness test

In a robustness test, we perform within-FSU (village) estimations to check whether our treatment effects are robust meaning that systematic differences in community characteristics between treated and comparison groups (e.g. as a result of historic segregation of the poor to certain communities and villages) are not driving the results.

We estimate all models separately by gender. In further analyses, we rerun all estimations on sub-groups according to age group, social and religious grouping and region.

5. DATA AND DESCRIPTIVES

We use unit record level data from five repeated cross-sectional rounds of the National Sample Survey (NSSO) Employment and Unemployment data spanning the period from 1983 up to 2004/05. These years were selected because they span the period of the major educational reforms, 3 periods before

and 2 periods after. The data are collected using a stratified multistage sampling design and weights are a natural part of the data. Since the DPEP was rolled out at the end of 1994 (and phased out in 2002) and its continuation, the SSA, introduced in 2000 we consider the 38th (data collected over the period January-December 1983), 43rd (July 1987- June 1988) and 50th (July 1993-June 1994) rounds as the ‘before’ period and the 55th (July 1999- June 2000) and 61st (July 2004 – June 2005) rounds as the post period in which the effect of the educational expansions should be detectable.

Two qualifications are necessary. First, the 43rd round of NSSO data has been found to diverge in some respects from other rounds including a disproportionate drop in rural incomes in this round, also found by other researchers. Hnatkovska et al., 2013 are unable to find an explanation for this fall in wages for a number of observations in their sample either in the documentation or following conversations with NSSO officials. They end up dropping this round from their analysis on income mobility. Other sources indicate that the period 1987-1988 could have been a year with food shortage since imported tonnage of wheat increased sharply in 1988-89 (Shiva, 2004). For this reason, we will conduct robustness analysis by omitting the 43rd round from some of the analyses.

Second, the full effect of the educational expansions may take time to play itself out. Thus, we also experiment whether treatment effects are larger when only the post-55th round is considered as the post-reform period.

(a) Key variables

Our sample consists of all rural households that have children in the age group 6-14. The dependent variable is whether or not the child is currently attending school. The control variables in the analysis are parental education¹⁷, number of children (0-5 years) and socioreligious grouping. Standard errors

are clustered at the state level in all estimations. Appendix Table 1 shows means for all variables separately by gender and treatment status at the start and at the end of the period.

As can be seen, rural rich children are better off in terms of parental education and have smaller sized families compared to the rural poor, hence the importance of netting out these factors from the analysis. However, as seen from the figures below, trends in school attendance evolve similarly over time for the two groups. We have intentionally kept the list of explanatory variables sparse in order not to encounter endogeneity related to either school or location choice. For instance, we do not include measures of school infrastructure, school location or access to other community infrastructure. In any case, not all these data are available in the early NSSO rounds as mentioned earlier. Finally, as the treatment status is defined on the basis of household equivalized expenditure, we refrain from adding it in the model since it is correlated with treatment status and including it will affect the estimates of both.

The means show that over time illiteracy levels drop and presence of small children falls for all groups. In fact, at the end of the period, sample households have less than 1 child in the age group 0-5 per household on average (varies from 0.4 to 1). This may seem low in an Indian context, but recall that this is not a measure of total fertility of the household but simply the number of younger siblings of children aged 6-14. We include this to capture whether the presence of younger siblings in the family may affect attendance. In particular, girls may be required to stay home to take care of younger siblings.¹⁸

(b) Trends in school attendance

Figures 1-2 show rising school attendance over the period of analysis, 1983-2004/5, for treatment and control groups alike. We show the trends for the urban poor also for comparison purposes. Urban

very low-income (bottom quintile) children in principle should resemble the treated children in terms of their background characteristics and are also not substantially affected by the programs because of easier availability of schooling in urban areas. Plus, there have been made substantially greater investments by the government programs to raise school accessibility in rural areas. However, in practice we find large differences in mean characteristics between urban poor and rural poor (available on request) and also as seen in Figures 1-2, the urban trend has been higher and quite different from the rural trend. Given the large differences between urban and rural settings in many low- and middle income countries, it may be problematic to assume that urban settings can provide a suitable benchmark for rural settings. Therefore, our strategy is to compare rural rich and poor children.

In each case, attendance is highest among rural rich and lowest among rural poor with urban poor falling in between. The rise in attendance over time is most dramatic in the rural-sector. Moreover, the rise in attendance is stronger among rural girls than rural boys. The trends show that rural rich children share similar pre-program trends in school attendance with the rural poor children (treated group). Even if trends are not parallel, the estimation method employed involves controlling for both a common trend and a group-specific time trend, both in levels and interacted with the reform. This will allow us to sort out differential trends for different sub-groups from the causal impacts of educational reforms.

{FIGURES 1-2 HERE}

6. ESTIMATION RESULTS

(a) Main results

Main estimation results are shown separately for girls and boys in Table 3. Treated children have lower school attendance, both girls and boys. The treatment effect (β_7 , the coefficient on Treated x Time x After) is around a 10 (7) percentage point statistically significant increase in the rate of attendance among poor rural girls (boys) in the period after the educational reforms were put in place (mid-1990s and on) compared to the period before and to the control group of rich rural girls (boys). The treatment effects and other coefficients are fairly robust to the addition of controls, but reduce slightly to 9 (5) percentage point gain in attendance rate for rural poor girls (boys). Thus, we base the rest of the discussion on results incorporating controls for maternal literacy, number of children (and differential trends in both) plus controls for socioreligious grouping (Muslim, SC, ST households).

The estimated effects on the other covariates in the model are briefly discussed here, keeping in mind that they represent merely associations and cannot be given a causal interpretation: having an illiterate mother seems to matter substantially more for sons and is associated with a lowered attendance of about 63 percentage points, whereas for daughters it is associated with a lower attendance of about 30 percentage points. We do not control for having an illiterate father as that will be highly correlated with having an illiterate mother. The presence of small children in the household is associated more with lower attendance for girls than boys, as can be expected.

In terms of socioreligious affiliation, being a Muslim female appears to be slightly more detrimental for school attendance than being a Muslim male, -7 percentage points vs. -6 percentage points. Belonging to SC households seems to lower attendance by about 6 percentage points for girls and by 3 percentage points for boys, which may indicate a double disadvantage of being low caste and a girl. Being of ST background is associated with a lower attendance of about 5 percentage point for both girls and boys. The effects of socioreligious grouping are highly significant. Muslim children appear

to be most penalized in terms of school attendance relative to Hindu forward caste children. The uniform negative effect observed for both boys and girls from ST households could be due to an unmet need for education within this group because they typically reside in remote areas.

The Sachar Committee Report of 2006 found that access to government schools for children of Muslim parents is limited and that 25 percent of children of Muslim parents in the 6-14 age group have either never attended school or have dropped out. In a non-evaluation study, Borooah and Iyer (2005) decomposed school enrollment likelihood according to religion and caste using the Human Development Survey of 1993/94 of 1,800 villages and found that there were substantial differences by community, but these tended to depend on maternal literacy, i.e., community differences in school enrollment were minimal when mothers were literate. When looking at school attendance and even after controlling for maternal literacy, we find lower attendance rates for Muslims, SCs and STs. But, as mentioned earlier, the estimated effects on the control variables represent merely associations.

As can be expected, there is a positive and significant time trend in school attendance for both girls and boys such that attendance increases by about 10 and 5 percentage points a year, respectively. The large negative effect on (Treated x After) coupled with a positive effect on (Treated x Time x After) is consistent with the treatment group having a smaller jump than the control group in the reform year but having a bigger change in slope after the reform than the control group. It is the latter which is the treatment effect. The explanatory power of these LP regressions is high, about 27% (40%) for girls (boys).

As evidenced from the figures showing the trends in school attendance, a slowdown in attendance occurs between the 38th and 43rd rounds and some sharper catch-up after that. As mentioned earlier, the period 1987-1988 experienced a drop in rural incomes and food shortages, and therefore the

treatment effect we found in second column of Table 3 may in part be driven by a pre-program slowdown in school attendance between the 38th and 43rd rounds with a sharper rise thereafter between the 43rd and 50th rounds. To make sure that the positive trend in school attendance among rural low-income children is not just an artefact of this slowdown followed by a sharp level increase, we drop the 43rd round entirely in the third column and re-estimate our models. Hnatkovska et al., (2013) also drop the 43rd round in their analysis of intergenerational income-related mobility.

Results are reassuringly similar in orders of magnitudes, signs and significances, with an estimated treatment effect of about 9 percentage points for rural poor girls relative to rural rich girls, and an estimate of about 5 percentage points for rural poor boys relative to rural rich boys. Still, since the estimated treatment effects are slightly smaller than what we found in the previous columns, we drop the 43rd round in all remaining analyses. All other estimated coefficients – such as those on maternal literacy, household income, socioreligious grouping etc., – are highly similar to what we had found on the full sample.

{TABLE 3 HERE}

(b) Heterogeneous effects

In Table 4, we perform a sub-group analysis by age group, socioreligious grouping and region. The age group analysis reveals that program impacts are even higher for the 6-11-year-olds, i.e. primary school level, which is also where the bulk of the investments were targeted. Within this age group we see that girls' attendance rate increases by 10 percentage points and boys' attendance rate also increases significantly by 6 percentage points. Among the middle school age group, 12-14, girls increase their attendance rate by 6 percentage points while boys increase it by 3 percentage points.

This may indicate that the efforts to provide access to close-by schools in rural areas to some extent have been successful at reducing dropout between primary and middle school levels (see Bhalotra and Zamora, 2008).

In Table 4 second column we also take up the issue of socioreligious inequities by examining whether the policies in fact narrow gaps in school attendance even within these sub-groups. Compared to their rural high-income counterparts, low-income rural Muslims of either gender do show positive effects in post-reform school attendance rate, but these are imprecisely estimated. Low-income rural SC girls (boys) and ST girls (boys), on the other hand, increase attendance substantially after the reforms come into play by 8.5 (4) percentage points and 12 (8) percentage points, respectively, compared to their rural high-income equivalents. These results are similar to those found by Jalan and Glinskaya (2013) and Schmid (2006) who find substantial program impacts for low-caste and minority children following DPEP.

In Table 5 we explore the gains made in different regions. Here, we see that rural low-income girls within specific regions gain with respect to rural high-income controls e.g. in the Northern and Eastern regions, where they manage to increase attendance rate compared to the comparison group by respectively, 18 and 10 percentage points. Rural, low-income boys from the Eastern region also increase their school attendance rate as a result of the reforms but not to the same extent as girls (their increase is 4 percentage points). Rural low-income boys from the South make a gain of 6 percentage points. Results for the other regions vary, are in some cases positive and large (e.g. the Northeast, girls) but not precisely estimated. Our results are in line with Asadullah and Yalonetzky (2012) who construct indices of educational opportunity and find substantial heterogeneity across states. They find that the Northern, Southern and Eastern regions have experienced upward mobility, meaning a

decline in inequality of opportunity in education, despite the Eastern states of West Bengal and Orissa being poor, while the Central region has experienced downward mobility. We also find either no change or declines in some of the other areas (e.g. West).

{TABLES 4-5 HERE}

7. FALSIFICATION TESTS, POTENTIAL CONFOUNDERS & CONCURRENT REFORMS

We turn to our first falsification exercise in Table 6, first column, estimated as a DDD with linear trends as before. Since the urban sector did not benefit from additional school building although they did benefit from some other components such as teacher training etc., we would expect smaller effects in the urban sector. Exploiting urban poor and rich children as treated and controls shows no statistically significant treatment effect in the post-reform period for low-income boys in the urban sector, in fact the coefficient is negative, -1 percentage point, whereas for girls the coefficient is larger, 4.6 percentage points, but significant only at the 10% level. The aim of the falsification exercise was to check whether there were weaker effects on attendance post-reform in the urban sector which has not experienced as massive an investment and this seems to be the case.

In the second falsification exercise in Table 6, column 3, we utilize 38th and 50th rounds only and pretend as though the reform occurred between these two rounds. In this case, we are unable due to lack of variation to estimate the full-blown triple difference model because we only have two periods at our disposal. Hence we rely on a simple DD estimation and compare it to the DD in the base case (using all 5 rounds) in column 2. The results show negative coefficients on the interaction term Treated x After for both girls and boys, -2.2 and -1.8 percentage points, though neither is statistically

significant. This is to be compared to the base case DD model where a statistically significant effect of 6 percentage point increase in the attendance rate is seen for girls, and a positive (though not statistically significant) effect of 1.3 percentage points for boys.

Our model controls for any pre-existing common linear trend as well as a differential trend between treated and controlled. Furthermore, as we include maternal literacy and number of small children and differential trends in both these factors in the model, concurrent changes in parental education or cohort size that potentially affect the demand for schooling have been controlled for. One may be concerned about the strategy of comparing poor rural children to rich rural children. From Appendix Table 1, we see that the control group is better off in terms of parents' education and have a smaller family size although they share somewhat the same socioreligious profile. The model has been kept intentionally sparse in order not to run into issues of endogeneity of choice variables such as other school or community infrastructural factors.

Within the rural-sector segregation at the village level exists in certain cases by caste or religion implying differential access to good quality schools and health facilities. To test if there could be potential confounders at the level of the community, we include FSU fixed effects in the rural-sector analysis. The FSU (first-stage unit) identifier is present in the NSSO data and indicates census villages in the rural-sector (and urban frame survey (UFS) blocks in the urban-sector). There are more than 14,000 FSUs in our sample. The within-FSU estimates appear in the fourth column in Table 6.

Results show that even within villages, poor rural girls manage to improve their school attendance 7 percentage points relative to rich rural girls and the effect is highly statistically significant. For boys, within-community results show a small positive but not statistically significant increase in attendance

of 1.1 percentage points compared to rich rural boys. Earlier in Table 3 we had found that poor rural boys' school attendance rate had increased 5 percentage points relative to rich rural boys. The difference in results across DDD and DD specifications for boys indicates that DD model is misspecified. Thus it cannot be used as a falsification test for boys. Whereas the effect on girls is not very different in the DDD and DD specifications, meaning that it is reasonable to use the DD model for specification tests for girls.

{TABLE 6 HERE}

We conclude that there is a positive program effect for both boys and girls, although the effect is weaker for boys. Our main result shows an increase in the rate of school attendance over the period that can be plausibly attributed to the school reforms by 9 percentage points for poor rural girls relative to rich rural girls and by 5 percentage points for poor rural boys relative to rich rural boys.

A relevant concern could be that the early 1990s in India was a period of reform across many sectors of the economy. There were substantial changes in trade policy, licensing, etc. following liberalization but these mainly affected capital-intensive tradable goods production at the urban level (i.e., jobless growth); still such changes could have potentially changed the perceived demand for schooling in rural areas. Therefore we controlled in our model for concurrent changes in household income and cohort size, factors that strongly affect the demand for schooling, as well as for differential linear trends by treatment status. Even though the evidence provided in this paper is indirect, our findings point to a strong causal effect of school reforms enacted in the mid-1990s on the school attendance rate of mainly low-income girls and to some extent also low-income boys.

8. DISCUSSION & CONCLUSION

Estimating a difference-in-difference-in-difference model incorporating differential linear trends on 5 rounds of NSSO data, we evaluate the effectiveness of educational policy initiatives starting in the mid-1990s in raising school attendance among poor children at the primary and middle school levels in rural India. Our results show that the reforms introduced in the mid-1990s boost school attendance rates for both rural low-income girls and boys, but the effect is twice as strong for girls. We find an increase of school attendance rate that can be plausibly attributed to the school reforms by 9 percentage points for poor rural girls relative to rich rural girls. For girls, the effect size is 25% smaller when looking within FSU (village) but still highly statistically significant. For boys, however, the within FSU results were misspecified as the DD and DDD model yielded different findings. Given the magnitude of the effect on attendance rate found for girls, our findings would suggest a rapid closing of the school attendance gap between rich and poor girls in rural India if the treatment effect were to persist in subsequent years.

We started with posing the question of whether the better infrastructure and easier school access due to the reforms have led to an increase in school attendance? For girls, we find this is the case, i.e., part of the increase in school attendance rates over this period can be causally attributed to the reforms. Our model controlled for maternal education and number of small children, i.e., concurrent changes in family background or cohort size that potentially affect the demand for schooling, and allowed for differential trends. Furthermore, we also tried running the same regressions including average state income and its square as a measure of economic growth as a possible explanatory factor for increased attendance. In all these specifications, we obtained essentially the same results (available on request).

Could the effects be the result of an announcement effect? Phase I of the District Primary Education Project (DPEP) was implemented in 42 districts across 7 states in 1994 so some anticipation of it could have been present in 1993/1994, at least in the affected districts. In Phase II, the DPEP program was universalized. SSA was rolled out in 2000 at the same time in all districts and the program was widely announced before-hand as the government's "flagship" program in education. It is unlikely that SSA could have been anticipated in 1993/1994 particularly since the ruling governmental party during its introduction (the NDA) was only elected into office in 1998. While it is true that the Jomiten Treaty was signed in 1990, it is highly unlikely that village households in rural India would have known about this in 1993/94 and have correctly anticipated its implementation. Earlier, we had confirmed that the effect arose mainly in the 61st round. Additionally, we tried running our model omitting the DPEP pilot states in Phase I entirely from the sample (Haryana, Tamil Nadu, Kerala, Maharashtra, Madhya Pradesh, Karnataka and Assam) and obtained similar treatment effects (available on request).

Even if there were some anticipation effects of the SSA as early as 1993/94, children in remote rural areas cannot increase attendance if nearby schools do not exist, and the financial statements released by the government show that a substantial fraction of outlays went into the building of new schools and infrastructure (civil works). In any case, if the anticipation of a large-scale reform of the educational system makes parents more eager to send their children to school or children more willing to attend, it can be argued that this is a positive and inevitable pre-outcome of the reform, hence to be considered part of the treatment effect.

Our results show that the educational reforms instated in the mid-1990s causally increased the school attendance rate for low-income rural girls in the 6-14 age group (and quite substantially so for girls

aged 6-11) and this was due to the reforms mainly impacting school attendance among treated SC and ST girls and girls in the Northern and Eastern regions but not among other groups or regions. As real improvements in attendance were found in this study only within certain socioreligious groups and confined to certain regions, future efforts should be directed towards finding out why the gains in the school attendance rate resulting from the educational policy initiatives have not been more uniformly distributed across all disadvantaged groups. Future work should also explore whether the increased attendance as a result of the reforms has led to improved learning outcomes or whether more targeted pedagogic initiatives can be more cost-effective in this regard.

REFERENCES

- Adukia, A. (2014). *Sanitation and Education*. Mimeo, Harvard University.
- Afridi, F. (2011). The Impact of School Meals on School Participation: Evidence from Rural India. *Journal of Development Studies*, 47(11), 1636-1656.
- Asadullah, M. N., & Yalonetzky, G. (2012). Inequality of Educational Opportunity in India: Changes Over Time and Across States. *World Development*, 40(6), 1151-1163.
- Basant, R., & Sen, G. (2014). Parental Education as a Criterion for Affirmative Action in Higher Education. *World Development*, 64(C), 803-814.
- Basu, K., & Van, P. H. (1998). The Economics of Child Labor. *American Economic Review*, 88(3), 412-27.
- Becker, G. S., & Lewis, H. G. (1973). On the Interaction between the Quantity and Quality of Children. *Journal of Political Economy*, 81(2), S279-88.
- Bhagat, R. B. (2005). Rural–urban classification and municipal governance in India, *Singapore Journal of Tropical Geography*, 26(1), pp. 61-73)

- Bhalotra, S. R., & Zamora, B. (2008). *Primary Education in India: Prospects of Meeting the MDG Target*. CMPO Working Paper Series, No. 08/190.
- Bhaumik, S. K., & Chakrabarty, M. (2010). *Mother or Motherland: Can a Government Have an Impact on Educational Attainment of the Population?: Preliminary Evidence from India*. IZA Discussion Papers, No. 4954, Institute for the Study of Labor (IZA).
- Borooah, V. K., & Iyer, S. (2005). Vidya, Veda, and Varna: The Influence of Religion and Caste on Education in Rural India. *Journal of Development Studies*, 41(8), 1369-1404.
- Borooah, V. K., & Iyer, S. (2005). Vidya, Veda, and Varna: The Influence of Religion and Caste on Education in Rural India. *Journal of Development Studies*, 41(8), 1369-1404.
- Bossiere, M. (2004). Rationale for Public Investments in Primary Education in Developing Countries. Background Paper for the Evaluation of the World Bank's Support to Primary Education. The World Bank, Washington, D.C.
- Dougherty, S., & Herd, R. (2008). *Improving Human Capital Formation in India*. OECD Economics Department Working Papers 625, OECD Publishing.
- Dreze, J., & Kingdon, G. G. (2001). School Participation in Rural India. *Review of Development Economics*, 5(1), 1-24.
- Dubey, A., Kaur, R., Sharma, O.P., Goswami, J., Arora, M.K., Singh, S., & Garg, L. (2006). *Deployment and Professional Competence of Para Teachers*. Department of School Education and Literacy, Ministry of Human Resource Development, New Delhi.
- Duraisamy, P. (2002). Changes in Returns to Education in India, 1983-94: By Gender, Age-Cohort and Location. *Economics of Education Review*, 21(6), 609-622.
- Edmonds, E. V. (2005). Does Child Labor Decline with Improving Economic Status? *Journal of Human Resources*, 40(1), 77-99.
- Edmonds, E.V. (2007). *Child Labor*. NBER Working Paper Series, #12926, National

Bureau of Economic Research, Cambridge, MA.

Francesconi, M., & Van der Klaauw, W. (2007). The Socioeconomic Consequences of “In-work”

Benefit Reform for British Lone Mothers. *Journal of Human Resources*, 42(1), 1-31.

Gertler, P., & Glewwe, P. (1990). The Willingness to Pay for Education in Developing Countries:

Evidence from Rural Peru. *Journal of Public Economics*, 42(3), 251-275.

Glewwe, P., & Miguel, E. A. (2007). The Impact of Child Health and Nutrition on Education in

Less Developed Countries. *Handbook of Development Economics*, 4, Chapter 56, 3561-3606.

Glewwe, P., & Muralidharan, K. (2015). Improving School Education Outcomes in Developing

Countries: Evidence, Knowledge Gaps, and Policy Implications. RISE-WP-15/001.

Hnatkovska, V., Lahiri, A., & Paul, S. B. (2013). Breaking the Caste Barrier Intergenerational

Mobility in India. *Journal of Human Resources*, 48(2), 435-473.

Jalan, J., & Glinskaya, E. (2013). *Small Bang for Big Bucks? An Evaluation of a Primary School*

Intervention in India. Working Paper No. 9, Center for Studies in Social Sciences Calcutta.

Kingdon, G. G. (2007). The Progress of School Education in India. *Oxford Review of Economic*

Policy, 23(2), 168-195.

Lanjouw, P., & Murgai, R. (2009). Poverty Decline, Agricultural Wages, and Nonfarm

Employment in Rural India: 1983--2004. *Agricultural Economics*, 40(2), 243-263.

Pal, S., & Kingdon, G. G. (2010). *Can Private School Growth Foster Universal Literacy? Panel*

Evidence from Indian Districts. IZA Discussion Papers, No. 5274, Institute for the Study of Labor (IZA).

Pratham (2006). ASER 2005 – Annual Status of Education Report, New Delhi.

Psacharopoulos, G. & Patrinos, H. A. (2004). Returns to Investment in Education: A Further

Update. *Education Economics*, 12(2), 111-134.

PROBE team (1999). *Public Report on Basic Education in India*, New Delhi, Oxford University Press.

Schmid, J. P. (2006). *Was the District Primary Education Programme in India Effective?* Draft Ph.D. Thesis Chapter, Zurich, Nadel ETH (Department for Humanities and Social Sciences, Swiss Federal Institute of Technology).

Self, S., & Grabowski, R. (2004). Does Education at All Levels Cause Growth? India, a Case Study. *Economics of Education Review*, 23(1), 47-55.

Setty, E.D. & Ross, E.L. (1987). A Case Study in Applied Education in Rural India. *Community Development Journal*, 22 (2): 120–129, Oxford University Press.

Shiva, V. (2004). The Future of Food: Countering Globalisation and Recolonisation of Indian Agriculture. *Futures*, 36(6), 715-732.

UNESCO (2000). *The Dakar Framework for Action, Education for All: Meeting our Collective Commitments*.

World Bank (2003). *A Review of Educational Progress and Reform in the District Primary Education Program (Phases I and II)*. Report No.1, Human Development Sector.

¹ However, there are still over 43,000 villages and habitations (about 7.3% villages) out of about 594 thousand that have literacy rates less than 25% in 2001.

⁴ Authors' own calculations.

⁵ These trends can be validated against the National Family Health Surveys 1993 to 1999. Even though the time period and age group being analyzed are slightly different, over a six-year period the NFHS data similarly show that school attendance among rural 6 to 10-year-old girls and boys rose by 20 and 12 percentage points respectively, with smaller increases for urban children (Kingdon, 2007).

⁶ The start of liberalization is in 1991 (the year in which the rupee was devalued following the balance of payments crisis and economic reforms had to be adopted), although the opening up of the economy had started even prior to that.

⁷ For instance, the Non-formal Education Program (1979-1990), introduction of Mid-day meals (MDM) (1982)), the National Policy on Education (1986), Operation Blackboard (1986), *Shiksha Karmi* (1987), Total Literacy Campaign (1988) and *Lok Jumbish* (1988). Various initiatives at the state level supplemented these programs. However, investments in these programs were not as substantial and public education continued to be of poor quality (Setty and Ross, 1987).

⁸ Tribal Development Plan, see http://ssa.nic.in/planning/Tribal%20Development%20Plan-FINAL.pdf/at_download/file.

⁹ Gross enrollment ratios for primary schooling are reported to be over 100% in recent years.

¹⁰ Furthermore, the NSSO probes into the reason for non-attendance, i.e., whether the child has never attended (codes 1-5) or ever attended but not currently attending (codes 11-15). If the child is attending, the course of study will be ascertained, and if more than one course is being taken concurrently, the course which is full-time or of longer duration is considered for current attendance (see Government of India, NSSO 2004, "Instructions to Field Staff: Chapter 4, page D11 and D12).

¹¹ Even though primary schooling is entirely subsidized in India, expenses on school books and uniforms can be prohibitive for poor families (see PROBE, 1999).

¹³ In the current analysis we made the LPM assumption because we were estimating a triple difference model which is difficult to incorporate into a non-linear framework. Future work can test the robustness of the findings here to using a non-linear DDD estimation method, estimated non-parametrically.

¹⁴ Dummies for Scheduled Caste and Scheduled Tribe, denoted hereafter as SC and ST, respectively.

¹⁵ The time trend variable takes on values ($t=1,2,3,4,5$), and *after* is a 0/1 dummy equaling 1 for $t=4,5$, 0 otherwise.

¹⁶ With only 3 years pre-reform and 2 years post-reform, we are not able to estimate different slopes for each post-reform year and neither are we able to incorporate quadratic trends.

¹⁷ NSSO data give information on the education of the head of household and all members related to the head.

Identifying the education level of the father and mother may be a complicated exercise in households with many members who are not related to the head (Basant and Sen, 2014). Since we start with a sample of nuclear family households, we are more easily able to observe the education level of the father and mother. This may impart some selection bias to our results as nuclear family households are likely to invest more in their children. However, this will most likely understate effects of public programs on school attendance. As nuclear family households are on the rise in India, the importance of this source of selectivity is diminishing with time.

¹⁸ For the population as a whole, as per census 2011 (see <http://www.censusindia.gov.in/2011census/hh-series/hh01.html>), the total number of households is 249.5 million and the number of children in the age group 0-6 is 164.5 million, i.e. less than 1 child in the 0-6 age group on average (0.65).

FIGURES

Figure 1. Attendance Rate by Treatment Status (Girls)

Figure 2. Attendance Rate by Treatment Status (Boys)

Table 1: Share of children not attending as school is too far by household expenditure quintile, NSSO 61st round

Expenditure quintiles	Boys	Girls
Bottom quintile	23.5	25.3
2	24.2	22.3
3	20.6	20.7
4	19.7	21.2
Top quintile	11.9	10.5
All	00.0	100.0

Source: NSSO 2004-05

Table 2. School attendance rates, NSSO 38th, 43rd, 50th, 55th and 61st rounds.

	Treatment (low-income rural, bottom two quintiles)		Control (high-income rural, top quintile)	
	Girls	Boys	Girls	Boys
38 th round (Jan-Dec, 1983) N ₃₈	0.254 (0.435) 17396	0.480 (0.500) 18981	0.584 (0.493) 9734	0.754 (0.430) 11293
43 rd round (July 1987- June 1988) N ₄₃	0.336 (0.472) 15472	0.527 (0.499) 17236	0.701 (0.458) 12203	0.823 (0.381) 14157
50 th round (July 1993- June 1994) N ₅₀	0.470 (0.499) 11781	0.649 (0.477) 13129	0.821 (0.383) 9351	0.899 (0.301) 10802
55 th round (July 1999- June 2000) N ₅₅	0.580 (0.494) 13541	0.698 (0.459) 14093	0.855 (0.352) 10091	0.913 (0.281) 11984
61 st round (July 2004- June 2005) N ₆₁	0.746 (0.436) 12308	0.822 (0.383) 12752	0.930 (0.255) 11360	0.959 (0.197) 13825
N ₃₈₋₆₁	70498	76191	52739	62061

Table 3. DDD with linear trends estimates of the probability of attending school, LPM.

	All rounds		All rounds with controls		All rounds minus 43 rd with controls	
	Girls	Boys	Girls	Boys	Girls	Boys
Treated x Time	0.103*** (0.025)	0.068*** (0.021)	0.089*** (0.022)	0.046*** (0.013)	0.086*** (0.022)	0.045*** (0.013)
x After						
Treated	-0.324*** (0.034)	- 0.294*** (0.029)	-0.225*** (0.030)	-0.102*** (0.014)	-0.223*** (0.031)	-0.095*** (0.013)
Time	0.118*** (0.011)	0.072*** (0.008)	0.107*** (0.010)	0.051*** (0.005)	0.107*** (0.010)	0.051*** (0.005)
After	0.087* (0.050)	0.049* (0.024)	0.087* (0.045)	0.008 (0.020)	0.085* (0.044)	0.008 (0.021)
Treated x Time	-0.013 (0.012)	0.010 (0.008)	-0.017 (0.011)	-0.008 (0.006)	-0.015 (0.011)	-0.008 (0.006)
Treated x After	-0.311*** (0.104)	-0.235* (0.106)	-0.267*** (0.089)	-0.153** (0.064)	-0.267*** (0.087)	-0.155** (0.063)
Time x After	-0.043*** (0.015)	- 0.027*** (0.007)	-0.039*** (0.013)	-0.012** (0.006)	-0.039*** (0.013)	-0.011* (0.006)
<i>Controls:</i>						
Mother illiterate			-0.295*** (0.014)	-0.632*** (0.012)	-0.283*** (0.014)	-0.647*** (0.012)
No. of children 0-5			-0.011* (0.004)	-0.005*** (0.002)	-0.012*** (0.004)	-0.005** (0.002)
Muslim			-0.072** (0.031)	-0.062*** (0.014)	-0.069** (0.028)	-0.059*** (0.013)
Scheduled caste			-0.062*** (0.012)	-0.031*** (0.007)	-0.063*** (0.010)	-0.028*** (0.007)
Scheduled tribe			-0.059* (0.030)	-0.056*** (0.10)	-0.062** (0.028)	- 0.054*** (0.009)
Constant			0.553*** (0.046)	0.783*** (0.018)	0.552*** (0.047)	0.783*** (0.018)
No. of observations	123237	138252	123237	138252	95562	106859
R ²	0.205	0.135	0.272	0.395	0.280	0.404

Note: Dependent variable is child is currently attending school. Sample consists of rural sector treated (two bottom quintiles of household equivalized monthly expenditure) and control (top quintile of household equivalized monthly expenditure) households only. Additional controls include Mother illiterate x Treated x Time and No. of children 0-5 x Treated x Time.

* $p < 0.01$.

** $p < 0.05$.

*** $p < 0.001$.

Table 4. DDD with linear trends estimates of the probability of attending school, heterogeneous effects by age-group and socioreligious grouping, treatment effects only.

	Girls				
	Age group 6-11	Age group 12-14	Muslim	SC	ST
Treated x Time x	0.103***	0.064**	0.083	0.085***	0.123***
After	(0.024)	(0.025)	(0.054)	(0.030)	(0.035)
No. of	65329	30233	11693	17313	14494
observations					
R ²	0.298	0.279	0.257	0.259	0.352
	Boys				
	Age group 6-11	Age group 12-14	Muslim	SC	ST
Treated x Time x	0.054***	0.028*	0.022	0.040**	0.080**
After	(0.014)	(0.015)	(0.023)	(0.018)	(0.030)
No. of	72380	34479	13048	19359	15718
observations					
R ²	0.424	0.376	0.399	0.426	0.449

Note: Dependent variable is child is currently attending school. Sample consists of rural sector treated (two bottom quintiles of household equivalized monthly expenditure) and control (top quintile of household equivalized monthly expenditure) households only. Controls (not shown) include Mother illiterate, No. of children 0-5, Muslim, SC, ST. Additional controls include Mother illiterate x Treated x Time and No. of children 0-5 x Treated x Time.

* $p < 0.01$.

** $p < 0.05$.

*** $p < 0.001$.

Table 5. DDD with linear trends estimates of the probability of attending school, heterogeneous effects by region, treatment effects only.

	Girls					
	North	Central	East	South	Northeast	West
Treated x	0.180*	0.083	0.097**	0.045	0.082	0.005
Time x After	(0.079)	(0.029)	(0.028)	(0.037)	(0.055)	(0.018)
No. of	9777	27604	21820	16393	10793	9175
observations						
R ²	0.277	0.297	0.305	0.245	0.209	0.241
	Boys					
	North	Central	East	South	Northeast	West
Treated x	-0.003	0.055	0.037**	0.059*	0.004	-0.032*
Time x After	(0.053)	(0.029)	(0.009)	(0.029)	(0.025)	(0.013)
No. of	11418	31841	24166	16851	12486	10097
observations						
R ²	0.327	0.398	0.456	0.337	0.348	0.337

Note: Dependent variable is child is currently attending school. Sample consists of rural sector treated (two bottom quintiles of household equivalized monthly expenditure) and control (top quintile of household equivalized monthly expenditure) households only. Controls (not shown) include Mother illiterate, No. of children 0-5, Muslim, SC, ST. Additional controls include Mother illiterate x Treated x Time and No. of children 0-5 x Treated x Time.

* $p < 0.01$.

** $p < 0.05$.

*** $p < 0.001$

Table 6. DDD with linear trends & simple DD estimates of the probability of attending school, falsification & robustness tests.

	Urban Sample, DDD with linear trends		Base model, simple DD		Pre-reform years only, simple DD		within FSU, simple DD	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Treated x Time x After Treated	0.046* (0.022)	-0.010 (0.017)	---	---	---	---	---	---
After	-0.294*** (0.022)	-0.160*** (0.016)	-0.276*** (0.022)	-0.119*** (0.009)	-0.232*** (0.024)	-0.103*** (0.009)	-0.242*** (0.016)	-0.104*** (0.008)
Time	-0.015 (0.028)	-0.033 (0.022)	0.175*** (0.021)	0.082*** (0.007)	0.224*** (0.020)	0.102*** (0.112)	0.084*** (0.024)	0.040 (0.009)
Treated x Time	0.037*** (0.006)	0.022*** (0.005)	---	---	---	---	---	---
Treated x Time	0.024** (0.010)	0.010 (0.008)	---	---	---	---	---	---
Treated x After	-0.173* (0.095)	0.044 (0.069)	0.059* (0.021)	0.013 (0.014)	-0.022 (0.023)	-0.018 (0.011)	0.067*** (0.021)	0.011 (0.013)
Time x After	-0.003 (0.007)	0.003 (0.006)	---	---	---	---	---	---
No. of observations	32625	35707	95562	106859	48262	54205	95541	106834
R ²	0.235	0.348	0.256	0.397	0.251	0.397	0.436	0.495

Note: Dependent variable is child is currently attending school. Sample consists of in first column of urban sector treated (two bottom quintiles of household equivalized monthly expenditure) and control (top quintile of household equivalized monthly expenditure) households only. In second-fourth columns of rural sector treated (two bottom quintiles of household equivalized monthly expenditure) and control (top quintile of household equivalized monthly expenditure) households only. Controls (not shown) include Mother illiterate, No. of children 0-5, Muslim, SC, ST. Additional controls include Mother illiterate x Treated x Time and No. of children 0-5 x Treated x Time.

* $p < 0.01$, ** $p < 0.05$, *** $p < 0.001$.

Appendix Table 1. Means of variables, NSSO 38th (1982) and 61st (1993/94) rounds.

Girls				
	38 th round rural poor	38 th round rural rich	61 st round rural poor	61 st round rural rich
Mother illiterate	0.427 (0.495)	0.162 (0.368)	0.203 (0.403)	0.059 (0.235)
Number of children 0-5 years	1.232 (1.125)	0.835 (1.062)	1.090 (1.125)	0.488 (0.818)
Muslim	<i>0.112</i> <i>(0.315)</i>	<i>0.112</i> <i>(0.315)</i>	<i>0.140</i> <i>(0.347)</i>	<i>0.130</i> <i>(0.337)</i>
Scheduled caste	<i>0.225</i> <i>(0.418)</i>	<i>0.103</i> <i>(0.304)</i>	<i>0.257</i> <i>(0.437)</i>	<i>0.105</i> <i>(0.306)</i>
Scheduled tribe	<i>0.165</i> <i>(0.372)</i>	<i>0.083</i> <i>(0.276)</i>	<i>0.164</i> <i>(0.371)</i>	<i>0.190</i> <i>(0.393)</i>
No. of observations	17396	9734	12308	11360
Boys				
	38 th round rural poor	38 th round rural rich	61 st round rural poor	61 st round rural rich
Mother illiterate	0.340 (0.474)	<i>0.096</i> <i>(0.294)</i>	0.010 (0.299)	<i>0.010</i> <i>(0.098)</i>
Number of children 0-5 years	1.175 (1.138)	0.738 (1.005)	0.978 (1.089)	0.397 (0.746)
Muslim	<i>0.112</i> <i>(0.315)</i>	<i>0.112</i> <i>(0.316)</i>	<i>0.144</i> <i>(0.351)</i>	<i>0.123</i> <i>(0.329)</i>
Scheduled caste	<i>0.233</i> <i>(0.423)</i>	<i>0.107</i> <i>(0.309)</i>	<i>0.247</i> <i>(0.431)</i>	<i>0.103</i> <i>(0.304)</i>
Scheduled tribe	<i>0.165</i> <i>(0.372)</i>	<i>0.078</i> <i>(0.269)</i>	<i>0.169</i> <i>(0.374)</i>	<i>0.178</i> <i>(0.383)</i>
No. of observations	18981	11293	12752	13825

Note: Italics indicate mean difference is not statistically significant between 38th and 61st rounds at 1% level.