Look no farther: The impact of local contract teachers on student outcomes

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Abstract

The increasing number of contract teachers in developing countries has led to concerns about its effect on teacher quality. Contract teachers are in general less trained and qualified. However, they are more likely to be hired from the local community which can positively affect student outcomes by reducing social distance or through better monitoring. This paper provides additional evidence on the difference in the impact of contract and regular civil service teachers looking at the effect of being a local teacher. Using a value-added estimation method, based on data from a unique survey in India, we find that there is not a significant difference in the overall performance of the two types of teacher. However, focusing on contract teachers as an identification strategy, we observe local teachers have a significant and positive impact (0.21 to 0.23 standard deviation) on student learning for grade 6.

Keywords: teacher quality, contract teacher, local teacher, developing countries

JEL Codes: I21,I28, J45

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1 Introduction

Many developing countries have made huge progress in increasing enrolments in primary education since the 1990's. The net enrolment ratios in primary education increased by at least 20 percentage points from 1999 to 2012 in 17 countries, 11 of which are in sub-Saharan Africa (UNESCO, 2015a). Though the rapid expansion in schooling helped many children to enter school, recent evidence has highlighted that millions of these children have failed to acquire even the most basic literacy and numeracy skills (Altinok et al., 2014). This has serious policy implications as studies have shown that the skills acquired rather than the years of education is pivotal for economic development (Hanushek and Woessmann, 2008; Schoellman, 2012).

With rising demand for education, many of the poor and middle-income countries are facing serious teachers shortages (UNESCO, 2015b). This can further exacerbate the learning crisis as recent evidence confirms that teachers play a critical role in improving the quality of education (Azam and Kingdon, 2015; Hanushek and Rivkin, 2006; Rockoff, 2004). Hiring regular civil service teachers in a centralised way is costly and time consuming. With limited budgets and lack of training capacity many governments, especially in sub-Saharan Africa and South and West Asia, have thereby adopted cheaper and faster alternatives for filling teacher vacancies. These teachers hired through alternative routes are often termed as "contract teachers".[1] They have less stringent entry requirements in terms of teacher training and qualification certificates, are paid less and are usually hired in a decentralised way from the local community (see Chudgar et al., 2014 for a detailed review on contract teachers)

This policy of hiring contract teachers helped in improving teacher supply but at the same time raised objections from various stakeholders questioning its impact on the "quality" of the teacher workforce and therefore learning outcomes. Existing research on teacher quality has highlighted the difficulty in identifying specific characteristics which define an effective teacher (Kane et al., 2008; Rivkin et al., 2005). It is not clear from the previous literature that contract teachers with less professional qualification and training will necessarily be less able to teach. Instead, the fact that they are more likely to be hired from the local community can positively affect student outcomes by reducing social distance between the teacher and the student or

[1]The diverse nature of hiring teachers through alternative methods makes it difficult to call them by a single name. In India, they are often termed as *para teachers* while elsewhere they are called *contract teachers*. Chudgar et al. (2014) use the term *alternative route* for *"any teacher hiring in which some element of the standard process has been diluted to allow school systems to fill vacant teaching positions."* We follow this broad definition when we refer to contract teachers throughout the paper.

through better monitoring of these teachers by schools and parents. Thus, more evidence is needed to understand the effect of different teacher hiring policies, which reward different characteristics on student learning. The aim of this paper is to answer the following questions:

- Do contract teachers perform worse than regular teachers where performance is measured in terms of teacher value-added?
- What is the impact on student learning of having a local teacher, i.e a teacher who is native to the village where the school is located?

In order to answer the above questions, we make use of a unique dataset from a survey commissioned by the World Bank and the Government of Bihar in collaboration with ASER Centre, New Delhi. The dataset has details on teachers and student characteristics, performance on tests (administered during the survey) for both teachers and students and information on various classroom indicators from government schools in India over one academic cycle (2013-14). It was collected from four districts in the rural areas of the state of Bihar, India, with the purpose of benchmarking teacher competencies to build a composite picture of teachers and teaching practices in the state (see Sinha et al. (2016) for detailed description of the survey).

In our data, one striking difference between regular and contract teacher is the probability that they live in the same village where they teach. While the differences in teacher performance based on qualifications, test scores and experience have gained much attention in the literature we present results of being a local teacher which has received much less attention. To estimate the effect of a local teacher we take advantage of the fact that in our dataset not all contract teachers are hired locally (about 40% of contract teachers are native to the village where the school is as opposed to only 5% of regular teachers). For better identification of local tecaher effect, we look at variation in teacher value added within contract teachers only as they form a more homogeneous group of teachers. Finally, we also test if any of the teacher characteristics namely qualification, training, test scores and experience explain variation in student performance.

Some studies have looked at the effect of social and cultural similarity between a teacher and student for better learning outcomes. For instance, Rawal, Kingdon, et al. (2010) in their study have shown that students do better when their teacher is socially and culturally more similar to them. Fagernäs and Pelkonen (2011) found that contract teachers are more content to work in remote areas compared to regular teachers which might be due to their own experiences

of growing up in remote areas. However, they could not test the effect of such preferences on student outcomes. We did not find any other study which specifically looks at the difference in performance of a local and a non-local contract teacher. This study is closely related to the broad literature on teachers in developing countries and more specifically to research on contract teachers (Atherton and Kingdon, 2010; Bold et al., 2017; Bourdon et al., 2010; Chudgar, 2013; Duflo et al., 2015; Muralidharan and Sundararaman, 2013).

The paper is divided into seven sections. In the following section, we present a literature review on teacher quality and the effect of hiring contract teachers on student performance. Section 3 provides a background of elementary education and teacher hiring policy in India. This is followed by data and descriptive statistics in section 4. In section 5 we discuss the estimation technique and section 6 elaborates the result followed by conclusion in the last section.

2 Literature Review

2.1 Teacher quality: How to identify a good teacher?

One of the major impediments to the estimation of the effect of teacher on student performance is the non random allocation of students to schools and teachers. Research on accumulation of human capital strongly acknowledges the fact that child development is a cumulative process which depends not only on the present inputs but also on the history of past investments (Todd and Wolpin, 2003). As a consequence, to estimate teacher effects one needs to account for the selection of students into certain neighbourhoods, schools and teachers on unobservable student, family and school level components. Understanding the potential bias in retrospective data many studies have employed other techniques like instrumental variable or experimental design to estimate the relationship between teacher quality and student achievement.

For instance, Rockoff (2004) use matched student-teacher panel data set from New Jersey, USA to separate various *fixed effects* of individual, school and classroom from teacher fixed effect. Observations of same students across different teachers helped to account for student-fixed effects, while observations of the same teacher teaching different classes was used to separate teacher fixed-effect (teacher quality) from classroom factors (like class size). Also to account for the various school level time-constant as well as time varying factors the author focused on variation *within* schools and years. It was found that a one standard deviation increase in

teacher quality raised students' reading and math test scores by approximately 0.1 standard deviations, on a nationally standardised scale.

In another study based in the US, Rivkin et al. (2005) use a rich source of panel data from the UTD Texas School Project with observation of students across multiple grades and cohorts. They employ a semi-parametric approach to estimate the variance in teacher quality *within* schools. Student achievement is seen as a function of student, school and teacher fixed components as well as all other time variant characteristics. To eliminate student/family time invariant factors they include the pattern of average gains between adjacent grades for a particular cohort. The lower bound estimates provide a strong evidence that teachers have powerful effects on reading and mathematics achievement. Although, not much of the variation is explained by observable teacher characteristics.

Studies from developing countries also provide evidence on the relevance of teacher quality. Azam and Kingdon (2015) estimate the relation between teacher quality and student outcomes in private schools in India. They found a much higher estimate of teacher fixed effect with a standard deviation of 0.366 compared to the average standard deviation of 0.13 found in the US (Hanushek and Rivkin, 2012). Similar to the evidence in the US, they also show that teacher characteristics like experience, education and training explain little of the variation.

The rising evidence on the role of teachers in improving student's learning has prompted active debates on measures to identify a high-quality teacher. Studies on teacher quality including those mentioned above have shown that most of the observable characteristics of teachers such as qualification, training, salary or other credentials explain little of the variation in teacher effectiveness.[2] In light of the existing evidence, one has less reason to believe ex-ante that contract teachers who are generally exempted from the status quo on training and qualification requirement might be less effective. It is therefore relevant to obtain more evidence on its effect on student performance and to identify other teacher characteristics that may have a more significant impact.

2.2 Contract teachers and student outcomes

There is no doubt that contract teachers provide a cheaper and faster alternative to reduce teacher shortages and alleviate adverse pupil-teacher ratios in many developing countries (UN-

[2]One exception is initial years of experience. Teachers perform worse on overage in the first couple of years of their teaching career but there is no significant effect of teacher experience on student performance after accounting for initial years (Hanushek and Rivkin, 2006)

ESCO, 2015b). But what does the evidence on the effect of contract teachers on quality of education say? Before we discuss the evidence on contract teacher effect it is important to note that the policy of contract teachers varies across regions in terms of the length of tenure, training and qualification requirements, salaries and whether the hiring is centralised or decentralised (Chudgar et al., 2014). This variation across regions in recruitment process and incentive structures makes it more difficult to generalise their effect on student outcomes. It is therefore not surprising that various quantitative studies on the effect of contract teachers on the quality of education find mixed results. There are studies that have found that contract teachers perform better than regular teachers (Duflo et al., 2015; Muralidharan and Sundararaman, 2013), some found no difference or heterogeneous effects (Atherton and Kingdon, 2010; Bourdon et al., 2010), while others (Vegas and De Laat, 2003) have shown that students taught by contract teachers perform worse than students of regular teachers. It is therefore important to understand what are the important features of contract teachers which make them more or less effective.

Earlier research has shown that teachers in developing countries face serious motivation problems with poorly incentivised contracts and no accountability (Chaudhury et al., 2006; Pritchett and Murgai, 2006). In an extensive review Kremer et al. (2013) highlight that reforms that improve accountability and incentives, such as the local hiring of teachers on short-term contracts are effective to improve teacher effort. Contract teachers thereby provided an opportunity to improve student learning through (a) incentivised contracts (b) better monitoring or accountability at the local level. We discuss below the evidence on contract teacher effect in relation to these properties.

It has been shown that incentives can help improve teacher performance (Muralidharan and Sundararaman, 2011). In this regard, the short-term contract system is believed to provide an option to incorporate incentive structures (like the renewal of contract based on performance) as opposed to the rigid permanent contracts of regular teachers. Bourdon et al. (2010) use an extensive data set across three countries in Africa- Niger, Togo and Mali, to analyse the effect of contract teacher policy. One of the main findings of their study is that contract teachers may do better than regular teachers in a low-ability context whereas regular teachers might do better in a less disadvantaged student environment. The authors find that in Mali contract teachers had a positive effect on student outcomes since the system worked through the local communities. In the case of Niger, the effect of contract teachers was negative. This may be explained by the

fact that the system changed all contract teachers to centralised public employees making them free from local monitoring.

In another study, Atherton and Kingdon (2010) use a value-added method with school-fixed effects to estimate contract teacher effects on student test scores *within* schools in the state of Bihar and Uttar Pradesh. They find a positive effect of contract teachers in case of Uttar Pradesh where contracts are renewed yearly but no significant effect for the state of Bihar where contract teachers are hired on a permanent basis. The data used for this paper is also for the Indian state of Bihar, where contract teachers are hired legally for life. Therefore, we do not expect to observe any impact on student outcomes through the incentive mechanism.

The second aspect of the work environment faced by contract teachers that is discussed in the literature is the monitoring or accountability at the local level. Contract teachers are more likely to be hired locally i.e. either hired by the local administration or from within the local community. This can improve student outcomes through (a) greater teacher accountability to local government, school management and/or parents which may lead to changes in teacher attendance and/or effort (Bourdon et al., 2010; Duflo et al., 2015) (b) reduced social distance between student and teacher which may lead to better understanding of student needs and reduced discrimination (Rawal, Kingdon, et al., 2010).

Duflo et al. (2015) provide an experimental evidence to explore the mechanism of community based accountability for Kenyan schools. The objective of the study was to understand the interaction between an extra teacher (locally hired on one quarter of civil teacher salary with promotion based on performance) and school governance (more accountability) and its effect on school quality. Accordingly, the experiment involved two kinds of treatment (a) allocation of an extra teacher to schools along with mechanisms to strengthen community involvement in the monitoring of teachers (b) allocation of an extra teacher but no monitoring mechanism. The control schools were those with no extra teacher or monitoring mechanism. It was found that though there was a huge reduction in class size for both types of teachers students of contract teachers performed better than students of regular civil service teachers in both kinds of treatment schools compared to control schools. Also, the gains were higher in schools where the community monitoring mechanism was made stronger. This study by Duflo et al. (2015) highlights the importance of governance/accountability as an important element to increase the benefits of increased teacher supply by curtailing rent-seeking.

The above studies have focused on whether the hiring is centralised or decentralised to study

the impact of local monitoring of teachers. We focus our analysis on the impact of teachers being local, i.e hired from the same village where the school is, or not. The local nature of teachers is an important and distinctive feature that might induce them to put more effort in difficult environments (remote areas, disadvantaged students) because of reduced social distance (Rawal, Kingdon, et al., 2010) or because they are more content to work in remote areas compared to regular teachers (Fagernäs and Pelkonen, 2011). Since in our dataset, not all contract teachers are hired locally we can take advantage of this heterogeneity to explore its effect on student outcomes (about 40% of contract teachers are native to the village where the school is located as opposed to only 5% of regular teachers).

3 Education system and contract teachers in India

In India, there exists a common school education structure (10+2) which can be divided into 4 parts, namely, primary, upper primary, secondary and higher secondary. Primary (grades I-V) and upper primary (grades VI-VIII) together constitute elementary education corresponding to the age group 6-13 years. Table 1 outlines these levels along with the associated grades and ideal age range. The school system functions under a federal structure such that the control and management of schools is under the state governments. The central government is mainly responsible for laying down broad policy frameworks with a view to maintain uniform quality standards across the nation. The central government also provides funding to states through various centrally sponsored schemes to meet education development goals.

	Grades	Age
Primary	I-V	6-10
Upper- primary	VI-VIII	11-13
Secondary	IX-X	14-15
Higher Secondary	XI-XII	16-17
Source: MHRD, 2018		

Table 1: Levels of education

Since the 1990's India has witnessed continuous expansion in elementary education through various centrally sponsored programs like the District Primary Education Programme (DPEP) in 1994 and the Education for All Campaign (Sarva Shiksha Abhiyan, SSA) in 2002. In 2010, Right to Education act, 2010 (RTE) was passed making elementary education free and compulsory for all children between ages 6-14. All this subsequently helped the country to make big strides in achieving its goal of universal elementary education with the Net Enrolment Ratio

reaching 98 per cent in 2009-10 (Government of India, 2013).

With a steady increase in enrolment rates across most parts of the country, the focus of the government has been shifting towards improving the quality of education (Muralidharan, 2013). Various studies in recent years have highlighted the dismal state of student performance across the country. A nationwide study by ASER Center reported that the proportion of children in rural India in grade 5 who can read a grade 2 level text is 47% and only 25.6% can solve a 3-digit by 1-digit division problem (Pratham, 2014b). In 2009 the country ranked 73 out of the 74 nations that participated in the PISA study conducted by OECD. Closely related to the issue of quality of schools is the quality of the teaching workforce. The country is not only witnessing an acute shortage of teachers but their lack of motivation has also been a major cause of concern (Chaudhury et al., 2006).

In India, the practice of hiring contract teachers gained prominence during the 1990s with the thrust in policy towards more decentralised management of schools to meet the rising education demand in a cost-effective manner (Kingdon and Sipahimalani-Rao, 2010). Consequently, many states started to fill teacher vacancies through alternative process of hiring teachers on a fixed term contract from the local community with less strict entry restrictions (Chudgar et al., 2014). Around 2000-01, the centrally sponsored scheme of universalising elementary education (Sarva Shiksha Abhiyan (SSA)) laid down norms that further boosted the hiring of contract teachers.

By the year 2009-10 there were about 637,000 contract teachers working in the country with their overall proportion in government schools reaching close to 14.4 percent (Mehta, 2009). The service conditions, qualifications and salaries of contract teachers varies across the country and so does the nomenclature – *shiksha mitra* in Uttar Pradesh, *shiksha sahayak* in Odisha, *niyojit shikshak* in Bihar, guest teachers in Delhi. However, recent regulations with insistence on professional training cut back the hiring of contract teachers with many states struggling to find ways to absorb them effectively in the system (Chudgar, 2013)

In the state of Bihar, where this study was conducted, the *Panchayats* or the local self governance bodies were given the responsibility for the recruitment of contract teachers from the local communities around the year 2005-06. This led to a massive hiring drive following which about 300,000 contract teachers were hired and the number of teachers in elementary schools almost doubled during the period 2006 to 2013 (Sinha et al., 2016).

4 Data

4.1 Background

The data for this study is derived form a survey that was commissioned by the World Bank and the Government of Bihar in collaboration with ASER Centre, New Delhi The survey was conducted in 400 randomly selected government elementary schools in four districts in the rural areas of the state of Bihar in India.[3]

District	Population (millions)	Literacy rate (all)	Literacy rate (female)	Female ratio[1]	Percent urban
Purnia	3.3	51.1	42.4	921	10.5
East Champaran	5.1	55.8	45.1	902	7.9
Jamui	1.8	59.8	47.3	922	8.3
Rohtas	3.0	73.8	63.0	918	14.5
State of Bihar	104	61.8	51.5	918	11.3
All India	1210	74.0	65.5	940	31.2

[1]Female per thousand male. Source: Census, 2015

Table 2: Description of Districts

Bihar is the third most populous and one of the poorest states in India. Table 2 gives a brief overview of the four districts where the survey was carried out. Bihar has the lowest literacy rate in the country with female literacy rate as low as 51.5% (Census, 2015). Over the last decade the state has achieved great success in increasing access to schooling but still performs poorly on various quality indicators. According to Pratham (2014a) the percent of children in grade five who can read a grade two level text declined from 65.4% in 2006 to 48.2% in 2014. It is also one of the states in India with lowest student attendance rates.[4] Our survey data also shows that the average student attendance was as low as 57 percent.

In our survey data we find evidence of expansion in contract teacher hiring since 2005 (Figure 1). Overall, close to 73% of teachers are contract teachers and around 40% of them are hired from the village where the school is. However, there is a steady decline in the number of contract teachers hired locally from around 60% in 2005 to less than 13% in 2013 (Figure 1).

[3]According to The Annual Status of Education Report (Pratham, 2014b) 82.4% of children in the age group 6-14 years in rural region of Bihar were going to government schools.

[4]States like Uttar Pradesh, Bihar, Madhya Pradesh and Jharkhand have student school attendance rates of below 60 per cent in public schools (Government of India, 2013)

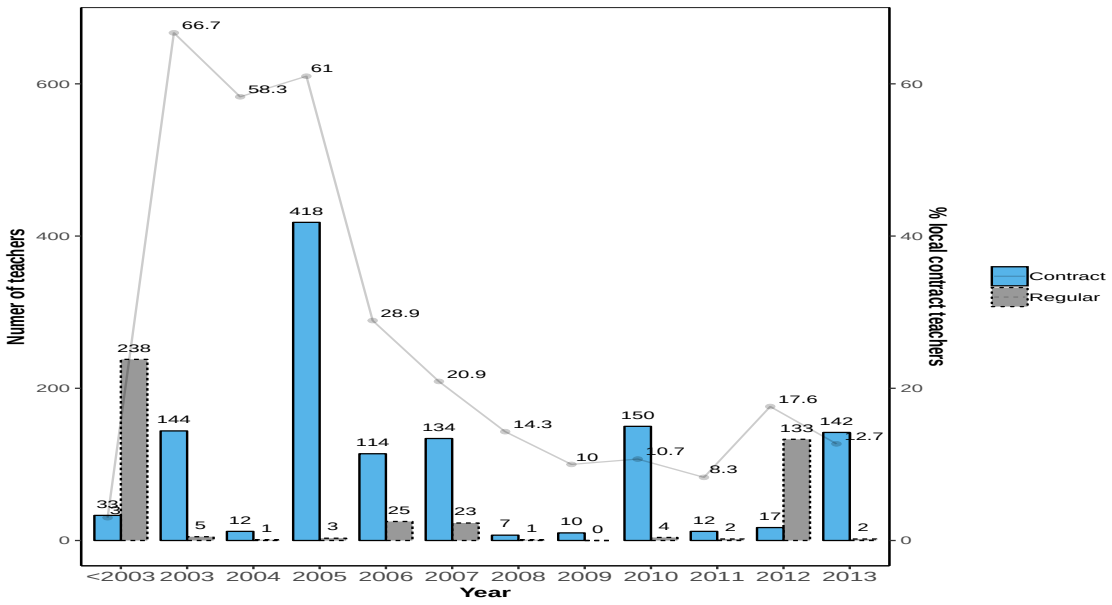

Figure 1: Number of contract and regular teachers by year of appointment and proportion of contract teacher who are local. Source: Authors own calculation. The bar plot in the figure gives the number of contract and regular teachers by year of appointment. The line plot indicates the proportion of contract teachers that are hired locally, that is, from the same village where the school is located. Since the number of local regular teachers in very small we do not plot it in the figure. Also we cumulate the number of teachers appointed before 2003 because of low frequency for years before 2003.

There also exists huge teacher shortages in Bihar.[5] Data from our survey reveals that in Bihar, the average student-teacher ratio for all grades combined in upper-primary schools is close to 67. Also, there is a high incidence of multi-grade teaching, a phenomenon where students of different grades sit in the same class mainly due to shortage of teachers. In our data in almost 60% of schools children in grade 4 were found sitting with another grade during the field visits.

4.2 Survey design and sample description

There were three phases of data collection whereby close to 400 randomly selected schools in four districts were tracked over a period of one year starting in September 2013. Information was collected through classroom and school observations formats, teacher interviews and teacher and student assessments. The stages and periods of data collection are shown in figure 2.

Out of the 400 schools 214 are upper-primary in our survey data. For the purpose of our analysis we only look at these upper-primary schools since student assessments were conducted in these schools only. Ten children from grade 4 and ten from grade 6 in each upper-primary school were randomly selected and assessed in language and math in the beginning of an academic year (September 2013) and then at the beginning of the next academic year (September

[5] According to an answer given in the *Lok Sabha* (lower house of Parliament) of the approx. 907,000 total vacant teacher posts in government elementary schools across India close to 22 percent (203,000) are in Bihar alone (MHRD, 2016)

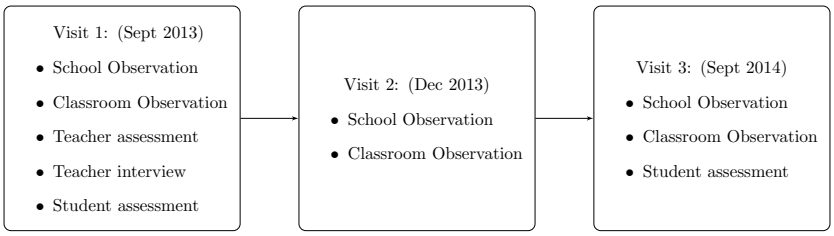

Figure 2: Stages of the survey

2014). In table 3 the details of the sample are given. The total number of children assessed is 4260 in baseline and 3927 in endline (In table 13 in the appendix we compare the mean performance of those students that were tested in both visits and those that dropped out). There are a total of 1656 teachers who were interviewed and assessed.

District	Schools	Teachers	% Contract	% Local[1]	Student Assessments			
					Grade 4		Grade 6	
					2013	2014	2013	2014
Purnia	60	427	73	38	600	548	600	538
E. Champaran	50	428	78	41	500	469	500	481
Jamui	53	345	79	32	530	483	530	479
Rohtas	51	456	65	40	500	465	500	464
Total	214	1656	73	38	2130	1965	2130	1962

[1]Perecent of contract teachers that are local. Source: Authors own calculation

Table 3: Survey sample data

To calculate the teacher effect we need to match students uniquely to the teachers who taught them throughout the academic year. To uniquely match teachers to students of grades 4 and 6 we needed information from classroom observation. As part of the study, surveyors had to observe teaching-learning activities of language teachers in grades 4 and 6 during the lectures. Unfortunately, math teachers cannot be identified as they were not observed as part of the survey. There were three such classroom visits spread over the academic year (Figure 2). To make sure that children were under the same teacher for most of the academic year we include only those teachers who were found teaching language to the same students at least twice out of the three visits. Although this helps us to match students to teachers more confidently it reduces our number of teachers to 339 (only language teachers) in a total of 199 schools. In Table 14 in the appendix we provide a comparison of characteristics of all teachers and those who are included in the final sample. For our main variables of interest we find no significant difference.

In table 4 we provide a summary of the final data set that was used for analysis. Student

	N	Mean	St. Dev.	Min	Max
Student variables					
z-score baseline*	3,390	0.01	0.99	−1.78	2.33
z-score endline*	3,122	0.001	0.99	−2.48	1.87
Female=Yes	3,356	0.52	0.50	0	1
Age in years	3,241	10.89	1.37	8	16
Grade level variables					
Grade=6	339	0.51	0.50	0	1
Multigrade=Yes	338	0.48	0.50	0	1
% Attendance: grade 4,6 combined	336	56.20	18.46	4.55	96.67
Class size: grade 4,6 combined	337	73.3	50.0	15	396
Teacher variables					
Contract=Yes	334	0.75	0.43	0	1
Female=Yes	323	0.39	0.49	0	1
Age in years	321	37.52	9.00	20	78
Qualification					
Professionally qualified=Yes	313	0.49	0.50	0	1
Graduate or above=Yes	319	0.49	0.50	0	1
Experience (yrs.)	321	7.13	5.75	1	39
Training (days)	310	10.43	11.65	0	60
Math score	339	6.73	3.52	0	12
Hindi score	339	4.39	2.21	0	9
Work environment					
Live in same village=Yes	319	0.34	0.47	0	1
Travel time (mins.)	320	38.33	55.71	0.00	720.00
Years in same school	320	5.43	3.47	1	24
No. of Transfers	317	0.35	0.82	0	4
Other activity=Yes	321	0.31	0.46	0	1
School variables					
Distance from HQ.	199	39.88	19.25	5	88
% Student attendance†	199	58.58	11.38	25.04	86.40
% Teacher attendance†	188	74.17	11.86	33.33	100.00
Proportion contract	199	72.78	17.75	25.00	100.00
Infrastructure index **	199	5.08	1.46	1	7
Average Math score§	199	11.74	2.80	4.95	19.25
School size					
Total enrolment†	199	512.74	242.25	156.00	1,942.67
Total teachers†	199	8.78	3.65	2	22
Student teacher ratio †	199	61.79	23.88	19.50	156.25
Monitoring					
Principal in school=Yes	199	0.14	0.35	0	1
BRC visits‡	199	4.21	0.67	1.67	5.67
SMC meetings‡	199	3.78	0.69	1.00	5.00
Schools	199				
Teachers	339				
Students	3,390				

Notes: * z-scores were created by normalising the total language score in each grade and in each visit
** Infrastructure index is a sum of seven indicators available in school these are: drinking water, toilet, separate girl's toilet, boundary wall, library, timetable and mid-day meal menu displayed on wall.
§Average math score is calculated by taking a simple average of grade level mean math scores for grade 4 and 6.
† Student and teacher enrolment, percent attendace and student teacher ratio was calculated by taking an average of the information from the three visits.
‡ BRC: Block Resource Co-ordinator, SMC: School management committee. The scale is average of three visits, higher value means meetings are held more often.

Table 4: Descriptive statistics

z-scores were created by standardising the language score for each grade and for each visit separately. Table 5 gives a detailed summary of student baseline and endline non-standardised scores by grade and subject. As stated earlier, students from grade 4 and 6 in upper-primary schools were assessed in language (Hindi) and math. One can see that the performance of students has improved over the academic year (figures 4 and 5 in appendix gives the density plots of total scores of students at baseline and the endline visits to schools).

More than half of the children (52%) in the age group 8 to 16 in government upper-primary schools are girls (table 4). There is a high incidence of multigrade teaching where students from multiple grades sit together in one class mainly due to shortage of staff (48%). One can also notice the prevalence of low student attendance (56%) and big classes with average class size of around 73 students. More than three-fourths of the teachers are contract teacher with an average age of around 38 years. Close to 34% of all teachers live in the same village where the school is located. The proportion of teachers that are female is well below fifty percent (39%). Almost half of the teachers are professionally trained and hold a graduate degree.

School variables were recorded thrice over the academic year. Instead of using information from just one visit we use a simple average over the three visits for certain variables like student and teacher enrolment, attendance and student teacher ratio. Similarly, for variables related to monitoring visits by Block Resource Co-ordinator (BRC) and school management committee (SMC) we create a scale which is an average of three visits. The questions which were asked from the primary respondent at school were (i) When was the last time the SMC had a meeting? (ii) When was the last time a CRC or BRC functionary visited the school? Based on the response category scores were created such that a higher value implies meetings are held more often.[6]

We found that most of the schools were equipped with basic infrastructure facilities. On average schools had 5 out of the seven basic amenities listed in the questionnaire.[7] On average there exists 8 to 9 teachers in each upper-primary government school. The probability that there is a principal appointed in school is extremely low at just 14%.

[6]The respose category and corresponding scores are: *Never,Don't Know*=0, *More than 6 months ago*=1, *During the last 6 months*=2, *During the last 3 months*=3, *During the last month=4*, *During the last week*=5 and *Today*=6

[7]Infrastructure index is a sum of seven indicators available in school these are: drinking water, toilet, separate girl's toilet, boundary wall, library, timetable and mid-day meal menu displayed on wall.

Grade 4					
Statistic	N	Mean	St. Dev.	Min	Max
Language baseline	1,660	8.1	4.8	0	18
Language endline	1,527	10.5	4.8	0	18
Math baseline	1,660	9.4	4.8	2	20
Math endline	1,527	11.5	5.1	0	20
Grade 6					
Language baseline	1,730	17.4	8.4	2	37
Language endline	1,595	21.2	8.4	0	37
Math baseline	1,730	14.2	6.0	2	28
Math endline	1,595	16.7	6.1	1	28

Table 5: Student score description by visit and grade

4.3 How different are the two types of teachers?

In this section we briefly discuss the difference between contract and regular teachers and local and non-local teachers. We also check the possibility that these different types of teachers are affected to different types of classes. Thus, we look at their differences in terms of teacher characteristics and work environment.

Table 6 presents several teacher characteristics by teacher type. It can be seen that there are significant differences between the two types of teachers. Regular teachers are professionally more qualified (difference of almost 43 percentage points) and trained. However, when it comes to educational qualification (graduate or above) the difference between the two is insignificant. Regular teachers have higher scores in language test administered during the survey (0.69 points higher) but the difference is not significant in math.

We next look at the difference between the two types of teachers regarding various classroom and school level indicators. We find that contract teachers are less likely to teach upper primary grades (grade 6) compared to primary grades (grade 4) but they are not different when it comes to other classroom indicators like the likelihood of teaching a multigrade class, class size or class attendance. We also find that on a average there are more monitoring visits (BRC visits) in the case of contract teachers than regular teachers.

Another important point to notice from table 6 is that there is a higher proportion of female contract teachers than regular teachers (21 percentage point difference) which is a positive feature of their workforce as the state has been struggling to increase the number of female teachers in schools. Lastly, we find that contract teachers are much more likely to live in the same village as school.

	Contract *(mean)*	Regular *(mean)*	*Difference in mean*	p.value[1]
General				
%Female	44.63	23.46	21.17	0.00
Age in years	34.17	47.43	-13.26	0.00
Qualification				
%Professional qualified	38.03	81.01	-42.98	0.00
%Graduate or above	50.84	43.21	7.63	0.29
Experience	6.52	8.94	-2.42	0.04
Training (days)	8.58	15.65	-7.07	0.00
Math score	6.75	7.07	-0.33	0.44
Hindi score	4.29	4.98	-0.69	0.01
Classroom environment				
Teach Grade 6	47.22	62.20	-14.97	0.03
Multigrade=Yes	50.60	40.24	10.35	0.10
Class size	70.77	80.81	-10.05	0.12
Student attendance	55.87	56.43	-0.55	0.82
Work environment				
%Live in same village	40.76	14.81	25.94	0.00
%Native to village	40.17	4.94	35.23	0.00
Travel time (min)	31.84	57.49	-25.65	0.02
Years in same school	6.26	2.99	3.28	0.00
Transfers	0.09	1.11	-1.02	0.00
%Other activity	34.17	22.22	11.94	0.06
BRC visits	4.26	4.06	0.20	0.03
SMC meetings	3.79	3.78	0.01	0.89
Principal in school=yes	15.08	12.20	2.88	0.64
N	252	82		

[1]p.value for t-test of difference in mean

Table 6: Difference in teacher characteristics and classroom environment by teacher type

Noticing the stark differences between contract and regular teachers we go a step further and consider only contract teachers to obtain a more homogeneous group of teachers and then compare the difference between a local and a non-local teacher. In table 7 we find that local teachers are mostly female who are teaching in the same school for a longer period. More importantly, they are not very different from a non local teacher in terms of education and training or any grade or school level indicators, except for multigrade teaching. We take advantage of this fact to isolate the impact of being a local teacher.

	Local *(mean)*	Non-local *(mean)*	*Difference in mean*	p.value[1]
General				
%Female	62.89	31.21	31.68	0.00
Age in years	34.77	33.81	0.96	0.31
Qualification				
%Professional qualified	35.79	40.15	-4.36	0.59
%Graduate or above	51.55	50.36	1.19	0.96
Experience	7.84	5.59	2.25	0.00
Training (days)	8.89	8.49	0.40	0.76
Math score	7.20	6.92	0.27	0.52
Hindi score	4.39	4.52	-0.13	0.63
Classroom environment				
Teach grade 6	49.48	46.81	2.68	0.78
Multigrade=Yes	38.14	57.86	-19.71	0.00
Class size	76.06	67.14	8.93	0.11
Class attendance	55.65	56.34	-0.69	0.78
Work environment				
Travel time (min)	15.23	43.43	-28.20	0.00
Years in same school	7.49	5.39	2.11	0.00
Transfers	0.11	0.06	0.06	0.22
Other activity=yes	29.90	37.59	-7.69	0.28
BRC visits	4.25	4.27	-0.02	0.85
SMC meetings	3.85	3.80	0.05	0.55
Principal in school=yes	17.53	12.77	4.76	0.41
N Teachers	97	141		

[1]p.value for t-test of difference in mean

Table 7: Difference in mean by teacher locality-Only contract teachers

5 Methodology

Based on the theoretical underpinning that child development is a cumulative process depending on the history of family and school inputs and his own endowment or ability we start our model with the commonly accepted equation of the education production function (Sass et al., 2014; Todd and Wolpin, 2003).

$$A_{it} = A_t[X_i(t), F_i(t), S_i(t), \mu_{i0}, \epsilon_{it}] \tag{1}$$

Where A_{it} refers to child $i's$ achievement at the end of t years in life. $X_i(t)$, $F_i(t)$ and $S_i(t)$ refer to the histories of individual, family and school inputs respectively. μ_{i0} represents child's endowment or ability which is inherited and does not vary with time and ϵ_{it} is the error term.

The specification above is highly demanding in terms of data. Researchers have come up with alternative forms of the model to deal with the problem of omitted variable bias. One such specification is the value-added approach which assumes that the lagged achievement score of students can be used as a regressor to account for the unobserved time-constant history of student and family inputs, as well as for time-varying historical student and school-based inputs. Assuming that the arguments in equation 1 are linear and additively separable the model to estimate the impact of contract teacher and student performance can be written as follows:

$$A_{ijkn,t} = \lambda A_{i,t-1} + \alpha X_i + \beta S_j + \gamma C_k + \delta(Contract)_n + \phi T_n + \eta_{ijkn} \tag{2}$$

This equation is a variation to the *partial persistence* model used in Sass et al. (2014). $A_{ijkn,t}$ is an indicator of present student performance or test scores. $A_{i,t-1}$ is the lagged test score, X_i, S_j and C_k represent the current student, school and grade characteristics respectively. $Contract_n$ the dummy for teacher type, which takes value one if the teacher is a contract teacher and zero otherwise, is our variable of interest. As a further step, we also include other teacher characteristics in the vector T_n to identify if other teacher specific features (qualification, training, gender and also being local) explain any variation in student performance. The OLS estimates using the above specification will be unbiased assuming that $A_{i,t-1}$ captures the effects of all previous inputs.

As a first look at the difference in value-added by teacher type we run a simple t-test for difference in average test scores of students. Table 8 presents the result of difference in difference of average student test scores in the first (baseline) and the last (endline) visit by teacher type for both grades separately. There are two main take away from this table, *first* there exists significant difference in the average baseline scores (row 1) of students under contract and regular teachers (column 3 and 6). For instance, in grade 6, students under contract teachers perform 1.03 points lower on average compared to students under regular teachers. This is indicative of some sorting of teachers by student ability. Thus, it makes a strong case for isolating initial difference in performance to estimate contract teacher effect and justifies our use of the model where we account for initial student performance.

Second, the initial negative differences in average scores by teacher type are reversed for grade 4 (row 3 column 3). Students under contract teachers gain significantly more than students under regular teachers between the two test dates (0.69 points on average). For grade 6 there is

	Grade 4			Grade 6		
	Cont.	Reg.	*Diff.*	Cont.	Reg.	*Diff.*
	(1)	(2)	(3)	(4)	(5)	(6)
Baseline	8.01	8.58	-0.57*	17.09	18.12	-1.03**
	(0.13)	(0.25)	(0.30)	(0.25)	(0.37)	(0.45)
Endline	10.55	10.47	0.09	20.67	22.38	-1.71***
	(0.14)	(0.25)	(0.31)	(0.26)	(0.37)	(0.46)
Difference	2.62	1.93	0.69**	3.54	4.20	-0.66
	(0.14)	(0.23)	(0.31)	(0.24)	(0.49)	(0.45)

Standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 8: Difference in student language test scores by visit and teacher type: t-test

no significant difference (row 3 column 6). These results provides some basis for the existence of positive effect of contract teachers on student performance only for grade 4 only.

Another aspect which needs to be accounted for before making causal inferences about the effect of teacher-type is the non-random allocation of teachers to schools and grades. It has been documented that contract teachers work in remote or more difficult areas compared to regular teachers. If teachers are selected into schools based on school quality then our estimates of teacher-effect would be biased. Also, there can be sorting of teachers in schools between or within grades. We saw in table 8 that on average contract teachers receive students with worse results.

Therefore, before estimating equation 2 we check if there is any selection of teachers on observable district, school or grades level indicators (Table 9). We run a logistic regression with teacher type as the binomial dependent variable and various school and grade level indicators along with district dummies as the explanatory variables.

There are four important take aways from the regressions results in Table 9. *First*, looking at the district dummies we find contract teachers are less likely to be working in the district of Rohtas compared to Jamui (used as the base category). For other districts the difference is not significant. From table 2 we know that Rohtas is the district with highest literacy and urbanisation rates compared to all other districts. This indicates that contract teachers are more likely to be present in resource constrained areas.

Second, we do not find any school quality variables explain sorting of teacher to schools within district. In column 1 of table 9 the variable *Average math score* which we use as an indicator of initial school quality is negative and statistically significant implying that contract teachers are more likely to be in schools with lower student performance. But when we look

Dependent variable: Contract teacher dummy			
	(1)	(2)	(3)
Distance from HQ.	-0.005	-0.005	-0.005
	(0.007)	(0.007)	(0.008)
Total enrolment	-0.001*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Student teacher ratio	0.001	0.001	0.002
	(0.006)	(0.007)	(0.008)
Teacher attendace	0.011	0.007	0.006
	(0.011)	(0.011)	(0.012)
Infrastructure Index	-0.100	-0.006	0.032
	(0.106)	(0.104)	(0.111)
Principal=Yes	0.193	-0.114	-0.169
	(0.403)	(0.429)	(0.456)
BRC visits	0.530***	0.582***	0.626***
	(0.187)	(0.197)	(0.203)
SMC meetings	0.092	0.033	0.008
	(0.206)	(0.212)	(0.216)
Average math score	-0.108**	-0.066	-0.081
	(0.048)	(0.053)	(0.055)
District dummy			
Rohtas		-0.975**	-0.988**
		(0.428)	(0.453)
Purnia		-0.618	-0.679
		(0.418)	(0.427)
E.Champaran		0.801	0.770
		(0.535)	(0.540)
Grade level			
Teach grade 6=yes			-0.628**
			(0.316)
Multigrade=yes			-0.005
			(0.355)
Class attendance			-0.001
			(0.009)
Class size			-0.001
			(0.005)
Observations	334	334	330
Pseudo R^2	0.047	0.095	0.111

Jamui district is taken as base category. Standard errors in parentheses.
We use robust standard errors. *p<0.1; **p<0.05; ***p<0.01

Table 9: Logit regression of contract teachers on school and grade factors

at within district variation *Average math score* is no more statistically significant (columns 2 and 3). Thus, by including district dummies we are more confident of our estimates of contract teacher effect assuming that there is no sorting of teachers to schools within districts.

Third, in all specifications we notice that contract teachers are more likely to be in schools with better monitoring mechanisms. This is evident from the positive and statistically significant sign on the variable BRC visits. Contract teachers are thus more likely to be in schools that

have frequent monitoring visits by the BRC (Block Resource Co-ordinator).

Fourth, the regression specification in column 3 includes grade level indicators to check for sorting between grades. Although contract teachers are less likely to teach grade 6 compared to grade 4, other grade level features like multigrade teaching, class size and student attendance do not vary significantly between the two types of teachers.

To summarise, we do not find evidence that within districts teachers are selecting themselves or otherwise affected into schools based on most of the observable school or grade level quality indicators except for monitoring. So, our main approach is to estimate equation 2 and include district dummies. However, there may still be selection of teachers to schools based on unobservables. One way to deal with the non-random allocation of teachers to schools on unobservable school factors is to focus on variation in teacher effect within schools by using school fixed effects. The school-fixed effect model can be written as follows:

$$A_{ijkn,t} = \lambda A_{i,t-1} + \alpha X_i + \gamma C_k + \delta(Contract)_n + \phi T_n + (\nu_j + \eta_{ikn}) \tag{3}$$

Where ν_j captures the unobserved school-level characteristics. In order to make sure that there exists variation within schools we need at least two different teacher observations in each school. In our sample we have at most two teacher observations (one for grade 4 and another for 6). Although we can exploit this variation in teachers by grades to apply school fixed effect, we use this in our analysis only as a robustness check due to the small teacher sample size within schools.

In our sample schools the probability of selection within grades is negligible as from the three classroom visits it was found that the incidence of multiple classes for a particular grade was very low in our sample schools. The proportion of schools with single class in grade 4 and grade 6 was 97 percent and 93 percent respectively. Thus, selection to classes within grades is not an issue.

In addition to the above models (equations 2 and 3) another way to look at the difference in the quality of contract and regular teachers is to estimate the distribution of teacher value added by teacher type. In order to obtain teacher value added we estimate the following equation:

$$A_{in,t} = \lambda A_{i,t-1} + \alpha X_i + \sigma Tid_n + \eta_{in} \tag{4}$$

Where σ is the estimated teacher fixed effect coefficient for every teacher Tid_n. We estimate

teacher fixed effect $\hat{\sigma}$ and compare the distribution for different teacher types. We also use equation 5 below to analyse if any of the teacher characteristics (T_n) explains variation in our estimated teacher fixed effect.

$$\hat{\sigma}_{njk} = \phi T_n + \eta_{njk} \tag{5}$$

To better identify the impact of being a local teacher we estimate the equations above by looking at only contract teachers. As discussed earlier to find local teacher effect we look only within contract teachers. Also, from descriptive statistics it was found that most local teachers are contract teachers (around 89% of local teacher are contract teachers).

6 Results and discussion

In Table 10 we present the results from the OLS value-added specification for each grade separately with endline z score as the dependent variable and baseline scores as one of the independent variables. We also include the results for both grades combined in column 7. The last column presents results from the school fixed effect model (equation 3). In columns 1 to 3 we present the results for grade 4 and in columns 4 to 6 for grade 6. As we move from left to right within each grade columns we keep adding more factors to isolate the effect of contract teacher on student performance. For instance, column 1 (and 4) is the basic specification with no school or teacher factors. In column 2 (and 5) we include school factors and in column 3 (and 6) we further add teacher characteristics. Thus, columns 3 and 6 correspond to the full specification in equation 2.

There are some interesting things to note from table 10. *First*, for grade 4 the effect of contract teacher on student performance is positive and statistically significant in columns 1 and 2. The effect size is 0.16 standard deviation. However, once we include other teacher characteristics the effect is no more statistically significant (column 3). *Second*, for grade 6 we notice that once we include all factors, contract teacher is found to have a negative effect on student performance (-0.21 standard deviation) but the negative effect is almost compensated by the positive coefficient of being local (the variable "Same village" , 0.18 standard deviation). These results imply that the effect of contract teachers might vary by grades.

When we look at the results for both grades combined the coefficient on contract teacher is no more statistically significant. Once again the only teacher characteristic that is positive and

	Dependent variable: Endline z- score							
	Grade 4			Grade 6			Both grades	School-fixed effect
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Contract teacher	0.16**	0.16*	0.07	−0.09	−0.10	−0.21**	−0.07	−0.10
	(0.08)	(0.08)	(0.10)	(0.08)	(0.08)	(0.10)	(0.07)	(0.08)
Student characteristics								
Previous year z score	0.51***	0.47***	0.48***	0.50***	0.46***	0.46***	0.47***	0.48***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)
Child female	−0.07	−0.07	−0.07	−0.03	−0.03	−0.08*	−0.08**	−0.05*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.03)
Child age	−0.03	−0.03	−0.04*	−0.02	−0.03	−0.001	−0.02	−0.01
	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)
Teacher characteristics								
Same village=yes			−0.01			0.18**	0.11*	0.05
			(0.09)			(0.09)	(0.06)	(0.07)
Female			0.11			0.01	0.04	0.09
			(0.09)			(0.09)	(0.06)	(0.08)
Graduate=Yes			−0.002			−0.05	−0.03	0.01
			(0.09)			(0.07)	(0.06)	(0.07)
Teacher test score			−0.01			−0.01	−0.01	0.01
			(0.02)			(0.02)	(0.01)	(0.02)
Experience			0.001			−0.01	−0.003	−0.01
			(0.01)			(0.01)	(0.005)	(0.01)
Training (Days)			−0.01			−0.001	−0.003	−0.001
			(0.005)			(0.003)	(0.003)	(0.004)
School factors	No	Yes	Yes	No	Yes	Yes	Yes	SFE
Grade factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	1,436	1,436	1,321	1,473	1,473	1,370	2,691	2,691
R^2	0.287	0.309	0.327	0.295	0.305	0.335	0.32	0.245
Schools (n)	158	158	145	161	161	149	184	184

Notes: We use cluster robust standard errors at school level.
*p<0.1; **p<0.05;***p<0.01

Table 10: Value-added regression on teacher type-All teachers

weakly statistically significant is the variable "Same village" (0.11 standard deviation). The school fixed effect model in the last column also shows no statistically significant difference between contract and regular teachers.

The fact that for grade 6 local teacher is positively related to student performance is explored further. In table 11 we run the same specifications as in table 10 but only for contract teachers and with local teacher as the main variable of interest. Looking at the results from full-specification in columns 3 and 6 of table 11 we find that for grade 6 only there is a statistically significant and positive effect (0.24 standard deviation) of local teacher (variable "Same village=Yes") on student performance.

Finally, we calculate teacher fixed effects using equation 4. We then regress the estimated value-added of each teacher on teacher characteristics. We present grade wise results of this analysis considering only contract teachers in table 12. As mentioned before, to better isolate the effect of a local teacher we look only at contract teachers. Figure 3 gives a density plot of teacher fixed effect for contract teachers that are local and those that are not.

In table 12 once again, it can be seen for grade 6 the effect of local teacher is significant

	Dependent variable: Endline z- score							
	Grade 4			Grade 6			Both grades	School-fixed effect
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Same village=yes	0.01	−0.05	−0.09	0.13	0.12	0.24**	0.08	−0.15
	(0.11)	(0.10)	(0.11)	(0.09)	(0.08)	(0.09)	(0.07)	(0.11)
Student characteristics								
Previous year z score	0.49***	0.45***	0.46***	0.53***	0.48***	0.49***	0.47***	0.50***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.03)	(0.03)
Child female	−0.08	−0.08	−0.08	−0.05	−0.04	−0.08	−0.07*	−0.04
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.04)	(0.04)
Child age	−0.05	−0.05*	−0.06**	0.01	0.005	0.02	−0.03*	−0.03*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
Teacher characteristics								
Female			0.13			0.04	0.08	0.15
			(0.10)			(0.10)	(0.07)	(0.13)
Graduate=Yes			0.02			−0.01	−0.03	−0.03
			(0.10)			(0.08)	(0.07)	(0.11)
Teacher test score			−0.01			−0.03	−0.01	0.003
			(0.03)			(0.02)	(0.02)	(0.03)
Experience			0.01			−0.04**	−0.01	0.02
			(0.02)			(0.02)	(0.01)	(0.02)
Training (Days)			−0.004			−0.0002	−0.003	−0.004
			(0.01)			(0.003)	(0.004)	(0.01)
School factors	No	Yes	Yes	No	Yes	Yes	Yes	SFE
Grade factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	1,090	1,090	1,046	987	987	934	1,980	1,980
R^2	0.276	0.311	0.319	0.303	0.314	0.36	0.323	0.247
Schools (n)	120	120	115	106	106	100	157	157

Notes: We use cluster robust standard errors at school level.
*p<0.1; **p<0.05;***p<0.01

Table 11: Value-added regression on teacher locality-Only contract teachers

and positive (around 0.22 standard deviation to 0.25 standard deviation). The relation between local teacher and teacher fixed effect becomes more clear when we plot the estimates of teacher value-added by spliting between local and non-local teachers in figure 3. For grade 6 one can notice the difference in distribution of teacher fixed effect for teachers who are local and those that are not.

Dependent variable=Teacher fixed effect σ				
	Grade 4		Grade 6	
	(1)	(2)	(3)	(4)
Same village=yes	−0.01	−0.07	0.22**	0.25**
	(0.13)	(0.13)	(0.11)	(0.11)
Female	0.10	0.09	0.03	0.01
	(0.11)	(0.11)	(0.12)	(0.12)
Graduate=Yes	−0.06	−0.03	0.02	−0.003
	(0.12)	(0.12)	(0.10)	(0.09)
Prof. qual=Yes	0.06	0.12	−0.04	−0.04
	(0.11)	(0.12)	(0.10)	(0.10)
Language score	−0.001	−0.01	−0.02	−0.02
	(0.03)	(0.03)	(0.03)	(0.02)
Training (Days)	−0.01	−0.004	−0.001	−0.0000
	(0.01)	(0.01)	(0.004)	(0.004)
Experience	0.01	0.01	−0.03*	−0.04*
	(0.02)	(0.02)	(0.02)	(0.02)
School factors	No	Yes	No	Yes
Grade factors	Yes	Yes	Yes	Yes
District dummy	Yes	Yes	Yes	Yes
Observations	114	114	97	97
R^2	0.124	0.221	0.123	0.247
We use robust standard errors.				
*p<0.1; **p<0.05;***p<0.01				

Table 12: Regression on teacher fixed effect by grade-Only contract teacher

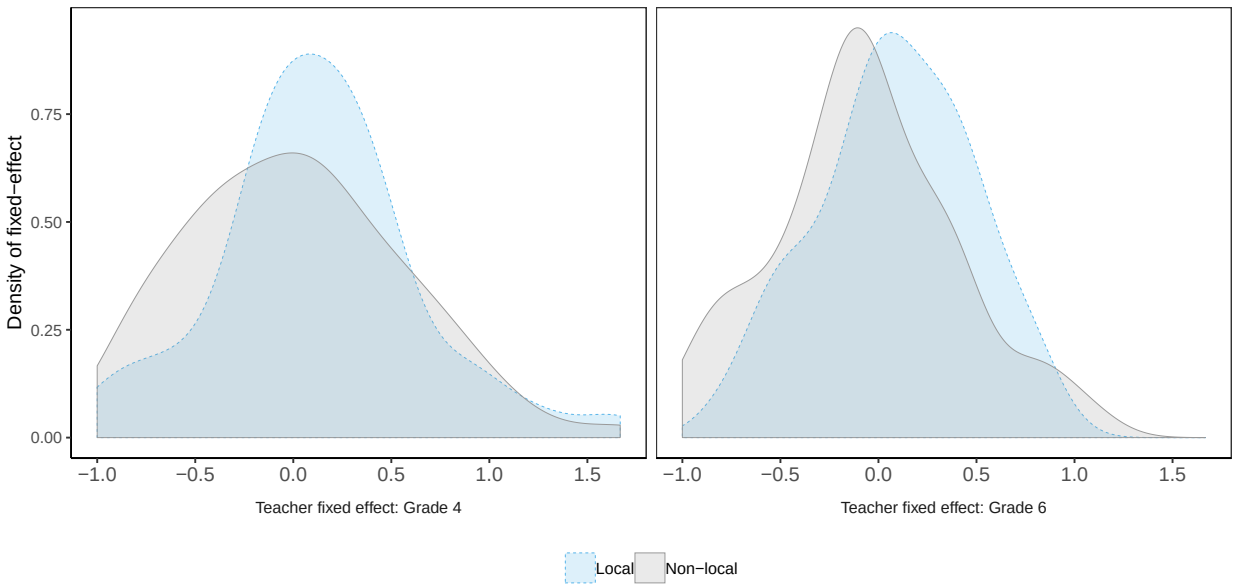

Figure 3: Density plot of teacher fixed effect by "Local" for contract teachers by grade

7 Conclusion

The increasing number of contract teachers in developing countries has led to concerns about its effect on teacher quality. This paper provides evidence on the effect of contract teacher on student learning outcomes. Contract teachers are usually less professionally trained and qualified. However, they are more likely to be hired locally, that is, either from the local community and/or by the local administration. This can positively effect student outcomes by reducing social distance between the teacher and the student or through better monitoring of teachers.

Using data form a survey conducted in the rural areas of the Indian state of Bihar, we answer the following question: i) Do contract teachers perform worse than regular teachers where performance is measured in terms of teacher value-added? (ii) What is the impact on student learning of having a local teacher, i.e a teacher who is native to the village where the school is located?

We find that although contract teachers are very different from regular teachers when it comes to various observable characteristics (professional qualification, training, age, gender), we were unable to find any statistically significant impact on student outcomes from having one or the other type of teacher. In order to identify the impact of being a local teacher on student performance we restrict our analysis to contract teachers so that we get a more homogenous group of teachers. Comparing local and non-local contract teachers we found a statistically significant and positive effect of a local teacher on student outcomes for grade 6. Lastly, various criterions required to qualify for the post of regular teachers like teacher training and certification fail to predict teacher effectiveness.

Our results imply that heavy reliance on strict entry level criterions for hiring and promotion of teachers might not be the best way to deal with low teacher quality facing many developing countries. There is a need for a deeper analysis of existing teacher training institutes/methods as well as hiring and deployment policies. The fact that hiring teachers from the local community might be important for their effectiveness in a rural setting needs further exploration with more detailed data.

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A Sample Description

	Both visits	Dropped-out	Difference	p.value
Grade 4				
Female=Yes	0.52	0.42	0.10	0.04
Age	10.02	10.35	-0.33	0.00
Lang score baseline	8.03	9.01	-0.98	0.04
Math score baseline	9.30	9.84	-0.54	0.25
N	1527	133		
Grade 6				
Female=Yes	0.54	0.43	0.11	0.02
Age	11.69	11.81	-0.11	0.10
Lang score baseline	17.44	16.85	0.59	0.44
Math score baseline	14.24	13.18	1.06	0.06
N	1595	135		

Table 13: Difference in mean. Characteristics of students who dropped out

	All	Sample	Difference	p.value
School variables				
Distance from HQ.	42.06	39.88	2.18	0.48
Student attendance	58.98	58.58	0.40	0.72
Teacher attendance	74.08	74.48	-0.40	0.74
Proportion contract	72.91	72.78	0.14	0.94
Infrastructure index	5.07	5.08	-0.01	0.94
Total enrolment	509.62	512.74	-3.12	0.90
Total teachers	8.71	8.78	-0.08	0.83
Student teacher ratio	61.81	61.79	0.02	0.99
Principal in school	0.15	0.14	0.01	0.80
BRC visits	4.21	4.21	0.01	0.90
SMC meetings	3.75	3.78	-0.03	0.66
Average math score	11.78	11.74	0.04	0.88
Teacher variables				
%Contract	0.73	0.75	-0.02	0.42
%Female	0.37	0.39	-0.02	0.50
Age in years	38.39	37.52	0.87	0.12
%Professional qualified	0.55	0.49	0.06	0.05
%Graduate or above	0.52	0.49	0.03	0.30
Experience	8.72	7.13	1.60	0.00
Training (days)	9.52	10.43	-0.91	0.20
Math score	7.14	6.73	0.41	0.05
Hindi score	4.61	4.39	0.22	0.09
%Same village=yes	0.33	0.34	-0.01	0.72
Travel time (min)	38.42	38.33	0.08	0.98
Years in same school	5.77	5.43	0.34	0.14
Transfers	0.57	0.35	0.22	0.00
Other activity=yes	0.32	0.31	0.01	0.72
N Schools	214	199		
N Teachers	1656	339		

Table 14: Difference in means of sample

B Student score distribution

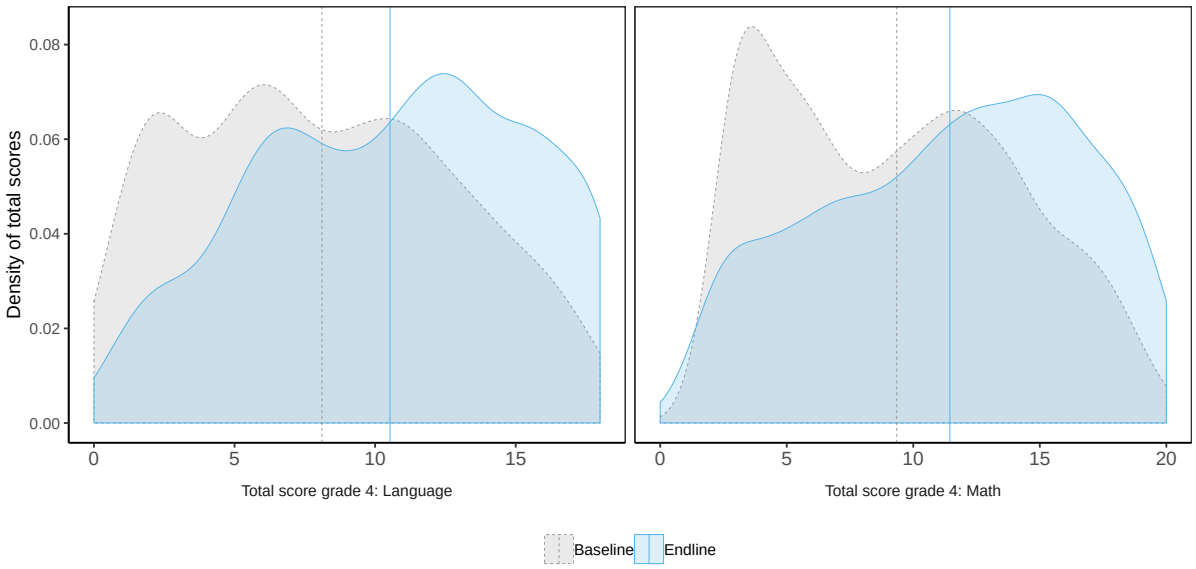

Figure 4: Density plot total scores Grade 4

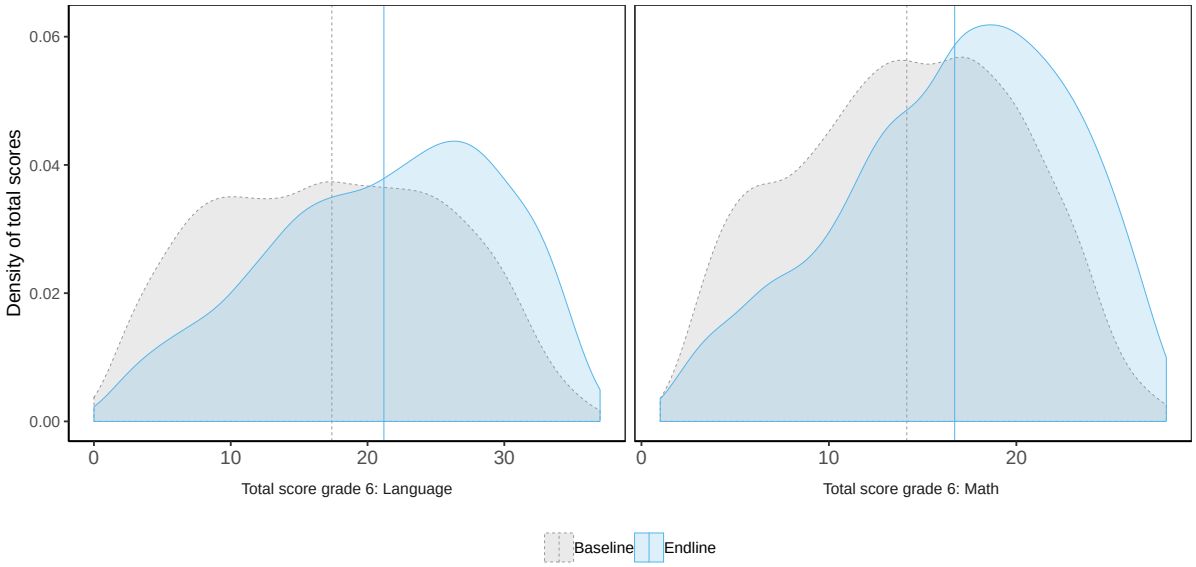

Figure 5: Density plot total scores Grade 6