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Contract Teachers

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Table of Contents

Acknowledgements.....	i
Abstract.....	ii
1. Introduction.....	1
2. Background and Literature Review.....	2
3. Data Description.....	3
4. Model hypothesizing the behavior of teachers by contract status.....	4
4.1 State norms for selection of contract teachers.....	4
4.2 Hypothesis on performance of regular and contract teachers.....	5
5. Empirical Results.....	6
5.1. Teacher characteristics by contract status.....	6
5.2. Teacher effort by contract status.....	6
5.2.1. Average effort.....	6
5.2.2. Average effort controlling for observed correlates and school fixed effects.....	7
5.3. Are contract teachers associated with higher scores after controlling for observed student and school correlates?.....	8
6. Discussion.....	10

Tables

Table 1: Summary of Key Variables.....	12
Table 2: Average teacher characteristics.....	13
Table 3: Average teacher attendance and activity.....	13
Table 4: MP and UP OLS: Village fixed effects regression of teacher effort.....	14
Table 5: MP and UP OLS: Village fixed effects regression of teacher effort.....	15
Table 6: OLS: Are school and teacher characteristics correlated with scores? Dependent variable is percent correct score, Grade 4, UP.....	16
Table 7: OLS: Are school and teacher characteristics correlated with scores? Dependent variable is percent correct score, Grades 3 and 2, UP.....	17
Table 8: OLS: Are school/teacher characteristics correlated with scores? Dependent variable is percent correct score, Grade 4, MP.....	18
Table 9: OLS: Are school/teacher characteristics correlated with scores? Dependent variable is percent correct score, Grades 3 and 2, MP.....	19

Figures

Figure 1: Teacher effort by contract type in UP.....	6
Figure 2: Teacher effort by contract type in MP.....	7

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Abstract

In this paper we use non-experimental data from government schools in Uttar Pradesh and Madhya Pradesh, two of the largest Indian states, to present average school outcomes by contract status of teachers. We find that after controlling for teacher characteristics and school fixed effects, contract teachers are associated with higher effort than civil service teachers with permanent tenures. Higher teacher effort is associated with better student performance after controlling for other school inputs and student characteristics. Given that salaries earned by contract teachers are one fourth or less of civil service teachers, contract teachers may be a more cost-effective resource. However, contracts “as they are” appear weak. Not only do contract teachers have fairly low average effort in absolute terms, but those who have been on the job for at least one full tenure have lower effort than others who are in the first contract period.

1. Introduction

The debate over contract versus teachers with permanent tenure (or regular) in government schools continues to engage academics, policy-makers and the general public in India and across the developing world. Many state governments in India faced with rapid rise in school enrolments and fiscal tightening have hired contract teachers in large numbers. Contract teachers have annually renewable contracts and do not have professional training unlike regular teachers. Their salaries are generally a fraction of the salary of regular teachers who are civil servants. The significant presence of contract teachers has raised the question of whether they are having an adverse impact on education quality or not. This concern is largely due to the lower educational qualifications required for someone to become a contract teacher and the little or no pre-service and in-service training they are given. Appositely, weak accountability of regular teachers as reflected in their high absence rates and low teaching activity when present in schools has also been an issue of serious concern. Contract teachers, on the other hand, are given performance-based contracts. Their contracts can be cancelled if their performance is adjudged dissatisfactory by the village education committee or other local community bodies that have the authority to hire them. This is expected to provide them with stronger incentives to perform.

In this paper, we use data collected from government schools of two large Indian states of Madhya Pradesh (MP) and Uttar Pradesh (UP) on schools, teachers and students in primary grades to compare the performance of regular and contract teachers. Performance is measured along three dimensions: (a) teacher attendance; (b) teacher engagement in teaching; and (c) students' test scores. We use multivariate regression analysis to control for other factors that are likely to influence teacher effort and student test scores.

The paper compares average teacher and student outcomes by contract status of teachers. It does not present the causal impact of a contract teacher relative to a regular teacher since the data are non-experimental. Even though experimental evidence is considered the gold standard for identifying causal estimates, they are often done to test impacts of specific interventions in specific contexts. The impact of a particular intervention may differ when it is applied or scaled up in the business-as-usual context within which policy makers operate. Studies such as this one that use observational data are also pertinent for policy-makers as they present 'as-is' relationships between various factors and educational outcomes. For governments in their business-as-usual management of the public education system, it is useful to refer to analysis of these average relationships since they are in the actual context within which they operate.

The paper is structured as follows. In section 2, we provide a brief review of the background behind hiring of contract teachers in India and the evidence on the effect of contract teachers on education quality. In section 3, we describe the data used. In section 4, we describe state norms for hiring contract teachers in the study states and a theoretical motivation behind the behavior of teachers facing different incentives due to differing contract status. Section 5 present empirical results on teacher performance by contract

status and determinants of test scores. Section 6 concludes. All the tables are collected in the appendix.

2. Background and Literature Review

Historically, the policy of hiring contract teachers was first used by some Indian states to provide additional support to single teacher schools, to run non-formal-education centers for out-of-school children, and for formal schools in remote and tribal areas. In the last fifteen years contract teachers have increasingly been used in lieu of regular teachers in mainstream formal schools. This has raised the fear that institutionalizing a mechanism of low-cost non-professional teachers will disintegrate the basis for providing education of good quality.

Contract teachers hired by the public education sector in India are of many types, community teachers and para-teachers among others.¹ All types of contract teachers, however, differ significantly in terms of salary and conditions of employment from the regular teachers in the public education system. Contract teachers are generally employed for a period of one year and at a fraction of the salary of regular teachers. Their contracts are renewable subject to satisfactory performance and more easily terminated unlike regular teachers who are civil servants. Contract teachers are not hired centrally by the central or the state governments, but by sub-state administrative bodies at the village or the district level. This is done with the additional motivation to decentralize the use of resources and decision-making to the local community.² The community also acquires stronger oversight on teacher performance through the extra mechanism of social norms if the teacher is a local resident.

As described above, contract teachers face stronger incentives to perform. On the other hand, they do not have formal training like regular teachers. The minimum level of educational qualifications required to be eligible for a contract teacher position is low – usually a higher secondary school certificate. Low education levels and lack of professional qualifications of teachers can, in principle, have an adverse influence on learning outcomes of students.

The evidence on comparative teacher effort across contractual status of teachers varies across studies and countries. In a large scale nationally representative World Bank study of government primary schools in India, Chaudhury et al (2004) found that contract teachers were no more likely to be absent than regular teachers. Muralidharan and Sundararaman (2008) in their experimental study of providing an extra contract teacher to schools randomly found that absence rate for contract teachers was 16% compared to 27% for regular teachers and the difference was significant. Similarly they found 46% of

¹ In India, education is a state subject which means that each state has the freedom to work out its own policies in the education sector using the national policies on education as a guiding framework. This is one of the reasons behind the variety of contract teacher types and their terms of employment across Indian states.

² The 72nd amendment to the Indian Constitution decentralized management and implementation of 28 subjects, including education, to the local community.

the contract teachers engaged in teaching activity conditional on presence compared to 39% of the regular teachers and this difference too was significant. Another World Bank study done for Peru found that contract teachers were 12-13% more likely to be absent than regular teachers (Alcazar et al, 2006).

As in the case of teacher attendance and effort, the empirical evidence for the effect of contractual status on learning outcomes is also mixed. In the study by Kremer et al (2004) in India, the contractual status of a teacher was found to have no statistically significant impact on child test scores, after controlling for a host of other school, teacher and child related factors. In a study done for three countries in Africa – Mali, Togo and Niger – contract teachers had a positive effect on low ability students in low grades and a negative impact on high ability students in high grades (Froelich, Bourdon and Michaelowa, 2007).

Duflo, Dupas and Kremer (2007) is one of the very few studies that provide experimental evidence on the effect of contract status of teachers on education quality. In this study of schools in Kenya, student performance as measured by test scores increased for students taught by a contract teacher. But the study tested for a combination of reduction in class size and hiring local teachers on short term contract.

3. Data Description

The survey was conducted in the two states, MP and UP, across 400 *gram panchayats* (villages). In each of the states four districts were chosen purposefully and were matched across states in terms of the literacy rate. The districts are Dhar, Guna, Katni, Raisen in MP and Hathras, Kanpur Rural, Pratapgarh and Sitapur in UP. 50 villages were randomly chosen from two randomly chosen blocks within each district. A block is an administrative unit between a district and a village. This gives a total of 200 *gram panchayats* in each state. One government primary school was randomly selected in every *gram panchayat*. All teachers teaching grades 1 to 5 are part of the sample. 45 students from each school, 15 randomly selected from each of grades 2, 3, 4, are in the sample. The survey was administered in 2006, towards the end of the school year.

Measured outcomes

Four unannounced visits were made to every sample school and village to collect information on the following.

- Teacher attendance and activity. Activity is a measure of whether a teacher is actively engaged in teaching when the survey team arrives unannounced. Teacher attendance is 1 if teacher is present in school, 0 otherwise. Teacher activity is 1 if teacher is teaching, writing on the board, supervising written work, teaching by rote, 0 if teacher is absent, chatting, sitting idle/standing outside classroom, keeping order in classroom but not teaching, doing other non teaching work. There are four observations per teacher on attendance and activity. Averaged across visits at the teacher level, these give the fraction of visits a teacher was present (or engaged in teaching).

- Test scores of sample students who were tested on competency and curriculum based language and math tests that lasted 20 minutes per child. The language test was a test of reading and writing skills. The math test was a test of number recognition, addition, subtraction, multiplication and division. The total test score is constructed separately for language and math tests as the percent of correct answers.
- School facilities survey.

Additional data was collected on socio-economic characteristics of students such as parents' education, caste, and wealth and on characteristics of teachers such as age, education, experience, wealth, type of contract and training. Table 1 presents a summary of variables in the data.

4. Model hypothesizing the behavior of teachers by contract status

4.1 State norms for selection of contract teachers

Madhya Pradesh

Contract teachers (called *samvida shikshak*) are hired on a 3 year renewable contract by the district *panchayat*. Applicants have to satisfy certain minimum eligibility criteria (18-35 years of age, minimum education of grade 12, reservation if any by caste and gender). They are to be selected according to their rank in terms of qualification (based on a weighted combination of grade attained in an exam conducted for all such applicants, teaching experience and pre service training if any). Contract teachers, once selected, cannot be transferred out of their assigned schools. If absent more than entitled leave days, their salary can be reduced in proportion to their excess absence. There are also former contract teachers (called *shiksha karmi*) who have been made permanent recently, except that their salaries are much lower than that of regular civil service teachers. Regular teachers and *shiksha karmis* are no more being recruited.

Uttar Pradesh

The village education committee (VEC) is involved in selection of contract teachers (called *shiksha mitras*). An additional contract teacher can be hired if the pupil-teacher ratio in the school exceeds 40, up to a maximum of two contract teachers and up to a maximum ratio of 3:2 of regular to contract teachers. For selection of contract teachers, VEC is required to follow state guidelines outlining eligibility criterion (18-35 years of age, minimum education of grade 12, preferably a resident of the *gram panchayat*³, and if there are reservations by caste and gender) and is expected to rank applicants in order of qualification (grades obtained in grade 12 and 10). The VEC sends a list of ranked applicants to the district education office which is supposed to select the top most ranked applicant. The contract is for a 10 month period and renewable by the VEC. With a two-thirds majority, it can remove the contract teacher anytime.

³ If the VEC cannot find a suitably qualified candidate within the *gram panchayat*, it can consider candidates from neighboring *panchayats*.

4.2 Hypothesis on performance of regular and contract teachers:

For two teachers who are alike otherwise but differ in one having a fixed wage and permanent tenure versus the other having a short term contract that is renewable based on performance, it is easy to see that the latter will put in higher effort.

Contract teachers and regular teachers face different incentives to perform and hence we expect their performances to differ. We use a simple principal-agent model, commonly used in the theory of the firm to model employer-worker relationship, to describe the different incentives faced by regular and contract teachers. The principal is the employer. The agent is the teacher who is hired by the principal to perform a task, which in this case is to teach in the school. In the case of regular teachers, one can think of the principal as the state or district education office. In the case of contract teachers, the principal would be the local body that hires them. We can think of student learning as the outcome from agent's effort. The agent's effort cannot be observed and the outcome may or may not be observable by the principal. Even in the case when outcome is observed, it is not a perfect indicator of agent's effort. The principal has to induce effort from the agent by giving incentives and/or monitoring.

How do the two types of teachers differ in their incentives to perform? A permanent civil service teacher is hired at a given salary not tied to performance. This is akin to a fixed wage contract in agency theory. Their recruitment is permanent. Neither their effort nor outcome (student performance) is monitored in practice, even though a system of monitoring from the district education office is in place. In this case of fixed wage and no monitoring of effort or outcome, worker effort as predicted by the agency model will be at its minimum. There is no incentive to perform as a fixed wage is paid irrespective of performance. A contract teacher faces a renewable contract. Assuming that a noisy measure of either effort or outcome can be observed, if the teacher underperforms the contract can be severed.

All else being the same, it is easy to see that a contract teacher will put in higher effort compared to a regular teacher with fixed wage and permanent tenure. Given the non experimental nature of our data, we cannot test this hypothesis. As teachers are not randomly assigned contract types, selection of teachers into contract types is likely to be endogenous. Contract teachers may differ from regular teachers on several characteristics. Being on contract is likely to be correlated with these other characteristics, observed and unobserved, that influence school outcomes.

Our strategy is as follows. In regressions of teacher effort, we report average difference in effort by contract type, both before and after controlling for observed teacher characteristics and school fixed effects that are likely to be correlated with effort.

5. Empirical Results

5.1 Teacher characteristics by contract status

We first report on differences in teacher characteristics by contract status (Table 2). In both states, contract teachers are younger, more educated, a greater fraction female, with fewer years of experience and less likely to have any pre service training. Most of these differences are significant at or below 5 percent level. In UP, contract teachers are mostly local whereas in MP, the average commute of a contract teacher is not different from that of regular teachers. This has to do with differences in hiring practices in the two states. In UP, contract teachers are required to belong to the *gram panchayat* they teach in while in MP, there is no residence requirement.

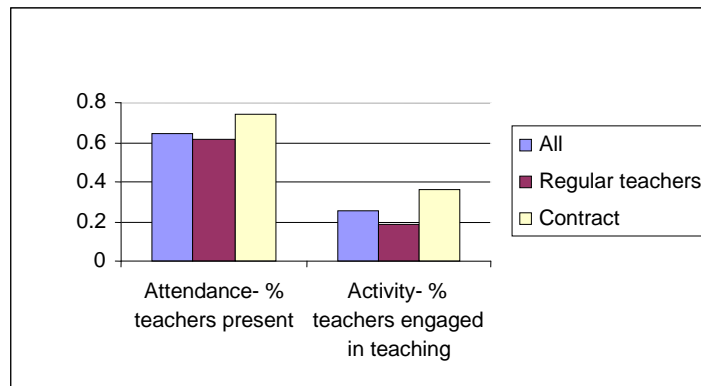
As there are evident differences in observed teacher characteristics (and therefore likely differences in unobserved characteristics) by contract type, effort can differ by contract status not only due to the contract but also because of these other differences that are possibly correlated with effort.

5.2 Teacher effort by contract status

5.2.1 Average effort

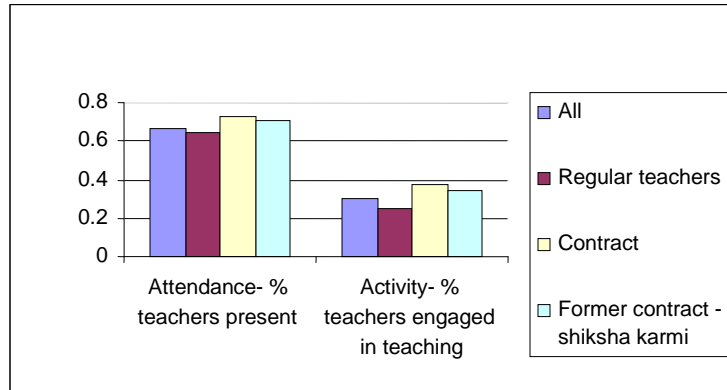
Contract teachers have higher attendance and activity compared to regular teachers in both states (Figures 1-2, Table 3). In UP, compared to regular teachers, contract teachers' attendance is higher by 13 percent points (21 percent) and activity is higher by 17 percent points (89 percent). Both these differences are significant at p values below .01.

Figure 1 Teacher effort by contract type in UP



In MP, contract teachers' attendance is 10 percent points (16 percent) higher and activity is 12 percentage points (48 percent) higher compared to regular teachers. These differences are significant at 1 percent significance level.

Figure 2 Teacher effort by contract type in MP



Some of the differences in effort by contract status can come from different characteristics of schools and teachers. Below we look at how much of the difference in effort by contract status remains after controlling for observed teacher characteristics and school fixed effects.

5.2.2 Average effort controlling for observed correlates and school fixed effects

We run regressions of teacher effort on teacher characteristics and school fixed effects. The regression equations are as below. *Teacher attendance_{ijk}* is a dummy variable which is 1 if teacher *i* in school/village *j* in block *k* was present on a given visit, 0 otherwise. *Teacher activity_{ijk}* is a dummy variable which is 1 if teacher *i* in school/village *j* in block *k* was present and actively engaged in teaching, 0 if the teacher was absent or engaged in non-teaching task (see bottom of table 1 for definition of activity). Both variables have four observations for every teacher (from the four visits). *X_{ijk}* is a vector of teacher characteristics that includes age, gender, caste, education, whether teacher has pre service training, number of years of service, number of days of in service training in last school year, whether teacher's appointment is on a contract basis. *f_{jk}* is a vector of school fixed effects.

$$Teacher\ attendance_{ijk} = a + bX_{ijk} + f_{jk} + \varepsilon_{ijk}$$

$$Teacher\ activity_{ijk} = a + bX_{ijk} + f_{jk} + \varepsilon_{ijk}$$

Table 4 presents the results. After controlling for observables, the differences in effort between contract teachers and regular teachers remain significant in both states. In UP, compared to regular teachers contract teachers' attendance is 10 percent points (16 percent) higher and activity 7 percent points (37 percent) higher. Both these differences are significant at *p* values below .05.

In MP, contract teachers' attendance is 14 percent points (22 percent) higher and activity 16 percent points (64 percent) higher compared to regular teachers. Both these differences are significant at *p* values below .05. Note that compared to regular teachers

former contract teachers do not have higher attendance rates but their activity is higher by 9 percent points (36 percent, $p=.01$). Compared to former contract teachers, contract teachers' attendance is higher by 8 percent points (11 percent, $p=.10$) and activity is higher by 7 percent points (21 percent, $p=.05$).

To summarize, after controlling for teacher characteristics and school fixed effects, contract teachers' attendance as well as teaching activity are significantly higher compared to regular teachers in both states.

In further analysis, we examine if being in the first contract tenure or beyond the first tenure is correlated with contract teachers' effort. 34 percent of contract teachers in MP and 38 percent in UP are in the first contract tenure. In the above regressions, we separate the contract teachers into two categories: those within their first contract period and otherwise.

Results are reported in table 5. In both states, contract teachers in the first contract period have significantly higher attendance (39 percent in MP, 17 percent in UP) and activity rates (58 percent in MP, 47 percent in UP) than contract teachers who have completed at least one full tenure. Compared to regular teachers, in both states contract teachers in the first tenure period have higher attendance and activity rates. Contract teachers who have completed at least one tenure work harder than regular teachers in MP, but in UP they do not differ from regular teachers in attendance and activity rates.

There are three other themes here on the more general question of what are the attributes of teachers with high effort. The first is that teachers who are more qualified in terms of measurable characteristics, for example those with more education or experience, are in general likely to put in less effort compared to less qualified teachers. This may have to do with the more qualified teachers having an elite status in the community. The second theme is that most of the variation in teacher effort is within schools. The percentage of variation in teacher activity that is explained by differences between schools is 21 in MP and 17 in UP. The third point is that observed teacher characteristics (including being on contract) together explain less than 6 percent of the variation in teacher effort within schools. These observations are consistent with other studies, although mainly from developed countries, that find substantial variation in teacher quality within schools and that observed teacher characteristics explain very little of teacher quality (Rockoff, 2004; Rivkin, Hanushek and Kain, 2005; Aarason, Barrow and Sander, 2007).

5.3 Are contract teachers associated with higher scores after controlling for observed student and school correlates?

If contract teachers put in higher effort due to the stronger incentives they face, an extra contract teacher should matter more for scores compared to an extra regular teacher. This would be a straightforward prediction from the standard agency model.

We cannot use our data to test this prediction. As selection bias is an issue, whether a teacher is on contract will be correlated with unobserved teacher, school and village

characteristics that influence student performance. The estimate on the contract variable will be biased and cannot be interpreted as the effect of the contract.

In the absence of a valid identification strategy, we shed light on the question indirectly. We examine the correlation between student performance and teacher effort after controlling for other school inputs and student attributes. Positive correlation between teacher effort and scores may suggest that contract teachers are associated with higher scores through higher effort. Once teacher effort is already included in the regression, the percentage of contract teachers may or may not be associated with scores.

Test score is regressed on observed student characteristics, school characteristics and block fixed effects. The regression equation is as follows.

$$Y_{ijk} = a + bX_{ijk} + cZ_{jk} + f_k + \varepsilon_{ijk}$$

Y_{ijk} is the score of student i in school/village j in block k . X_{ijk} is a vector of observed student characteristics (age, gender, caste, mother's and father's literacy, wealth), Z_{jk} is a vector of observed school and teacher characteristics. Since multi-grade teaching is widespread in the sample and it is difficult to identify a teacher to a class, instead of individual teacher characteristics, average characteristics of all teachers in the school are used. Z_{jk} consists of teacher-pupil ratio, index of school infrastructure, percentage teachers with college degree, percentage teachers with graduate degree, percentage teachers with pre-service training, percentage male teachers, percentage general caste teachers, mean teacher age, mean years of experience, mean days of in service training, mean teacher attendance, mean teacher activity and percentage of contract teachers. f_k are block dummy variables that control for block fixed effects and ε_{ijk} is the error term.

Tables 6 to 9 present results from these regressions. In UP, teacher activity is positively and significantly correlated with language and math scores in all grades (Tables 6-7). Controlling for activity, teacher attendance is not significant in the regressions. Other school and teacher characteristics, except teacher pupil ratio, are not correlated with scores.

In MP, teacher activity is positively and significantly correlated with language and math scores in all grades (Table 8-9). Other school characteristics including teacher-pupil ratio are not correlated with scores.

In both states, the one school characteristic that is positively and significantly correlated with scores in both language and mathematics in all grades is teacher activity. This may be suggestive that contract teachers are associated with higher scores through higher effort.

As an aside, note that although we report test score correlations (not causations) based on a cross section survey, the general nature of our findings is consistent with international evidence on the impact of school and teacher characteristics on student test scores. There is fairly robust evidence that among the school level variables which can be influenced by

policy, factors to do with teachers and teaching are the most important influences on student learning. The broad consensus is that teacher quality is the single most important school variable influencing student learning (Darling-Hammond, 2000; Rockoff, 2004; Rivkin, Hanushek and Kain, 2005). But what it is about teachers that matters is not known. Researchers agree that many important aspects of teacher quality are not captured by commonly used quality indicators such as education, experience, and subject matter knowledge. Our results are broadly parallel to these findings in that teacher activity is positively correlated with student performance, unlike other school and teacher attributes including education, experience and training that are not correlated with student performance.

6. Discussion

The results from the paper show that within public schools contract teachers are associated with higher effort compared to regular teachers. And higher teacher effort is associated with better student performance after controlling for other school and student characteristics. Attendance and engagement in teaching activity are higher for contract teachers compared to regular teachers in both study states, MP and UP. This difference remains significant and large even after controlling for observed differences across teachers and schools. And teacher activity is positively correlated with language and math scores in all three grades tested in both states, after controlling for other school and teacher attributes likely to be correlated with scores.

Our study is non-experimental, based on observational data. In the absence of experimental evidence, it is difficult to estimate the causal impact of providing an extra contract teacher versus a regular teacher to a school. The few experimental studies that compare the two teacher types conclude positively in favor of contract teachers. Non-experimental data provide analyses of average relationships between various school and student attributes and school outcomes in an as-is scenario. Most non-experimental studies too in general find contract teachers performance to be no worse or better than regular teachers. These results are confirmed by our study.

Contract teachers now form a sizable part of the teaching force in public elementary education in India. The evidence so far suggests that at least in the short run, contract teachers are a more efficient resource compared to regular teachers. In a recent study that collected data on teacher salaries in the two states, we find that contract teachers get paid between one-fourth and one-fifth of regular teachers (Goyal and Pandey, 2008). By hiring contract teachers in lieu of regular teachers, the government buys the same or more learning output at a lower cost.⁴ Given that salaries of regular teachers account for 90 percent or more of the states' budget on basic education, these findings are quite relevant for policy. They are relevant from another aspect of the results. Of all the school level inputs, teacher effort is the single input consistently correlated with scores across all grades tested. This suggests that policies that induce teacher effort may work better than

⁴ It is quite plausible that the greater presence of contract teachers may lead to more shirking on the part of regular teachers (Muralidharan and Sundararaman, 2008).

input based policies in raising education quality. But which teachers are observed to work more than others? Our data show that teacher characteristics commonly used by policymakers and school administrators as indicators of teacher quality such as training, experience and education are generally not associated with higher teacher effort. Being a contract teacher is consistently correlated with higher teacher effort. This suggests that focusing on teacher contracts may be a more efficient way to raise effort than rewarding teachers on the basis of their credentials.

An important caveat here is that contracts “as they are” will only go so far in raising effort. If we look in absolute terms, contract teachers are also fairly inactive. In UP, only 36 percent of contract teachers were actively teaching. The remaining were either not teaching (38 percent) or absent (26 percent). In other words, even though the threat of insecure contract is associated with higher effort, the size of the association is not very large. Furthermore, we find that contract teachers with at least one tenure period have lower effort compared to those in the first tenure period. Incentives within the contract as well as contract enforcement may be weak. Do school oversight committees (or other hiring authorities) verify the performance of contract teachers before deciding to renew the contract? Do they receive adequate information and training regarding their involvement in the process of hiring, renewing or firing contract teachers? As a separate arm of this study, members of the school oversight committees were asked to list the committees’ mandated roles and responsibilities they were aware of. In UP fewer than 5 percent members stated selecting a contract teacher as one of their responsibilities. In MP, less than 6 percent of members stated verifying teachers’ attendance among their responsibilities.

We also have little idea of the long run impact on education quality of recruiting contract teachers.⁵ Teacher remuneration policies influence the pool of candidates in the teacher labor market. The terms of work for contract teachers may discourage people of greater ability to enter the teaching profession. In India, the process of teacher appointment in public education is highly politicized. There is evidence from many states of India that contract teachers are organizing themselves and putting political pressure on state governments to regularize them. This has happened with former contract teachers (*shiksha karmis*) in MP who have been given regular appointments and so are left with weaker incentives.⁶ If this process of using the contract teacher system as a by-way to a regular appointment continues, the education system may end up with a large number of non-professional teachers who will have the same weak performance incentives as the current regular teachers.

⁵ Worried with the presence of a sizable contingent of non-professional teachers, commentators have suggested that contract teachers should be provided with some professional training to improve their productivity in the school system. However in cross-section analyses of learning outcomes, teacher training does not seem to have any significant correlation with test scores. This has been found to be true for studies that look at only public schools and also in studies that compare public and private schools (Goyal 2006a; Goyal 2006b; Pandey and Goyal, 2008). Most teachers in private schools have little or no professional pedagogical training and in general, their students have better test scores compared to counterparts in public schools. While the minimum educational qualifications required for a contract teacher is generally grade 12, many of the actual contract teachers in position have post-secondary education reflecting poor labor market conditions.

⁶ We find that *shiksha karmis* have lower teaching activity compared to contract teachers.

Table 1 Summary of Key Variables

	UP		MP	
	Mean	Std. Dev.	Mean	Std. Dev.
Mean Student variables				
% Correct score Grade 4- Math	.23	.29	.29	.29
Grade 4- language	.27	.35	.33	.34
Grade 3- Math	.17	.28	.26	.30
Grade 3- language	.21	.32	.30	.35
Grade 2- Math	.13	.26	.25	.31
Grade 2- language	.20	.29	.31	.33
Age	8.72	1.61	8.95	1.57
Gender (1 if male)	.49	.50	.51	.50
General caste (neither SC/ST, nor OBC)	.15	.36	.20	.40
OBC	.40	.49	.31	.46
SC	.44	.50	.15	.36
ST	-	-	.34	.47
Mother literate	.21	.40	.13	.33
Father literate	.60	.49	.46	.50
Land owned (in acres)	1.13	1.65	2.50	4.27
Mean School characteristics				
Enrollment	178	89	119	66
Pupil-teacher ratio	66	39	56	30
% schools with toilet	.33	.47	.38	.49
% schools with drinking water	.83	.38	.72	.45
% schools with playground	.79	.41	.50	.50
% schools with electricity	.01	.07	.07	.25
Number of blackboards	3.75	1.77	3.32	1.84
Mean Teacher characteristics				
Attendance (mean over 4 visits)	.64	.48	.67	.47
Activity (mean over 4 visits)	.25	.43	.30	.46
% of contract teachers	.41	.20	.15	.36
% of former contract	-	-	.45	.50
Age (years)	38	14	39	9
Non-SC/ST (general caste+OBC)	.80	.40	.69	.46
Male	.60	.49	.80	.40
% with class 12 degree	.42	.49	.48	.50
% with college degree	.32	.47	.30	.46
% with graduate degree	.26	.44	.23	.42
% with preservice training	.59	.49	.36	.48
Distance to work (km)	6	10	9	12
Teaching experience (years)	10.9	13	13.8	10
% doing multigrade	.81	.39	.87	.34
Days of in service training in last school year	5.83	8	10.95	12

Definition of variables: Teacher attendance= 1 if teacher present, 0 otherwise (and averaged over the four visits), teacher activity=1 if teacher actively engaged in teaching i.e., if teacher is teaching, writing on the board, supervising written work, teaching by rote, 0 if teacher is absent, chatting with others, sitting idle/standing outside classroom, keeping order in school/class but not teaching, doing some other work unrelated to teaching (and averaged over the four visits)

Index of infrastructure in school= sum of four indicator variables for whether school has water, toilet, playground, electricity and the total number of blackboards in school.

Table 2 Average teacher characteristics

Percentage unless indicated otherwise	UP			MP				
	Regular	Contract	p^1	Regular	Contract	p^1	Former contract	p^2
Age (years)	46	27	.00	45	31	.00	34	.00
Non- SC/ST	.83	.76	.03	.75	.65	.20	.65	.03
Male	.71	.45	.00	.93	.72	.00	.70	.00
Highest education-whether class 12	.49	.32	.00	.58	.47	.15	.38	.00
Whether college degree	.24	.45	.00	.25	.36	.13	.33	.08
Whether graduate degree	.28	.24	.25	.17	.17	.99	.29	.00
Pre service training	.93	.08	.00	.56	.17	.00	.22	.00
Days of in service training in last school year	5	6	.14	10	10	.98	12	.24
Years of teaching experience	17	2	.00	21	5	.00	9	.00
Distance commute to school (in km)	10	1	.00	9	12	.09	8	.63

¹ Robust p values for difference between regular and contract teachers.

² Robust p values for difference between regular and former contract teachers.

Table 3 Average teacher attendance and activity¹

	Attendance		Activity	
	UP	MP	UP	MP
All	0.64	0.67	0.25	0.3
Regular teachers	0.61	0.63	0.19	0.25
Contract	0.74	0.73	0.36	0.37
<i>p value</i> (contract- regular)	(.00)	(.00)	(.00)	(.00)
Former contract	-	0.71	-	0.34
<i>p value</i> (former contract-regular)		(.00)		(.00)
<i>p value</i> (former contract-contract)		(.47)		(.45)

¹ Robust p values are reported.

Table 4 MP and UP OLS: Village fixed effects regression of teacher effort

(Dependent variable has four observations per teacher: Attendance=1 if teacher present, 0 otherwise; Activity=1 if teacher actively engaged in teaching, 0 otherwise)

	Attendance	Activity	Attendance	Activity
Whether teacher is contract teacher	0.10	0.07	0.14	0.16
	(0.05)*	(0.04)*	(0.03)*	(0.00)**
Whether <i>shiksha karmi</i> (former contract teachers)	-	-	0.06	0.09
			(0.17)	(0.01)*
Age	-0.004	-0.004	-0.01	-0.01
	(0.11)	(0.05)*	(0.03)*	(0.00)**
Caste (1 if non- SC)	-0.03	0.01	-0.01	0.02
	(0.31)	(0.63)	(0.71)	(0.14)
Gender (1 if male)	-0.02	-0.09	0.06	0.00
	(0.57)	(0.00)**	(0.10)	(0.89)
College educated	-0.07	-0.04	-0.04	-0.05
	(0.04)*	(0.13)	(0.17)	(0.06)
Graduate degree	-0.13	-0.07	-0.03	-0.04
	(0.00)**	(0.01)*	(0.47)	(0.25)
Pre service training	-0.04	-0.01	-0.03	-0.03
	(0.39)	(0.88)	(0.37)	(0.41)
Years of service	0.00	0.00	0.00	0.01
	(0.22)	(0.69)	(0.34)	(0.01)**
Days of in service training	0.00	0.00	0.00	0.00
	(0.90)	(0.63)	(0.67)	(0.34)
School fixed effect (200 schools)	YES	YES	YES	YES
R ²	.18	.23	.23	.22
Observations	2416	2415	1792	1792

Robust p values in parentheses clustered at teacher level. * significant at 5%; ** significant at 1%

Table 5 MP and UP OLS: Village fixed effects regression of teacher effort

(Dependent variable has four observations per teacher: Attendance=1 if teacher present, 0 otherwise; Activity=1 if teacher actively engaged in teaching, 0 otherwise)

	MP		UP	
	Attendance	Activity	Attendance	Activity
Whether contract teacher in first contract tenure	0.40	0.36	0.19	0.17
	(0.00)**	(0.04)*	(0.00)**	(0.00)**
Whether contract teacher for longer than first contract tenure	0.12	0.15	0.06	0.03
	(0.06)	(0.04)**	(0.19)	(0.32)
Whether <i>shiksha karmi</i> (former contract teachers- MP only)	0.06	0.09	-	-
	(0.18)	(0.01)*		
Age	-0.01	-0.01	-0.01	0.00
	(0.03)*	(0.00)**	(0.06)	(0.01)*
Caste (1 if non- SC)	-0.01	0.02	-0.04	0.00
	(0.64)	(0.15)	(0.21)	(0.89)
Gender (1 if male)	0.06	-0.01	-0.01	-0.09
	(0.13)	(0.82)	(0.67)	(0.00)**
College educated	-0.05	-0.06	-0.06	-0.03
	(0.14)	(0.05)*	(0.07)	(0.27)
Graduate degree	-0.03	-0.04	-0.12	-0.06
	(0.43)	(0.23)	(0.00)**	(0.03)*
Pre service training	-0.03	-0.03	-0.03	0.01
	(0.36)	(0.40)	(0.53)	(0.82)
Years of service	0.00	0.01	0.00	0.00
	(0.33)	(0.01)**	(0.11)	(0.88)
Days of in service training	0.00	0.00	0.00	0.00
	(0.64)	(0.33)	(0.53)	(0.62)
School fixed effect	YES	YES	YES	YES
	.24	.22	.18	.24
Observations	1792	1792	2416	2415
Robust p values in parentheses clustered at teacher level				
* significant at 5%; ** significant at 1%				

**Table 6 OLS: Are school and teacher characteristics correlated with scores?
Dependent variable is percent correct score, Grade 4, UP**

	Hindi	Math	Hindi	Math	Hindi	Math
Teacher-pupil ratio	5.00	5.00	5.0	4.9	4.9	4.9
	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.00)**
Index of infrastructure	0.00	0.00	0.00	0.00	0.00	0.00
	(0.91)	(0.70)	(0.88)	(0.62)	(0.85)	(0.62)
% non-sc teachers	-0.03	-0.05	-0.03	-0.05	-0.03	-0.05
	(0.56)	(0.15)	(0.56)	(0.15)	(0.54)	(0.13)
% male teachers	0.01	0.01	0.01	0.01	0.01	0.02
	(0.88)	(0.70)	(0.89)	(0.71)	(0.84)	(0.66)
% teachers with college deg	0.05	0.01	0.05	0.01	0.06	0.02
	(0.27)	(0.72)	(0.29)	(0.83)	(0.23)	(0.62)
% teachers with graduate deg	0.05	0.02	0.05	0.02	0.05	0.03
	(0.25)	(0.56)	(0.25)	(0.57)	(0.21)	(0.47)
Av. Years of service	0.00	0.00	0.00	0.00	0.00	0.00
	(0.68)	(0.60)	(0.63)	(0.76)	(0.51)	(0.86)
Av. days in service in last year	0.00	0.00	0.00	0.00	0.00	0.00
	(0.91)	(0.41)	(0.92)	(0.40)	(0.96)	(0.30)
% teachers with pre service training	0.01	-0.02	0.01	-0.02	0.07	0.04
	(0.80)	(0.64)	(0.80)	(0.64)	(0.32)	(0.41)
% teachers doing multi grade	0.00	0.03	-0.01	0.03	0.00	0.03
	(0.94)	(0.53)	(0.94)	(0.54)	(0.95)	(0.51)
% teachers actively engaged in teaching (mean over 4 visits)	0.13	0.14	0.15	0.17	0.12	0.13
	(0.05)*	(0.01)*	(0.05)*	(0.00)**	(0.09)⁺	(0.03)*
% teachers present in school (mean over 4 visits)	-	-	-0.02	-0.05	-	-
	-	-	(0.73)	(0.28)	-	-
% contract teachers	-	-			0.10	0.11
	-	-			(0.26)	(0.10) ⁺
Block fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
n	2553	2553	2553	2553	2553	2553

Robust p values in parentheses clustered at GP level, * significant at 5%; ** significant at 1%; ⁺ significant at 10%. Other controls include student family background characteristics and block fixed effects.

Table 7 OLS: Are school and teacher characteristics correlated with scores?
Dependent variable is percent correct score, Grades 3 and 2, UP

	Hindi Grade 3	Math Grade 3	Hindi Grade 3	Math Grade 3	Hindi Grade 2	Math Grade 2	Hindi Grade 2	Math Grade 2
Teacher-pupil ratio	5.83	5.33	5.83	5.33	4.4	3.7	4.4	3.7
	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.00)**
Index of infrastructure	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00
	(0.16)	(0.33)	(0.16)	(0.31)	(0.20)	(0.60)	(0.20)	(0.55)
% non-sc teachers	-0.01	-0.03	-0.01	-0.03	-0.01	-0.02	-0.01	-0.02
	(0.93)	(0.54)	(0.93)	(0.53)	(0.78)	(0.52)	(0.78)	(0.52)
% male teachers	0.03	0.01	0.03	0.01	0.04	0.00	0.04	0.00
	(0.44)	(0.78)	(0.45)	(0.76)	(0.18)	(0.89)	(0.18)	(0.93)
% teachers with college deg	0.09	0.03	0.09	0.03	0.09	0.06	0.09	0.06
	(0.01)*	(0.34)	(0.02)*	(0.31)	(0.01)*	(0.06) ⁺	(0.01)*	(0.06) ⁺
% teachers with graduate deg	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.05
	(0.29)	(0.35)	(0.29)	(0.34)	(0.19)	(0.18)	(0.19)	(0.17)
Av. Years of service	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.38)	(0.84)	(0.40)	(0.91)	(0.97)	(0.83)	(0.95)	(0.73)
Av. days of in service last year	0.00	0.00	0.00	0.00	0.00	-0.003	0.00	-0.003
	(0.79)	(0.41)	(0.79)	(0.38)	(0.41)	(0.06) ⁺	(0.44)	(0.05)*
% teachers with pre service training	0.04	-0.01	0.04	0.01	0.03	0.02	0.02	0.04
	(0.40)	(0.91)	(0.47)	(0.84)	(0.53)	(0.59)	(0.61)	(0.31)
% teachers doing multi grade	0.01	0.03	0.01	0.03	0.00	0.01	0.00	0.01
	(0.84)	(0.44)	(0.84)	(0.43)	(0.93)	(0.74)	(0.93)	(0.73)
% teachers actively engaged in teaching (mean over 4 visits)	0.11	0.10	0.11	0.10	0.13	0.10	0.13	0.10
	(0.05)*	(0.03)*	(0.05)*	(0.03)*	(0.00)**	(0.01)*	(0.00)**	(0.02)*
% contract teachers	-	-	0.00	0.03	-	-	-0.01	0.04
	-	-	(0.99)	(0.65)	-	-	(0.88)	(0.45)
Block fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
n	2673	2670	2673	2670	2697	2695	2697	2695

Robust p values in parentheses clustered at GP level, * significant at 5%; ** significant at 1%; ⁺ significant at 10%. Other controls include student family background characteristics and block fixed effects.

Table 8 OLS: Are school/teacher characteristics correlated with scores?
Dependent variable is percent correct score, Grade 4, MP

	Hindi	Math	Hindi	Math	Hindi	Math
Teacher-pupil ratio	1.11	0.22	0.96	0.14	1.05	0.21
	(0.34)	(0.78)	(0.41)	(0.86)	(0.36)	(0.79)
Index of infrastructure	0.01	0.00	0.01	0.00	0.01	0.00
	(0.12)	(0.72)	(0.10) ⁺	(0.67)	(0.13)	(0.74)
% non-sc teachers	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04
	(0.26)	(0.21)	(0.18)	(0.16)	(0.29)	(0.21)
% male teachers	-0.03	-0.04	-0.03	-0.04	-0.02	-0.04
	(0.52)	(0.34)	(0.54)	(0.35)	(0.64)	(0.37)
% teachers with college deg	0.01	0.02	0.01	0.02	0.01	0.02
	(0.80)	(0.55)	(0.79)	(0.55)	(0.82)	(0.55)
% teachers with graduate deg	0.03	0.03	0.04	0.04	0.04	0.04
	(0.57)	(0.40)	(0.51)	(0.35)	(0.52)	(0.35)
Av. Years of service	0.00	0.00	0.00	0.00	0.00	0.00
	(0.29)	(0.37)	(0.29)	(0.37)	(0.58)	(0.66)
Av. days of in service last year	0.00	0.00	0.00	0.00	0.00	0.00
	(0.48)	(0.41)	(0.44)	(0.43)	(0.46)	(0.40)
% teachers with pre service training	-0.02	-0.04	-0.01	-0.03	-0.02	-0.04
	(0.63)	(0.23)	(0.72)	(0.26)	(0.59)	(0.22)
% teachers doing multi grade	-0.09	-0.05	-0.09	-0.06	-0.08	-0.05
	(0.14)	(0.24)	(0.12)	(0.22)	(0.16)	(0.26)
% teachers actively engaged in teaching (mean over 4 visits)	0.15	0.18	0.19	0.20	0.14	0.18
	(0.03)*	(0.00)**	(0.01)**	(0.00)**	(0.04)*	(0.00)**
% teachers present in school	-	-	-0.09	-0.05	-	-
	-	-	(0.19)	(0.42)	-	-
% contract teachers	-	-	-	-	-0.11	-0.04
	-	-	-	-	(0.14)	(0.53)
% shiksha karmi teachers (former contract teachers)	-	-	-	-	0.00	-0.01
	-	-	-	-	(0.94)	(0.77)
Block fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
n	2142	2142	2142	2142	2142	2142

Robust p values in parentheses clustered at GP level, * significant at 5%; ** significant at 1%; ⁺ significant at 10%. Other controls include student family background characteristics and block fixed effects.

**Table 9 OLS: Are school/teacher characteristics correlated with scores?
Dependent variable is percent correct score, Grades 3 and 2, MP**

	Hindi Grade 3	Math Grade 3	Hindi Grade 3	Math Grade 3	Hindi Grade 2	Math Grade 2	Hindi Grade 2	Math Grade 2
Teacher-pupil ratio	1.68	0.71	1.75	0.78	2.41	1.81	2.46	1.85
	(0.15)	(0.41)	(0.14)	(0.38)	(0.06) ⁺	(0.07) ⁺	(0.05)*	(0.07) ⁺
Index of infrastructure	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.68)	(0.93)	(0.70)	(0.91)	(0.57)	(0.61)	(0.60)	(0.61)
% non-sc teachers	-0.02	0.02	-0.04	0.00	0.01	0.03	0.01	0.02
	(0.56)	(0.66)	(0.34)	(0.98)	(0.71)	(0.33)	(0.84)	(0.46)
% male teachers	0.02	0.02	0.00	0.01	0.03	0.04	0.03	0.04
	(0.75)	(0.59)	(0.97)	(0.86)	(0.50)	(0.25)	(0.57)	(0.33)
% teachers with college deg	-0.01	0.02	-0.01	0.02	0.02	0.02	0.02	0.02
	(0.78)	(0.63)	(0.86)	(0.53)	(0.58)	(0.59)	(0.55)	(0.54)
% teachers with graduate deg	0.12	0.10	0.13	0.11	-0.04	-0.06	-0.03	-0.06
	(0.02)*	(0.01)*	(0.01)*	(0.01)**	(0.33)	(0.08) ⁺	(0.40)	(0.10)
Av. Years of service	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.20)	(0.51)	(0.87)	(0.71)	(0.78)	(0.75)	(0.68)	(0.47)
Av. days in service in last year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.14)	(0.32)	(0.20)	(0.43)	(0.87)	(0.98)	(0.95)	(0.90)
% teachers with pre service training	0.02	0.00	0.01	-0.01	0.06	0.07	0.06	0.07
	(0.59)	(0.98)	(0.73)	(0.81)	(0.09) ⁺	(0.02)*	(0.11)	(0.03)*
% teachers doing multi grade	-0.06	-0.10	-0.06	-0.10	-0.15	-0.12	-0.14	-0.12
	(0.38)	(0.07)	(0.37)	(0.06)	(0.02)*	(0.02)*	(0.02)*	(0.02)*
% teachers actively engaged in teaching	0.21	0.17	0.20	0.17	0.21	0.12	0.21	0.12
	(0.01)**	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.02)*	(0.00)**	(0.03)*
% contract teachers (samvida)	-	-	-0.04	-0.04	-	-	-0.05	0.00
	-	-	(0.56)	(0.55)	-	-	(0.47)	(0.95)
% shiksha karmi teachers (former contract teachers)	-	-	-0.09	-0.09	-	-	-0.05	-0.04
	-	-	(0.03)*	(0.01)**	-	-	(0.27)	(0.32)
Block fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
n	2190	2190	2190	2190	2239	2239	2239	2239

Robust p values in parentheses clustered at GP level. * significant at 5%; ** significant at 1%; ⁺ significant at 10%. Other controls include student family background characteristics and block fixed effects.

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