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Akin to my teacher: Does caste, religious or gender distance between student and teacher matter? Some evidence from India

Shenila Rawal[*], **Geeta Kingdon**[†‡]

Abstract. This paper uses a unique data set from 5028 primary school children in rural India to examine whether the demographic interactions between students and teachers influence student outcomes and whether social distance between student and teacher exacerbates gender, caste and religious gaps in children's achievement. One would expect this to be the case if discrimination and/or role model effects persist in the classroom. School and individual fixed effects methodology are used. In the pupil fixed effects model, across subject variation is used to test whether having a teacher whose gender, caste and religion are the same as that of the student improves student test scores. We find statistically significant positive effects of matching student and teacher characteristics. We find that a student's achievement in a subject in which the teacher shares the same gender, caste and religion as the child is, on average, nearly a quarter of a SD higher than the same child's achievement in a subject taught by a teacher who does not share the child's gender, caste or religion. Policy implications are considered.

JEL classification: I2, I21.

Keywords: education, religion, gender.

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1 INTRODUCTION

The association between higher levels of educational achievement and the promotion of economic growth and development (Glewwe, 2002; Hanushek and Woessmann, 2008; Krueger and Lindhal, 2001) makes analysis of educational achievement of global importance. In addition to this income inequality is strongly correlated with test-score inequality (Nickell, 2004). Therefore research must examine whether individuals in society perform at similar levels throughout schooling, succeed at similar rates and reap the same benefits from their educational experiences (Freeman, 2004).

Equity in education is of particular concern in certain developing countries. For example, despite primary education being a fundamental right for all children aged 6-14 in India, and in spite of affirmative action policies to promote disadvantaged groups' participation in education[1], previous analyses suggest the persistence of social, religious and gender bias in the Indian educational system. This is the case whether one looks at enrolment or achievement. For example girls in India generally acquire less education and face differential educational treatment than their male counterparts (Kingdon, 2005).Lower castes and non-Hindu faith groups (such as Muslims) are also economically and educationally deprived (Sachar Committee, 2006). In addition to this, given that returns to education rise with levels of education in India (Colclough, Kingdon and Patrinos, 2010; Duraisamy, 2002; Dutta, 2006; Kingdon and Unni, 2001)[2] any caste, gender or religious gaps in education will translate into further gaps in labour market earnings for members of these groups.

Internationally also there are persistent differences in school performance between the genders and ethnic groups. Studies show that girls on average outperform boys in reading whereas in mathematics the reverse is true (PISA, 2003). Research has also shown that in many countries ethnic majorities tend to outperform ethnic minorities e.g. on average white students tend to outperform black and Hispanic students in the US (NAEP, 2004). Therefore gender, racial and social gaps in educational outcomes are a matter of real and growing concern, especially if this means that certain groups are less likely to attend higher education, be represented in certain fields and face differing opportunities in the labour market.

Reducing or eliminating these gaps in education by raising achievement of certain students is seen as a critical component of promoting broader social equality with respect to a variety of outcomes in addition to educational attainment such as earnings, crime reduction, health improvements and strengthening the family structure (Jencks and Phillips, 1998). Jencks and Phillips (1998) also argue that due to the fact that differences in observable characteristics do not have sufficient explanatory power in explaining these gaps in education, future explanations of achievement gaps are more likely to

[1] For example for many years girls' education has been fee-free up to higher secondary level in many Indian states. Also Schedule caste and Schedule tribe children are entitled to certain benefits such as free school uniforms and scholarships.

[2] Colclough, Kingdon and Patrinos (2010) who review more than 35 studies using recent data find similarly in developing countries generally, i.e. that the wage increment from each extra year of schooling is greater at higher than at lower levels of schooling.

come from more nuanced hypotheses about the dynamics within families, schools and classrooms. One such potential explanation for the gender and ethnic differences in school performance could be the non-representative composition of the teaching staff with respect to gender and ethnicity (Lindahl, 2007). It is based on the assumption that gender, caste and religious match between student and teacher enhances the teacher's understanding of the child and results in greater acceptance, understanding and encouragement of those students who may otherwise be misunderstood by teachers of a different religion, caste and/or gender.

This research paper aims to examine whether the social and demographic identity of students and their teachers matters. More specifically we will be investigating whether reducing the cultural, gender or religious distance between student and teacher can help reduce gaps in educational achievement in India. The paper will focus on three characteristics of students and teachers: gender, caste and religion and investigate whether students who have teachers who are of the same gender, religion and/or caste perform better that those whose teachers' characteristics are different from their own. We will also examine some potential explanations for the findings.

2 LITERATURE

2.1 TEACHERS AND THEIR INTERACTIONS WITH STUDENTS

In India education, religion and caste are profoundly and fundamentally inter-linked (Borooah and Iyer, 2005). In many communities within the country there is no tradition of sending children to school and little pressure from peers to do so. In addition to this, these traditions can co-exist with established social norms that condone child labour and out of school children (Wazir, 2002). Within school also race, gender, age and social status all frame teachers' identities and these categories combine to exert an influence on teachers' philosophies, pedagogy, practice and interactions with pupils (Dillabough, 1999; Maguire, 2001; Maylor, 2009). These sociological factors also influence pupils. Akerlof and Kranton (2002) translate key sociological concepts into an economic model of students and schools to show how sociological variables can affect schooling outcomes and the emphasize the need to include certain sociological variables and issues to enhance economic analysis. They state that an individual gains utility when his or her actions or those of others enhance his or her 'self –image'. This 'self-image', or identity, is associated with one's social environment whereby people (such as students and teachers) think of themselves and others in terms of different social categories that include racial, gender, ethnic and religious designations. Individuals then gain or lose utility in so far as they belong to social categories with high or low social status and their attributes and behaviour match the ideal of their category. In this way students with features similar to the school's 'social background' and its 'ideal student' readily identify with the school and therefore may exert higher levels of effort than those who may not fit in as easily.

Despite initial research suggesting that school inputs play a limited role in determining student outcomes, there is now a growing body of research showing that schools do make a difference and almost all observers of the education process, be they scholars, school administrators, policy-makers or

parents, acknowledge teacher quality as the most significant institutional determinant of academic success (Clotfelter, Ladd and Vigdor, 2006). There is, however, considerable debate regarding exactly which aspects and characteristics of teachers are important. The issue is further confounded by the absence of evidence that any traditional observable teacher characteristics (e.g. training, experience, qualifications) explain any of this across teacher variation in student scores. There is a wealth of research into this topic and the findings have been mixed. Researchers have examined a wide range of traditional teacher characteristics as well as more nuanced issues such as that of teaching style and practise. For example, teacher subject matter knowledge is seen as one good predictor of student achievement (Fuller *et al*, 1999; Harbison and Hanushek, 1992; Mullens, Murnane and Willett, 1996). Research by Bernard (1999) finds that teacher's ability to spot mistakes has a positive relationship with student performance and this in turn is not correlated with the teacher's own educational attainment. Research from developing countries has also emphasised the importance of classroom practises on predicting student outcomes. Fuller et al. (1999) find that where children spend more time on instructional tasks as compared to being disciplined by the teacher their scores improved. In Swaziland it was found there is a positive relationship between the time the teacher spent monitoring and evaluating children's performance and student achievement (Lockheed and Komenan, 1989). Aslam and Kingdon (2007) find that the standard resume characteristics of teachers do not matter significantly to pupil achievement but that teaching 'process' variables (e.g. lesson planning, questioning students during class etc.) matter significantly. Therefore it is likely that teacher effectiveness can be attributed to a combination of these traditional observable teacher characteristics, subject matter competency, unobservable characteristics (such as intrinsic motivation, commitment and effort) and pedagogical practices in that it is not only what teachers know and who they are but also what they do that matters (Allen and Duthilleul, 2005).

Many countries are running role model teacher recruitment drives under the assumption that like is good for like (Carrington, Merrell and Tymms, 2005). Policy makers have shown concern over the under-representation of certain groups within the teaching profession and have questioned whether this is also associated with the gaps in educational achievement, underachievement and disaffection from school shown by children of those groups. There are two main ways in which demographic matches may influence student outcomes (Dee, 2005). Firstly they influence outcomes through passive teacher effects. These arise from the teacher's gender, ethnicity etc. and are not triggered from explicit teacher behaviours. Secondly, they influence outcomes through active teacher effects. These include intended and unintended teacher biases in their prior expectations and interactions with students who have different demographic traits (Ferguson, 1998).

Having a teacher with similar demographic characteristics as the student can improve or reduce schooling outcomes through a variety of effects. One such category of effects is referred to as role model effects. According to this students are more engaged, behave more appropriately and perform better when taught by someone who shares their gender, caste and/or religion. These role models may provide children with examples of well-adjusted, successful and academically achieving individuals of their gender/ethnicity/social background and thereby improve their attitudes towards education and effort in school. For example in the mid-1980s there was an influx of young teachers of plantation community origin into rural schools in Sri Lanka. These teachers, who shared the same ethnic and community identity as many of their students, provided motivational role models for the next generation

of children by providing images of plantation youth aspiring to and gaining government jobs (Little, 2008).

In line with Maylor (2009) in order for these role model effects to improve student performance one must assume that:

- Teachers regard themselves as role models and accept such a role
- Pupils automatically see teachers as role models and connect their behaviour or actions with their own behaviour, aspirations and achievement

The other way in which teacher demographic characteristics can affect students' schooling outcomes is through the negative effects of discrimination. This is a situation where teachers treat children differently because of their demographic characteristics or because they belong to a particular social group. Even if actual discrimination is not taking place students can still perform worse if they perceive they will be discriminated against. This so-called Pygmalion effect is a case of self-fulfilling expectations whereby students perform better/worse because they react to this expectation. This actual or perceived discrimination may be partly responsible for the differences in human-capital investment and schooling and thereby will also affect eventual occupational choices and labour market opportunities. This is similar to stereotype threat. That is the threat of being perceived as a negative stereotype or the fear of poor performance that would confirm this stereotype. This in itself may be powerful enough to shape the intellectual performance and academic identities of an entire group of people (Lavy, 2008). Examples of stereotypical perceptions are that boys excel in mathematics and science and girls excel in other subjects, or that boys are talented and girls work hard (Deaux and LaFrance, 1998). Stereotyping can affect student confidence in that it can impact on teachers' classroom behaviour (e.g. offering of praise/criticism, encouragement, and remediation).

There is a growing literature that examines the gender, ethnic and religious interactions between students and teachers. The findings to date in this area have shown mixed results. Papers to date have examined both subjective as well as objective measures of student achievement. Summarized below is a range of such research papers and their findings. While research in the current paper will use objective measures of student achievement (namely student test scores) it is important to note that subjective measures and research into them, despite being more prone to measurement error, still provide an important contribution as these teacher perceptions are likely to influence educational opportunities as well as the learning environment in which children find themselves.

Dee (2005) in his paper " A Teacher Like Me" examines student specific evaluations from teachers in the United States, in two distinct subjects, using a fixed effects model to examine how two demographically different teachers examine the same student. He finds that racial, gender and ethnic dynamics have consistently large effects on teachers' perceptions of student performance but that the effects associated with race and ethnicity appear to be concentrated among student with low socio-economic status and those living in the South. In a further U.S based paper in 2007 (Dee, 2007), Dee examines whether assignment to a same gender teacher influences student achievement, teachers' perceptions of student performance as well as student engagement. Within-student comparisons indicate that having a same gender teacher improves the achievement of both boys and girls as well as improving teacher perceptions and student engagement with that subject. Furthermore, the sizes of the

estimated effects are quite large when compared to the subject specific gender gaps. For example the assignment of a student to an opposite gender teacher lowers student achievement by 0.05 standard deviations. This implies that for a male student one year with a male English teacher would eliminate nearly a third of the pro-female gender gap in reading. The policy concern is that this effect not only works through improving the performance of boys but by simultaneously harming the performance of girls. Also in that year, the REACH (2007) report alludes to racial and gender mismatches in schools as being detrimental to Black male pupils performance.

Ehrenberg et al. (Ehrenberg, Goldhaber and Brewer, 1995) also examine data from the National Educational Longitudinal Study of 1988 in the US and also find that the match between teachers' race, gender and ethnicity and those of their students have little association with how much students learned, but that in several instances it seems to have been a significant determinant of the teacher's subjective evaluations of their students. It should however be noted that this data does not include any information on characteristics other than race, gender and ethnicity of the teachers and no other measures of their ability. Both school and teacher characteristics are treated as being predetermined. Similar results were found by Hopf and Hatzichristou (1999) who found that there was a significant relationship between teachers' subjective judgements and gender. Oazad (2008) examines U.S. early childhood data on teacher assessments of students and finds that teachers give significantly higher assessments to children of their own race, but not significantly higher assessments to children who share the same gender. Pigott and Cowen (2000) examine the effects of teacher's race, pupil's race and teacher-pupil racial congruence on teacher ratings of the school adjustment of 445 American children. African American children were judged by both African-American and white teachers to have more serious school adjustment problems, fewer competencies, more stereotypically negative qualities and poorer future educational prognoses than white children.

A study by Lindahl (2007) investigates the importance of gender and ethnic interactions among teachers and students for school performance in Sweden. The results show that students are more likely to obtain better results in maths when they share the same gender as their teacher. Similarly, ethnic minority students show better results in maths when the share of ethnic minority teachers increases. However this same gender positive effect is counteracted by a negative assessment effect in that same-gender teachers are less generous in their subjective assessments. In Swedish and English no statistically significant effects are found. Earlier work by Holmlund and Sund (2005) examines upper secondary school data to investigate whether the pro-female gender gap in performance can be attributed to the fact that the teaching profession in Sweden is female dominated, namely, is there a causal effect on student outcomes from having a same-sex teacher? They find that there is no strong support that same-sex teachers improve their students' outcomes. They attribute this to the fact that they examine older children and think that gender effects may more important in the early stages of a child's education.

2.2 GENDER

The Indian educational system has been characterised by gender bias (especially in rural areas) with Indian girls facing significantly different educational treatment, outcomes and opportunities than their male counterparts. India ranked 103/107 in the UNDP Gender Development Index in 1996 and 114/155

in 2007 (UNDP, 2009). It is apparent that females in India generally acquire less education than males and this lack of education is of concern not only from an equity standpoint but it is also economically and socially inefficient (Kingdon, 1998). Previous research has suggested that female education is more important than male education for social outcomes such as fertility, child health and infant mortality, emphasizing the need to address gender gaps in education (Drèze and Murthi, 2001; King and Hill, 1993; Subbarao and Raney, 1995). Research has argued in favour of hiring more female teachers in developing countries under the assumption that their presence will lead to higher levels of girls' enrolment and achievement (UNESCO, 2006). In line with this notion a great emphasis has been placed on hiring more female teachers in India (Chudgar and Sankar, 2008). The most ambitious programme, Sarva Shiksha Abhiyan, continues to aim for the goal of 50% of all teachers being female. Figures from the Department of Elementary Education and Literacy and Department of Secretary and Higher Education show this figure had crept up to 43% in 2004 although it should be noted that there are rural and urban differences in these proportions.

It is however very hard to measure a causal relationship between teacher's gender and a pupil's attainment in the context of so many other competing variables. This is why there is very little evidence on whether or not a teacher's gender plays a significant role in their pupil's attainment (DfES, 2007).

Aslam and Kingdon (2007) find that girls benefit from having female teachers. Analysis in a paper by Chudgar and Sankar (2008) shows that male and female teachers differ in terms of their classroom management practises and their belief in students' learning ability. In partial support of the policy in India to hire female teachers, they find that being in a female headed classroom is advantageous for language learning but that teacher gender has no effect on mathematics learning. It should be noted that the data in this study is taken from a survey that asks teachers their opinion on various matters and these reveal their classroom practises, in contrast to my research that uses data where classroom practises are actually observed. Also Chudgar and Sankar examine urban and not rural school data.

Ammermuller and Dolton (2006) find evidence of positive gender interaction effects for boys' maths scores in the US and science scores in England at Grade 8. Further to this, using individual fixed effects analysis of the difference between maths and science scores they can confirm the presence of maths gender interaction effects in England (not in the US) at Grade 8 by 2003 when these effects were not present in 1995 or 1999. Where they find these effects they are likely to be understated due to the fact that they do not have data on gender of the teachers the pupil had in previous years.

Machin and McNally (2006) find that there is a persistent gender gap in the UK but that the explanations for changes in the size of this gender gap are found in the teenage and secondary years of education and not in the early experiences at school. Some of the possible school-based explanations they give include:

- School inputs (resources, gender mix of pupils, teachers)
- Teaching practise (genders may learn differently)
- Methods of assessment
- Non-school factors (social, cultural)

Lavy (2008) tests for the existence of gender stereotypes and discrimination in Israel's public high schools using a natural experiment based on blind and non-blind test scores that students achieve on

matriculation exams in their senior year. This paper finds that contrary to expectations male students face discrimination in each subject and that this discrimination widens female-male achievement differences as girls outperform boys in all subjects except English and at all levels of the curriculum.

Duffy et al. (Duffy, Warren and Walsh, 2001) conduct an observational study investigating the effects of teachers' and students' gender on classroom interactions to find that teachers are equitable in all interactions with students.

Driessen (2007) investigates the feminisation of Dutch primary education and the effects of teachers' gender on pupil achievement, attitudes and behaviour. The study aimed to address the concern that increased feminisation of the teaching profession led to the lack of role models for boys and therefore results in negative consequences for boys. The results showed that teacher's gender has no effect on achievement, attitude or behaviour of pupils. These results applied for both boys and girls, for both ethnic minority and non-minority children, as well as for lower and upper social classes.

The question of whether male teachers foster positive attitudes amongst boys and female teachers amongst girls is examined using quantitative data by Carrington et al. (Carrington, Merrell and Tymms, 2005). They find little support for role model drives in recruitment, i.e. there was no indication from their analysis that male teachers were particularly effective or enhanced the performance of boys and females teachers of girls. With regards to attitudes they find that female teachers seem to bring out the best in both genders. However it should be noted that at the time when the data were collected the children had only been with the teacher for four months and therefore the results may have differed had the data been collected at the end of the academic year. Also these results did not control for gender of previous teacher.

2.3 RELIGION

Previous research relating to the educational outcomes of Muslim children in India has been mixed. Drèze and Kingdon (2001) find no evidence of intrinsic educational disadvantage among Muslim children. Kingdon (2002) and Dostie and Jayaraman (2006) report some evidence of Muslim educational disadvantage in schooling even after accounting for differences in family background and personal attributes. More recently there has been evidence of social disparity in educational outcomes in that children from Muslim and lower caste families achieve much less than those from Hindu families (Borooah and Iyer, 2005; Desai and Darden, 2006; Rajaram and Jayachandran, 2007).

Jeffrey and Jeffrey (1997) state that many Muslims themselves regard their relative economic weakness as stemming from discriminatory practises in job-hiring and the belief that their children will not get good jobs may lead to Muslim parents devaluing the importance of education for their children. These findings are analogous to those of Muzammil (1994) who finds that perpetuation of ancestral manual occupations and labour market discrimination is likely to lower the expected rate of return to education for Muslims and cause them to desire fewer years of schooling.

In addition to this, factors such as perceived discrimination in schools, representation of Islamic norms by clergy (e.g. relating to the education of girls), the existence of alternative Madrasa education and lack of teaching of Urdu language in the formal school sector play an important role in determining the educational outcomes of Muslim children. For example Muslim parents may be reluctant to send their daughters to school due to purdah restrictions (Iyer, 2002) and this may be affected also by the proportion of male teachers in schools.

2.4 CASTE

The caste system in India can be described as " a highly stratified social hierarchy, in which largely endogamous groups of individuals are invested with different social status and social meaning" (Hoff and Pandey, 2004, p. 2). The origins of the caste system are linked to traditional professional occupations and result in four classes in hierarchical order. The Fifth group, previously known as the 'Untouchables', were considered too lowly to be counted within the caste system. The official and neutral term for this group is now 'Schedule Caste' and they are characterised with social, educational and economic backwardness. The Indian constitution of 1950 abolished the caste system; however, it is still a visible part of society especially in rural India. Even as recently as early this century the majority of Schedule Caste men (56%) report that they remain standing or sit on the floor when visiting the home of a higher caste family (Hoff and Pandey, 2004). The lower returns to education for the lower caste individuals are well documented and these can be seen to be attributed to wage and job discrimination (Kingdon, 2002). This in turn may lower the motivation of lower caste children and parents to acquire schooling as well as translating to less effort being exerted by these children when they are in school. However the 'reservation' of a certain proportion of public sector jobs for persons from low caste backgrounds by the Indian government has given low caste individuals an economic incentive to enhance their education and perhaps discard their traditional conservatism. Therefore the relationship between caste and education is an empirical one.

Another policy issue relating to caste is that in India the Government, as part of its initiative to improve access to schooling, has made provision of a school within walking distance from each rural household a priority. Rural India resides in habitations and it is these habitations that form the basis for provision of a school. Due to the fact that habitations are generally organised along caste lines, one finds that schools in rural India can be characterised by a considerable degree of caste-based segregation (Kochar, 2008). These policies therefore translate extensive residential segregation into a system of de facto schooling segregation that is likely in turn to affect schooling attainment and reinforce caste based divisions (Kochar, 2008). The low schooling attainment of the lower caste children could reflect the poor physical conditions of government schools. Separating the school access decision from the school size decision has resulted in many very small schools that cannot justify the fixed cost requirements for investment in physical infrastructure and basic facilities in many schools. The average schedule caste child is likely to reside in a habitation of a smaller size and therefore be affected more by these issues of lower quality schools with fewer teachers than a general caste child.

Hoff and Pandey (2004) examine experimental evidence to test whether history shapes people's belief systems and individuals' response to opportunities despite the fact that legal barriers to economic and social advancement by oppressed groups having been abolished. They find that there is no caste

difference in the performance of students when caste is not publicly revealed; however when caste is made salient a large and robust caste gap in performance of students emerges. In addition to this they find that introduction of a non-human reward factor (i.e. no subjective judgement and the link between performance and reward is mechanical e.g. a random draw) makes the caste gap disappear demonstrating that students anticipate that their caste will result in their efforts being poorly rewarded. This illustrates how social identity- that is a product of history, culture and personal experience of discrimination- can create a pronounced economic disadvantage for a group through its effect on individual's expectations and provides an explanation for the persistence of historical inequalities across social groups (Hoff and Pandey, 2004).

A paper by Hanna and Linden (2009) finds that when marking exam papers, teachers give those answers assigned to be of lower caste students, lower scores than similar answers that are assigned to be of higher caste students. Interestingly, and contrary to previous literature that funds individual discrimination in favour of members of their own group, they find that discrimination against the lower castes is mainly driven by low caste teachers, while teachers who belong to higher castes do not appear to discriminate at all.

Borooah and Iyer (2005) find that the size of the community and caste effect depends on the non-community circumstances in which children are placed. Under favourable circumstances (e.g. when parents are well educated), the size of the community effect is negligible whereas under less favourable circumstances the size of this community effect is considerable.

3 DATA

We examine a unique dataset (SchoolTELLS) that contains information on 160 rural primary schools in two of the most educationally disadvantaged states in India, Uttar Pradesh and Bihar. The pilot study was first conducted in Bihar and consequently a full survey carried out from July 2007 to April 2008 covering 11 districts in Uttar Pradesh and 6 districts in Bihar. Information was collected at the child, household, teacher, school and village levels allowing for several levels of fixed effects analysis. The pupil questionnaire captures information on the child's personal characteristics such as age, gender, recent illness, anthropometric indicators etc. Information was also collected at the family level on various household characteristics. These included information such as parental education, household assets, religion, and caste amongst others. The teacher questionnaire includes information on a range of teacher characteristics such as education, experience, rates of absence, gender, religion and caste. Table 1 describes the variables to be used in the analysis of this paper.

At the school level four visits were made to each school during the 2007-08 school year, and the children were tested on the first and last visits, approximately 9 months apart. The tests were administered to children in grade 2 and in grade 4. These tests were developed by Rukmini Banerji of *Pratham*, a large educational NGO in India, though the tools tested a much wider range of competencies than those tested for Pratham's Annual Status of Education Report (ASER). The tests conducted included writing, reading and maths. Language scores were marked out of 241 and maths

out of 173. The marks were then normalized with respect to mean mark (converted into z-scores) and used as the key variable of interest in examining the research question.

The data allow student test scores in different subjects to be matched to the data on the teachers who teach those subjects. Within – pupil (across subject) variation can therefore be used to examine whether the characteristics of different subject teachers are related to a student's marks across subjects. Since we have test score data, the analysis presented here is in relation to the actual differences in attainment, as opposed to differences in attainment as perceived by teachers (which are found in many studies) because this subjective data can be more prone to measurement error bias. However, the subjective views of the teachers are available and these will be examined to try to gain an understanding of some of the explanations behind the findings. Binary variables to indicate whether the teacher's religion, gender and caste match that of the student were also created. These are the key independent variables of interest. A match variable methodology is used, in line with Dee (2005), instead of using an interaction effect as used in Dolton and Ammermuller (2006), as this is a more correct specification of the question of interest, namely whether having a teacher who is the same gender, religion and/or caste matters. For example, as gender, caste and religion are binary variables; in the case of both teacher and student having 0 in these cells the resulting interaction variable would be 0 whereas the match variable would correctly be 1 indicating that the student and teacher match in that characteristic.

4 ECONOMETRIC IDENTIFICATION AND ESTIMATION

Firstly the analysis within this paper assumes that teacher gender, caste and religion are exogenous and that within a specific school and a specific subject, student-teacher assignment is random therefore we initially use a simple Ordinary Least Squares Regression analysis. Estimation of the impact of various factors on student learning is however confounded by the fact that there are several unobservable characteristics, not only at the pupil but also at the household and school levels. These are shown in Table (2). In order to control for these school and individual level characteristics we then use the more sophisticated statistical techniques of school and pupil fixed effects models. Teacher labour market sorting (e.g. where teachers with better qualifications work in schools serving more advantaged students) and parental efforts to secure better resources for their children also confound efforts to estimate the relationship between teachers and student outcomes and may mean that OLS results are biased (Clotfelter, Ladd and Vigdor, 2006). In addition there may also be within- school sorting of teachers to more or less able children by the fact that different teachers are assigned to teach different classes. If this happens then school fixed effects models, in which estimation of effects relies entirely on within-school variation, are also not adequate. The fact that children in rural India usually attend the closest, and usually the only available school in the area and that within that school there is only one grade 2 class and one grade 4 class, suggests that school level fixed effects models are adequate and address most concerns regarding selection bias. The richness of our dataset however allows an even more stringent model namely pupil fixed effects (differencing the achievement of the same student across two subjects). This model deals with many of the issues that might have arisen from any non-random teacher student matching, as well as capturing the influences of past school and teacher characteristics on current achievement. It also helps to address the problem of non-random

attrition of students/teachers which is an issue for studies that use panel data methods across time. Gender, caste and religious differences in teacher quality also do not confound our results as we have included control variables to account for teachers' gender, caste and religion.

The analysis follows that of Kingdon (2006).For the OLS model a standard educational production function is used whereby:

$$A_{ik} = \alpha + \beta X_{ik} + \delta S_k + \mu_i + \eta_k \qquad (1)$$

Where the achievement of the ith student in the kth school is determined by a vector of his or her individual characteristics (X) and a vector of school and teacher characteristics (S). The unobservables at the school level are captured in η and the unobservables at the individual level are captured in μ. This provides an across school estimation of student achievement.

Then fixed effects analysis is used at the school and student levels. Individual student level fixed effects analysis is possible as data are available from which one can match the student's test score in a given subject with the characteristics of the teacher who teaches that subject. One can then estimate a within student across subject equation of achievement using the following specifications:

$$A_{ijk} = \alpha + \beta X_{ijk} + \gamma T_{jk} + \delta S_k + (\mu_{ij} + \varepsilon_{jk} + \eta_{jk}) \quad (2)$$

A_{ijk} is the achievement of the ith student in the jth subject in the kth school. X is a vector of individual characteristics of the ith student, T is a vector of teacher characteristics for the jth subject and S is a vector of characteristics for the kth school. The brackets represent the composite error term representing the unobserved pupil, teacher and school characteristics. Therefore the student fixed effects model for the two subjects within the data would be:

$$(A_{i2k} - A_{i1k}) = \beta (T_{2k} - T_{1k}) + \{(\mu_{i2} - \mu_{i1}) + (\varepsilon_{k2} - \varepsilon_{k1}) + (\eta_{k2} - \eta_{k1})\} \qquad (3)$$

If school and pupil unobservables are not subject-specific then:

$$(Ai_2 - Ai_1) = \beta (T_2 - T_1) + (\varepsilon_2 - \varepsilon_1) \qquad (4)$$

Regressing the difference in a pupil's test score across subjects on the difference in characteristics of the teachers across those subjects we are able to control for the effects of subject-invariant student unobservables that may affect achievement. However although the pupil fixed effects approach has its advantages there are also some drawbacks. One of these would be the fact the while this approach takes out all subject-invariant aspects of pupil unobserved characteristics, and while many believe that those who excel in one subject also do well in others (i.e. ability is person specific, not subject-specific), some aspects of pupil and school unobservables may be subject specific and they will remain in the error term (Kingdon, 2006). In addition to this, there also may be differences between the teachers in their unobservable characteristics which may be correlated with both student achievement as well as with the included teacher characteristics. This limits the extent to which we can attribute causality to the effect of teacher characteristics. For example, if teacher motivation, commitment or effort are systematically correlated with both student achievement and with teacher's gender (or caste, or religion), then the coefficients on these teacher characteristics cannot be presumed to represent the

causal effect of these characteristics on student achievement. However, for this to be the case, it must be that male teachers are systematically different to female teachers in terms of their unobserved characteristics (such as effort, motivation or commitment towards teaching), or that Muslim teachers are systematically different to Hindu teachers in terms of such characteristics, which seems somewhat implausible.

5 RESULTS

5.1 Descriptive Statistics

The descriptive statistics of the variables used in the analysis are shown in Table 3. The children in Grades 2 and 4 were tested in two subjects, mathematics and language. 53% of the children are male (which is not far from the sex-ratio in the child population in these backward northern states of India). Mother's education is very important for children's educational outcomes (especially for female children) and father's education is important to both boys' and girls' schooling (Kingdon, 2002). On average sample mothers had 1.79 years of education and the fathers 5.28 years of education. 23.7% of the children are from the schedule caste and 8% are from Muslim families. An asset-ownership index is also created to proxy for the wealth of the family. Wealth gaps in educational outcomes are large in many developing countries and in some, gender gaps are also of immense concern. In certain countries with female disadvantage in education, such as India, household wealth interacts with gender to create as especially large gender gap among the poor and therefore it is essential to consider wealth and gender simultaneously. In addition to this it is also important to control for the economic status of children as research has shown that teachers view poor children as weaker academically and have lesser expectations for their academic achievement and futures (McLoyd, 1998). Compared with high caste families, low caste individuals are less likely to have educated parents and have lower levels of wealth. A low caste individual may be viewed differently and behave differently if the education and wealth of his family rise, thereby freeing them from social subordination. By including variables to account for both parental education and wealth we are able to distinguish the caste effect from the class effect. Research has shown links between teacher absence and student performance and that schools located in more remote rural areas suffer from higher levels of teacher absence (Kremer *et al*, 2005). Therefore we also control for teacher absence by including a teacher absence rate variable. The majority of the teachers are male (57.48%). 22% of the teachers are from the schedule caste and 6% are Muslim. 53% of the children are with teachers of the same gender, 69% with teachers of the same religion and 63% with teachers of the same caste.

Table 4 shows how the teachers from each gender, religion and caste differ in relation to certain key characteristics. From this table it can be seen that in within our data set more male teachers have Bachelors' and Masters' Degrees however more female teachers have graduated with a first division pass. More female teachers have teacher training and more are para-teachers. They also display a lower teacher absence rate than male teachers. General caste teachers are more likely than schedule caste teachers to have graduated with a first division degree, they are also more likely to have had teacher training. However they display higher rates of absenteeism. Muslim teachers demonstrate

higher rates of absenteeism than their Hindu counterparts. A higher percentage of Muslim teachers are para-teachers. Therefore, in light of these differences, it is essential for our analysis to control for these variables when examining whether having a teacher of the same gender, religion and caste affects student outcomes.

5.2 Ordinary Least Squares Analysis

The results of the initial analysis (Table 5) show that male children perform better than female children by 0.185 SD, a large effect but one that is in line with the existing literature on gender gaps in educational outcomes in India. Mother's and father's education levels also affect children's outcomes with each year of mother's education improving student outcomes by 0.0245 standard deviations, after controlling for father's education (i.e. comparing children whose fathers have the same level of schooling).

In line with Hoff and Pandey (Hoff and Pandey, 2004) our evidence also suggests that the effect of caste is not an artefact of class difference between the castes since caste has a significant association with student outcomes even after controlling for parental education, household assets and other aspects of the individual's background. We find that children from lower caste families perform 0.0899 SD worse than their general caste peers. Other research results have also shown that lower caste children score worse (by 0.41 SD) than higher caste children (Hanna and Linden, 2009). Children from Muslim families perform 0.114 SD better than those of the Hindu religion and children from households with higher asset levels also perform better.

As one would expect, higher teacher absence rates have a negative relationship with student performance and in line with previous research (Goyal and Pandey, 2009; Kingdon, Banerji and Chaudhari, 2008; Muralidharan and Sundararaman, 2008) students taught by para-teachers perform better than those taught by regular teachers.

Turning to the variables of most interest for this paper, our results show that learning from a teacher of the opposite gender reduces student performance (by 0.0587 SD). This is similar to the findings in Dee (2006) where learning from a teacher of the opposite gender has a detrimental effect on student achievement and engagement. He estimates that test scores are reduced for both boys and girls by approximately 4% of a standard deviation and that the effects are even larger for other measures of student engagement (Dee, 2006).

Ordinary Least Squares analysis results can give biased estimates in many respects. The error term in the ordinary least squares analysis contains both teacher as well as student unobservables. Student unobservables may be correlated with student attainment and/or correlated with teacher observable characteristics (e.g. by the force of parents seeking out more desirable schools/teachers to maximise the quality of their children's education). Teacher unobservables may also be correlated with student attainment and/ or with teacher's own observable characteristics (e.g. teacher labour market sorting whereby certain teachers seek to find more amenable working conditions). This positive matching of students to teachers may mean that higher achieving students are being taught by better credential teachers thereby leading us to overestimate the effects of teacher credentials on student outcomes or

vice versa. One way to deal with this endogenous selection of children to certain schools is through schools fixed effects analysis. In addition to this the systematic social differences between schools and students also result in the need for more rigorous methods of investigation.

5.3 School Fixed Effects

The results of the school fixed effects model are shown in Table 6. The results demonstrate that male teachers and those from the schedule caste and schedule tribe are negatively associated with student performance. Teachers who have Bachelors' and Masters' degree have a positive association with student scores as do para teachers. As one would expect the teacher absence rate has a large and significant negative effect on student outcomes. An increase in teacher absence from 1SD below the mean to 1 SD above the mean is associated with a reduction in student performance of 0.086 SD.

The climate in some schools may assist in challenging the traditional gender and social stereotypes. Schools impart skills as well as an ideology and this in turn will affect how and which students learn more. For example schools may be supposedly masculinised because the teaching staff is predominantly male and this could result in the practise and delivery of the curriculum, management strategies and teaching expectations favouring male students (Skelton, 2002). Student outcomes could also be affected by the social norms within a school and whether these are in line with the socio-economic norms with which the child has grown up. This is especially important because for any individual student, he/she is either part of a large majority or small minority (as far as caste and religion are concerned) due to high levels of segregation of school children in relation to caste and religion. In addition to this if students and teachers sort into particular schools on the basis of their unobserved characteristics which are correlated with both the included student and teacher variables and with the dependent variable (student test scores), then the coefficients on the included variables will be biased. The school level fixed effects model eliminates any bias associated with such across school sorting; since identification in this model comes entirely from within-school variation.

The results of this analysis show that the gender, religion and caste match variables are all statistically significant. Children who are taught by teachers of the same gender as themselves perform 0.0381 SD better than those taught by teachers of the opposite gender. As regards religion, if a child is taught by a teacher of the same religion his/her performance is expected to be 0.0605 SD better than one taught by a teacher of a different religion. Children taught by teachers of the same caste as themselves perform 0.0262 SD better than those taught by a teacher of a different caste to themselves.

5.4 Pupil Fixed Effects

Even within-school analysis can result in biased estimates due to both pupil and teacher unobservables remaining in the error term. A pupil fixed effects model improves on this by removing the effect of subject invariant pupil unobservables and is therefore the most stringent model in this paper. However, it must be noted that teacher unobservables still remain in the error term. The pupil fixed effects model here relates a student's difference in marks between two subjects to the difference in the characteristics

of the teachers that teach the two subjects. The main variables of interest, again, are the binary variables indicating whether or not the gender, caste and religion of the pupil and the teacher are the same. Specifically, the difference in a student's mark across Maths and Hindi is regressed on the difference between the two gender match variables. Similarly this is also done for the caste and religion match variables. Within this model, pupil unobservables are not correlated to included teacher variables such as teacher's caste, religion or gender. This would be a problem if, for example, a child who was more motivated could engineer being in a class with a teacher of certain characteristics for a particular subject. Within this data there is only one class for Grade 2 and only one class for Grade 4; in addition to this, for each subject, the entire class is taught together by one teacher. Therefore our most stringent pupil fixed effects model can be argued to yield causal effect.

From these results (Table 7), we can see that social and demographic distance between student and teacher matters significantly. Children taught by teachers of the same gender perform 0.0361 SD better than those who are taught by a teacher who is of a different gender. Having a teacher of the same religion improves performance by 0.168 SD. For caste, having a teacher of the same caste improves results by 0.0389 SD. A student's achievement in a subject that is taught by a teacher who is of the same religion, caste and gender as the student is about a quarter of a standard deviation higher than his/her achievement in a subject that is taught by a teacher whose demographic characteristics do not match that of the teacher. This assumes that the effects of the demographic match variables are additive and separable. Analysis was also conducted including interaction effects (between pairs of the match variables as well as for all three match variables together) and these were found to be insignificant thereby confirming the validity of this assumption.

In examining the reasons why demographic distance between teacher and student matters one can look into our rich data set for further explanations as to whether role model effects or discrimination explain why having a similar teacher improves student outcomes. One might argue that the children in the dataset are quite young and may not be aware of their own or their teacher's caste for role modelling or perceived discrimination to be relevant. However, if these children see their parents behave in a particular way towards a teacher these attitudes and/or reactions may also be reflected in their own behaviour and beliefs even if they do not know that it is due to caste differences/similarities. In seeking to explain our findings, we used the fact that the SchoolTELLS survey collected information on teachers' opinions about the level of intelligence and 'interest in studies' of male and female children and of general caste and schedule caste/tribe children. Each teacher was asked the extent to which she/he agreed with given statements, e.g. such as that "SC/ST children are less intelligent than general caste children". We examined the responses of teachers to such questions, by teacher's own gender and caste. If teachers' attitudes about children of the opposite gender (or caste/religion) are less favourable than their attitudes towards children of their own gender (or caste/religion), this provides an important mechanism through which demographic distance from the teacher would lower student achievement. As Table 8 shows, general caste teachers have significantly more negative attitudes (than SC/ST teachers) towards schedule caste and schedule tribe children. This provides support for the argument that being taught by a general caste teacher is more disadvantageous for a schedule caste child due to discrimination and stereotyping mentioned in the literature review previously. This also applies for male teachers and their views on the perceived differences in abilities between boys and girls, especially as regards mathematics. It should also be noted that this table only reflects explicit

stereotype endorsement as opposed to implicit stereotype endorsement. Implicit stereotyping is different from self-reported stereotyping in that people may not be aware of it, may not endorse it or may not wish to reveal that they do endorse it. However, previous research (Nosek *et al*, 2009) has shown that implicit stereotype endorsement also influences choices and behaviour and that, for example, gender-science stereotyping (i.e. relating good performance in Maths and Science to males and Liberal Arts to females) is strongly related to differences in student performance in those subjects. Hence the negative impact of stereotyping may be underestimated in our analysis as we do not have implicit association testing within our data and are therefore only able to account for explicit stereotype endorsement.

5.5 Analysis separately by subject

Addressing subject specific gaps in outcomes stems from the concern regarding the dearth of certain types of students and faculty members in certain subject areas as well as examining the findings of previous research that has shown that males and females perform differently across subjects with girls tending to perform better in reading and boys in mathematics (Freeman, 2004; NAEP, 2004; PISA, 2003). In addition to this, previous research in India has shown that teachers can be differentially effective across subject areas. Kingdon (2006) finds that the effect of teacher's gender differs greatly by subject with female teachers promoting learning in the languages and humanities but being detrimental to learning in the maths and science arena. She also finds that while boys' achievement is only weakly negatively affected by having a female teacher, girls benefit significantly from having a female teacher. One would expect results to differ across subjects with regards to religion as most Muslim families speak Urdu not Hindi as a first language in the home.

Table 9 shows the results separated by subject. The equation uses the school fixed effects estimator since in our approach pupil fixed effects is unavailable when we fit an achievement equation for any one subject. Table 9 shows that demographic distance between the teacher and the taught matters only for Maths learning and not for language learning. This may be due to the fact that language learning tends to be more reliant on rote learning and therefore perhaps less prone to the disadvantages of discriminatory behaviour on the part of the teacher than is maths learning (which is more teacher-intensive). While the caste match variable has a point estimate that is similar to that found in Tables 7, its t-value here is 1.62, i.e. it is only weakly significant (at the 11% level of significance) in the Maths achievement equation.

6 CONCLUSION

We test the hypothesis of whether or not assignment to a demographically similar teacher influences student performance. We find that even our most stringent pupil fixed effects model shows that having a teacher who is demographically similar to you significantly improves student performance. Our across-subject pupil fixed effects analysis shows that having a teacher who is the same gender as the student improves performance by 0.0361 SD, having a teacher who is the same religion as the student improves student test scores by 0.168 SD and that sharing the same caste as the teacher enhances student test scores by 0.0389 SD. If these effects are additive, we can say that a student's achievement

in a subject in which the teacher shares the same gender, caste and religion as the child is, on average, nearly a quarter of a SD higher than the same student's achievement in a subject taught by a teacher who does not share the child's gender, caste or religion. These large demographic effects clearly have important policy implications.

There have been two primary objectives of the Government of India's educations policies. The first of these is to increase school attainment and secondly to reduce schooling gaps, particularly those based on gender and caste (Kochar, 2008). This research may help guide policy initiatives to provide opportunities for members of those groups that have suffered discrimination in the past. One such policy concern is the underrepresentation of minority teachers and providing a more balanced representation of society for all students. A wide range of factors have been linked to discrimination, oppression and barriers in society and in the classroom (Butler and Christensen, 2003). Previous research has examined factors thought to contribute to this based on race, class, gender, ethnicity and religion. The notion that classroom dynamics between teachers and students make a substantive contribution to the demographic gaps in achievement has wide currency and there is also now a growing literature that demographic interactions between students and teachers also matter (Dee, 2005). This paper aims to follow on from this research. From a policy perspective, in addition to the moral and practical concerns relating to segregating teachers and students, even just recruiting teachers due to their caste, gender and/or religion does not provide a guarantee that these recruits will possess the necessary aptitudes and dispositions need to develop and sustain an effective learning environment (Carrington, Merrell and Tymms, 2005) and therefore the policy goal should focus on recruiting effective, high quality teachers whatever their demographic characteristics, whilst at the same time recognising the need to make teaching a more inclusive profession. Our indications of some discrimination by teachers mean that this research would also recommend implementing policies that promote demographic neutrality of teachers and training aimed at reducing discriminatory practises and preconceptions in the classroom. In addition to this, close examination of learning materials is also required to ensure the impartiality of all schooling resources.

Finally one must note that the ultimate outcome of social interest may not necessarily be student test scores but perhaps a broader set of life chances (Clotfelter, Ladd and Vigdor, 2006). It is also important to examine issues of access to schooling e.g. does increasing the proportion of female teachers improve girls' enrolment rates? Further to this, even if all groups of society start out on a similar footing, how do they progress though school (repetition, dropout rates etc.) and do the characteristics of the teachers by whom they are taught matter? The evolution of gender, social and ethnic gaps at various stages of education mean that it would also be interesting to investigate this issue for secondary school children in order to learn whether gaps in educational achievement are narrowing or widening as children progress through the different stages of the schooling system. Furthermore, as mentioned previously, research on contract teachers in India (Atherton and Kingdon, 2010; Goyal and Pandey, 2009; Muralidharan and Sundararaman, 2008) has shown that students taught by para-teachers have higher achievement than those taught by regular teachers who are four or more times better paid. This suggests that economic distance between the teacher and the taught could also be related to student learning. Despite having data on the children's home asset ownership, our model could not verify whether economic distance matters due to a lack of appropriate data on teacher's wealth levels. This would be an informative area for further research.

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8 TABLES

Table 1: Description of variables

Variable	Definition
Total Marks	Total Achievement Score for both Maths and Language
Class	Grade 2 or Grade 4
Maths	Maths or Language
Bihar	Bihar or Uttar Pradesh
Survey Number	Visit 1,2,3 or 4
Age of Child	Child's age in years
Male Child	Child's gender
Ln Weight	Log weight of child
Ln Weight Miss	Weight of child missing
Child Height	Height of child in cm
Ill Last 3 months	Has the child been ill in the last three months
Mother's Education	Mother's years of education
Mother's Education Missing	Mother's Education Missing
Father's Education	Father's years of education
Father's Education Missing	Father's Education Missing
Child SCST	Child Schedule Caste or Schedule Tribe
Child Muslim	Child religion Muslim
Assets	Asset index built from individual assets owned (or not owned) by the household e.g. bicycle, tape recorder, fridge, radio etc. out of a total of 22 listed assets
Log Assets	Log of Assets variable
Log Assets Missing	Log of Assets Missing
Age of Teacher	Age of teacher in years
Male Teacher	Gender of teacher
Teacher SCST	Teacher Schedule Caste or Schedule Tribe
Teacher Muslim	Teacher religion Muslim
BA	Does the teacher have a Bachelor’s Degree
MA	Does the teacher have a Master’s Degree
First Division	Did teacher obtain a First Division Pass
Teacher Training	Has the teacher had teacher training
Para teacher	Is the teacher a para teacher
Teacher Absence Rate	Percentage of time teacher absent out of the four visits
Private School	Private or Government school
Gender Match	Child and teacher's gender is the same
Religion Match	Child and teacher's religion is the same
Caste Match	Child and teacher's caste is the same

Table 2: Examples of Unobserved Characteristics

	Examples of Unobserved Characteristics
Student Level	Genetic endowment Innate ability Levels of Motivation Ability to concentrate
Family Level	Household Intellectual Atmosphere Parental involvement Household Income Nutritional Inputs Cultural or Religious attitude to education
School Level	Effectiveness of school management School ethos and atmosphere School Intellectual Environment
Teacher Level	Innate teaching ability Levels of motivation

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Marks	17594	102.7358	100.0279	0	414
Class	17839	2.920792	0.996886	2	4
Maths	17839	1.505522	0.4999835	1	2
Survey Number	17839	2.428443	1.498334	1	4
Age of Child	17795	8.93043	1.673466	4	15
Male Child	17763	0.5353825	0.4987605	0	1
Ln Weight	17839	9.860329	1.108091	0	10.83565
Ln Weight Miss	17839	0.0119962	0.1088712	0	1
Child Height	17748	124.4474	10.89291	90	190
Ill Last 3 months	16938	0.4259062	0.4944942	0	1
Mother's Education	17839	1.366556	3.010615	0	15
Mother's Education Missing	17839	0.2058411	0.4043263	0	1
Father's Education	17839	4.039184	4.675342	0	15
Father's Education Missing	17839	0.2233309	0.41649	0	1
Child SCST	17839	0.2365603	0.424982	0	1
Child Muslim	17839	0.0833567	0.2764284	0	1
Log Assets	17839	1.214868	1.008509	0	3.7612
Log Assets Missing	17839	0.1674982	0.3734305	0	1
Age of Teacher	17839	32.13762	10.32102	17	62
Male Teacher	17839	0.5780593	0.493883	0	1
Teacher SCST	17839	0.2189024	0.4135139	0	1
Teacher Muslim	17839	0.0635125	0.2438894	0	1
BA	17839	0.3449184	0.475355	0	1
MA	17839	0.1802231	0.3843839	0	1
First Division	17839	0.2917204	0.454567	0	1
Teacher Training	17839	0.4601715	0.4984251	0	1
Para teacher	17839	0.6376479	0.4806933	0	1
Teacher Absence Rate	17839	0.1525263	0.1883127	0	1
Private School	17839	0.1137396	0.3175036	0	1
Gender Match	17839	0.5300185	0.4991121	0	1
Religion Match	17839	0.7347385	0.4414847	0	1
Caste Match	17839	0.6733561	0.4689989	0	1

Table 4 Teacher characteristics by gender, caste and religion

TEACHER		Male	Female	t stat of diff	General Caste	SC/ST	t stat of diff	Hindu	Muslim	t stat of diff
BA	Mean	0.380	0.297	-12.103	0.341	0.355	-1.681	0.355	0.195	11.383
	SD	0.486	0.457		0.474	0.479		0.478	0.396	
MA	Mean	0.202	0.148	-9.645	0.185	0.159	3.800	0.174	0.249	-6.600
	SD	0.402	0.355		0.388	0.366		0.379	0.433	
First Division	Mean	0.246	0.348	15.386	0.321	0.181	17.673	0.289	0.302	-0.921
	SD	0.431	0.476		0.467	0.385		0.453	0.459	
Teacher Training	Mean	0.438	0.496	7.912	0.485	0.383	11.757	0.471	0.346	8.492
	SD	0.496	0.500		0.500	0.486		0.499	0.476	
Para Teacher	Mean	0.603	0.686	11.940	0.617	0.715	-11.653	0.634	0.705	-4.994
	SD	0.489	0.464		0.486	0.452		0.482	0.456	
Teacher Absence Rate	Mean	0.159	0.144	-5.266	0.161	0.123	11.625	0.149	0.195	-8.226
	SD	0.192	0.182		0.198	0.144		0.184	0.229	

Note: Reported t-values are from a t-test of mean comparison between two groups, e.g. in the fourth column, they show whether the difference between male and female teachers in the mean of a given characteristic is statistically significant.

Table 5: Ordinary Least Squares Analysis

VARIABLES	zscore	zscore	zscore	zscore
Class	0.340***	0.341***	0.341***	0.340***
	(0.025)	(0.025)	(0.025)	(0.025)
Maths	-0.0776***	-0.0771***	-0.0770***	-0.0777***
	(0.018)	(0.018)	(0.018)	(0.018)
Survey Number	0.0866***	0.0867***	0.0867***	0.0866***
	(0.006)	(0.006)	(0.006)	(0.006)
Bihar	0.570***	0.572***	0.573***	0.570***
	(0.049)	(0.049)	(0.049)	(0.049)
Age of Child	0.0201**	0.0199**	0.0198**	0.0202**
	(0.010)	(0.010)	(0.010)	(0.010)
Male Child	0.185***	0.193***	0.193***	0.185***
	(0.026)	(0.026)	(0.026)	(0.026)
Ln Weight	0.143	0.136	0.136	0.142
	(0.102)	(0.101)	(0.101)	(0.101)
Ln Weight Missing	1.505	1.427	1.425	1.493
	(1.051)	(1.044)	(1.041)	(1.047)
Child Height	0.00704***	0.00709***	0.00709***	0.00704***
	(0.002)	(0.002)	(0.002)	(0.002)
Ill last 3 months	-0.0678***	-0.0671***	-0.0668***	-0.0677***
	(0.019)	(0.019)	(0.019)	(0.019)
Mother's Education	0.0246***	0.0245***	0.0245***	0.0245***
	(0.004)	(0.004)	(0.004)	(0.004)
Mother's Education Missing	0.0583	0.0600	0.0579	0.0602
	(0.048)	(0.049)	(0.048)	(0.049)
Father's Education	0.0152***	0.0152***	0.0152***	0.0152***
	(0.003)	(0.003)	(0.003)	(0.003)
Father's Education Missing	0.0767	0.0774	0.0764	0.0790
	(0.050)	(0.051)	(0.050)	(0.050)
Child SCST	-0.0811**	-0.0818**	-0.0889***	-0.0899***
	(0.034)	(0.034)	(0.031)	(0.031)
Child Muslim	0.105**	0.117**	0.107**	0.114**
	(0.049)	(0.056)	(0.049)	(0.055)
Log Assets	0.0718***	0.0719***	0.0723***	0.0718***
	(0.015)	(0.015)	(0.015)	(0.015)
Log Assets Missing	0.0437	0.0513	0.0443	0.0516
	(0.057)	(0.060)	(0.057)	(0.060)
Age of Teacher	-0.0001	0.0000	0.0000	-0.0001
	(0.003)	(0.003)	(0.003)	(0.003)
Male Teacher	-0.0377	-0.0354	-0.0347	-0.0376
	(0.040)	(0.040)	(0.040)	(0.040)
Teacher SCST	-0.0124	-0.0116	-0.0190	-0.0196
	(0.046)	(0.046)	(0.048)	(0.048)
Teacher Muslim	0.0544	0.0576	0.0516	0.0622
	(0.068)	(0.069)	(0.069)	(0.069)
BA	0.00620	0.0067	0.0067	0.0061
	(0.043)	(0.043)	(0.043)	(0.043)
MA	-0.0039	-0.0033	-0.0032	-0.0041
	(0.048)	(0.048)	(0.048)	(0.048)
First Division	0.0002	0.0003	0.0000	0.0002
	(0.038)	(0.038)	(0.038)	(0.038)

Teacher Training	-0.0365	-0.0356	-0.0360	-0.0363
	(0.043)	(0.043)	(0.043)	(0.043)
Para Teacher	0.0162	0.0175	0.0181	0.0170
	(0.058)	(0.058)	(0.058)	(0.058)
Teacher Absence Rate	-0.0943	-0.0951	-0.0950	-0.0944
	(0.093)	(0.094)	(0.094)	(0.093)
Private School	0.709***	0.714***	0.715***	0.710***
	(0.108)	(0.108)	(0.107)	(0.108)
Gender Match	0.0586**			0.0587**
	(0.024)			(0.024)
Religion Match		0.0124		0.0145
		(0.047)		(0.047)
Caste Match			-0.0158	-0.0167
			(0.028)	(0.029)
Constant	-4.201***	-4.133***	-4.106***	-4.190***
	(0.864)	(0.861)	(0.853)	(0.859)
Observations	16740	16740	16740	16740
R-squared	0.398	0.397	0.397	0.398

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: School Fixed Effects Analysis

VARIABLES	zscore	zscore	zscore	zscore
Class	0.384***	0.385***	0.384***	0.384***
	(0.008)	(0.008)	(0.008)	(0.008)
Maths	-0.0849***	-0.0849***	-0.0846***	-0.0856***
	(0.011)	(0.011)	(0.011)	(0.011)
Survey Number	0.0915***	0.0918***	0.0916***	0.0917***
	(0.004)	(0.004)	(0.004)	(0.004)
Age of Child	0.0263***	0.0265***	0.0263***	0.0267***
	(0.005)	(0.005)	(0.005)	(0.005)
Male Child	0.192***	0.197***	0.198***	0.193***
	(0.012)	(0.012)	(0.012)	(0.012)
Ln Weight	0.0929*	0.0855	0.0903*	0.0897*
	(0.054)	(0.054)	(0.054)	(0.054)
Ln Weight Missing	0.963*	0.889	0.935*	0.934*
	(0.548)	(0.548)	(0.548)	(0.548)
Child Height	0.0039***	0.0039***	0.0039***	0.0039***
	(0.001)	(0.001)	(0.001)	(0.001)
Ill last 3 months	-0.0634***	-0.0637***	-0.0630***	-0.0642***
	(0.012)	(0.012)	(0.012)	(0.012)
Mother's Education	0.0212***	0.0210***	0.0212***	0.0211***
	(0.002)	(0.002)	(0.002)	(0.002)
Mother's Education Missing	0.0524**	0.0611**	0.0525**	0.0613**
	(0.026)	(0.026)	(0.026)	(0.026)
Father's Education	0.0161***	0.0161***	0.0161***	0.0161***
	(0.002)	(0.002)	(0.002)	(0.002)
Father's Education Missing	0.0839***	0.0901***	0.0822***	0.0901***
	(0.025)	(0.025)	(0.025)	(0.025)
Child SCST	-0.108***	-0.111***	-0.0940***	-0.0974***
	(0.015)	(0.015)	(0.017)	(0.017)
Child Muslim	0.0998***	0.144***	0.102***	0.143***
	(0.024)	(0.030)	(0.024)	(0.030)
Log Assets	0.0461***	0.0457***	0.0463***	0.0450***
	(0.007)	(0.007)	(0.007)	(0.007)
Log Assets Missing	-0.0069	0.0290	-0.0055	0.0272
	(0.026)	(0.030)	(0.026)	(0.030)
Age of Teacher	0.0026**	0.0027**	0.0027**	0.0026**
	(0.001)	(0.001)	(0.001)	(0.001)
Male Teacher	-0.0596***	-0.0585***	-0.0589***	-0.0610***
	(0.018)	(0.018)	(0.018)	(0.018)
SCST	-0.0737***	-0.0739***	-0.0602**	-0.0613***
	(0.022)	(0.022)	(0.024)	(0.024)
Muslim	0.0695**	0.0999***	0.0647*	0.0999***
	(0.035)	(0.037)	(0.035)	(0.037)
BA	0.0617***	0.0632***	0.0627***	0.0643***
	(0.019)	(0.019)	(0.019)	(0.019)
MA	0.130***	0.133***	0.131***	0.131***
	(0.023)	(0.023)	(0.023)	(0.023)
First Division	-0.0321*	-0.0326*	-0.0313*	-0.0325*
	(0.019)	(0.019)	(0.019)	(0.019)
Teacher Training	-0.147***	-0.149***	-0.148***	-0.148***
	(0.022)	(0.022)	(0.022)	(0.022)
Para Teacher	0.112***	0.113***	0.111***	0.110***

	(0.025)	(0.025)	(0.025)	(0.025)
Teacher Absence Rate	-0.214***	-0.213***	-0.213***	-0.214***
	(0.042)	(0.042)	(0.042)	(0.042)
Gender Match	0.0383***			0.0381***
	(0.012)			(0.012)
Religion Match		0.0627**		0.0605**
		(0.025)		(0.025)
Caste Match			0.0285*	0.0262*
			(0.016)	(0.016)
Constant	-3.212***	-3.193***	-3.201***	-3.262***
	(0.439)	(0.439)	(0.440)	(0.440)
Observations	16740	16740	16740	16740
R-squared	0.306	0.306	0.306	0.307
Number of schoolid	158	158	158	158

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Pupil Fixed Effects Analysis

VARIABLES	zscore	zscore	zscore	zscore
Maths	-0.0765***	-0.0764***	-0.0763***	-0.0770***
	(0.007)	(0.007)	(0.007)	(0.007)
Survey Number	0.0921***	0.0922***	0.0922***	0.0921***
	(0.002)	(0.002)	(0.002)	(0.002)
Age of Teacher	-0.0003	0.0004	-0.0001	0.0002
	(0.001)	(0.001)	(0.001)	(0.001)
Male Teacher	-0.0369**	-0.0434**	-0.0379**	-0.0454**
	(0.018)	(0.018)	(0.018)	(0.018)
Teacher SCST	-0.122***	-0.124***	-0.0943***	-0.103***
	(0.022)	(0.022)	(0.025)	(0.025)
Teacher Muslim	0.104***	0.157***	0.102***	0.154***
	(0.032)	(0.034)	(0.032)	(0.034)
BA	0.0488***	0.0654***	0.0500***	0.0653***
	(0.017)	(0.017)	(0.017)	(0.017)
MA	-0.0507**	-0.0437**	-0.0535**	-0.0476**
	(0.022)	(0.022)	(0.022)	(0.022)
First Division	0.0345**	0.0367**	0.0354**	0.0373***
	(0.014)	(0.014)	(0.014)	(0.014)
Teacher Training	-0.0397**	-0.0484**	-0.0390*	-0.0478**
	(0.020)	(0.020)	(0.020)	(0.020)
Para Teacher	-0.0198	-0.0125	-0.0224	-0.0164
	(0.021)	(0.021)	(0.021)	(0.021)
Teacher Absence Rate	-0.0723**	-0.0892**	-0.0672*	-0.0836**
	(0.035)	(0.035)	(0.035)	(0.035)
Gender Match	0.0382***			0.0361**
	(0.015)			(0.015)
Religion Match		0.173***		0.168***
		(0.031)		(0.031)
Caste Match			0.0484**	0.0389*
			(0.023)	(0.023)
Constant	-0.0854**	-0.218***	-0.108**	-0.254***
	(0.043)	(0.050)	(0.046)	(0.053)
Observations	17839	17839	17839	17839
R-squared	0.139	0.140	0.138	0.141
Number of Children	5028	5028	5028	5028

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Teachers' opinions about ability/motivation of SC/ST and male children, by teacher's caste and gender

Agrees to some degree that:	Teacher caste/gender		T stat of diff
	General caste	SC/ST	
'SC/ST children less motivated'	76.38	59.79	21.551
'SC/ST children less intelligent'	59.78	37.30	26.288
	Female teacher	Male teacher	
'Boys more enthusiastic about studies'	48.85	59.22	-16.690
'Boys are more capable in maths'	74.60	76.63	-3.207

Note: Reported t-values are from a t-test of mean comparison between the two groups. E.g. they show whether the difference between male and female teachers' opinions of boys being more capable in maths are statistically significant.

Table 9 School Fixed Effects Analysis Separated by Subject

	Language	Maths
VARIABLES	zscore	zscore
Class	0.341***	0.429***
	(0.011)	(0.014)
Survey Number	0.0921***	0.0909***
	(0.005)	(0.006)
Age of Child	0.0291***	0.0224***
	(0.006)	(0.008)
Male Child	0.238***	0.151***
	(0.015)	(0.018)
Ln Weight	0.206***	-0.00345
	(0.067)	(0.084)
Ln Weight Missing	2.071***	0.0661
	(0.679)	(0.843)
Child Height	0.00414***	0.00355**
	(0.001)	(0.002)
Ill Last 3 months	-0.0635***	-0.0619***
	(0.015)	(0.018)
Mother's Education	0.0182***	0.0249***
	(0.003)	(0.003)
Mother's Education Missing	0.0411	0.0733*
	(0.032)	(0.039)
Father's Education	0.0132***	0.0187***
	(0.002)	(0.002)
Father's Education Missing	0.0623**	0.103***
	(0.031)	(0.038)
Child SCST	-0.0865***	-0.102***
	(0.021)	(0.027)
Child Muslim	0.0178	0.223***
	(0.039)	(0.044)
Log Assets	0.0437***	0.0471***
	(0.009)	(0.011)
Log Assets Missing	-0.0155	0.0414
	(0.038)	(0.045)
Age of Teacher	0.00164	0.0125***
	(0.002)	(0.002)
Male Teacher	-0.0183	-0.109***
	(0.027)	(0.030)
Teacher SCST	0.0349	-0.0389
	(0.034)	(0.043)
Teacher Muslim	-0.0305	0.278***
	(0.054)	(0.074)
BA	0.0394	0.0936***
	(0.030)	(0.036)
MA	0.144***	0.265***
	(0.033)	(0.043)
First Division	-0.00459	-0.0676*
	(0.030)	(0.037)
Teacher Training	-0.0968***	-0.271***
	(0.036)	(0.041)
Para Teacher	0.131***	0.273***
	(0.041)	(0.050)

Teacher Absence Rate	-0.104	-0.337***
	(0.067)	(0.077)
Gender Match	0.0216	0.0424**
	(0.015)	(0.018)
Religion Match	-0.00232	0.0671*
	(0.035)	(0.038)
Caste Match	0.0101	0.0405
	(0.019)	(0.025)
Constant	-4.419***	-2.940***
	(0.547)	(0.679)
Observations	8282	8458
R-squared	0.346	0.291
Number of schoolid	153	154

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1