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Teacher Characteristics, Actions and Perceptions: What Matters for Student Achievement in Pakistan?

Shenila Rawal^{*}, Monazza Aslam^{**} and Baela Jamil^{***}

Abstract

Substandard teaching is believed to be the foremost reason for poor quality schooling in the developing world. This paper uses unique data from primary schools in the state of Punjab in Pakistan to delve into the issues that may determine what makes one teacher more effective than another. The hypothesis that differential teacher effectiveness stems from far more than observable teacher characteristics is tested and more nuanced reasons behind these differences are examined. In particular, teacher attitudes and opinions are investigated to give a more holistic approach to researching teacher effectiveness and its impact on student learning.

Key words: teacher effectiveness, student achievement, teacher attitudes, teacher opinions, fixed effects, Pakistan

^{*}Corresponding Authors: Dr. Shenila Rawal, Department of Quantitative and Social Sciences, Institute of Education, University of London. Email: shenilarawal@aol.com and ^{**} Dr. Monazza Aslam, Department of Humanities and Social Sciences, Institute of Education, University of London. Email: m.aslam@ioe.ac.uk

^{***}Baela Raza Jamil, Director Programs, Idara-e-Taleem-o-Aagahi (ITA) Pakistan and Heading ASER Pakistan. Email: b.jamil@itacec.org

1. Introduction

Despite the rapid expansion of primary schooling and progress made towards achieving universal primary education across the globe, it has been indicated that this success may well have been at the cost of schooling quality. Despite the notable rise in enrolments and years of schooling completed in the developing world, what children are actually learning in school (indisputably more important than quantity of schooling they receive) and the standard of the education they receive has been called into question. For example shocking results from Pakistan (ASER Pakistan, 2010, 2011 and 2012) have consistently shown that the vast majority of pupils aged between five and sixteen years of age have not even achieved what is expected of a grade 2 student in language and mathematics. Similarly worrying findings have also been revealed in India (ASER India, 2005-2012) as well as other developing countries. Investigations into the reasons behind this phenomenon have indicated that much of this deterioration in quality of education has been attributed to low teaching quality and differences in teacher effectiveness have now been universally acknowledged as being a key determinant in the differences in educational quality received by children in the world today (Hanushek and Woessmann, 2011).

Across the globe, educational leaders, researchers and policy makers alike now acknowledge that material and social factors are not the only, and perhaps not even the most important, deterrents to their countries' inability to meet educational targets and that in fact it is poor schooling quality that is one of the key factors documented to lie behind children's underachievement in schooling. Whilst in the developing world this does stem from a combination of factors such as the lack of basic facilities, outdated and irrelevant curricula etc., substandard teaching is often cited as being at the forefront of poor schooling quality in the developing world. This is of particular concern because this poor level of instruction and ineffective teaching may lead to a reduction in the demand for education which in turn reduces the pool of qualified teachers from which recruitment can take place thereby creating a vicious cycle of poor educational quality. In addition to acknowledging and recognising that improvements in teaching may be the most effective ways of raising educational quality¹, it is also important to note that these improvements in student learning (from better quality of teaching) also translate into economic gains that may benefit the country as a whole. Recent

¹ Glewwe and Kremer, 2006

research by Hanushek (2011) has placed a substantial monetary value to the impact of improving teaching quality. The author aimed to estimate an economic value of higher teaching quality in the US and estimated that a teacher who is one standard deviation above the mean in effectiveness would generate annual marginal gains of \$400,000 in terms of present value of future student earnings and potentially more when other conditions change. In this research he also suggests that if the bottom five to eight percent of teachers were replaced with average teachers this could potentially improve US ranking in maths and science achievement to near the top in terms of international achievement rankings. The present value of this move is estimated to be worth around \$100 trillion. Whilst these figures are representative of the US and not the developing world, they allow an understanding of the immense potential benefits of teacher quality improvements in the developing world not only because such a vast proportion of the world's children study in the developing world but also because the levels of teaching quality can be far lower to start off with in most of these countries. More recent studies from the developing world also highlight the importance of teachers for learning outcomes. A review of 43 studies from developing countries by Glewwe et al. (2012) identified teachers' subject knowledge and their presence or absence in school as critical determinants of student achievement.

This paper uses recent unique data from primary schools in the state of Punjab in Pakistan to delve into the question of what makes one teacher more effective than another. The hypothesis that differential teacher effectiveness stems from far more than observable teacher characteristics is tested and more nuanced reasons behind these differences are examined. In particular, teacher attitudes and opinions are investigated to give a more holistic approach to researching teacher effectiveness and its impact on student learning.

2. Background

Whilst Pakistan has made positive strides in relation to quantity of education achieved over the last few decades, education indicators in Pakistan regarding both quantity but particularly the quality of education have highlighted some key remaining concerns. Participation rates (particularly at higher education level), resourcing (particularly the lack of trained teachers) and academic results are comparatively low in relation to other countries within the region as well as internationally (Das, Pandey and Zajonc, 2006 ; Memon, Joubish and Khurram,

2010). This is coupled with regional and gender disparities in educational outcomes. Girls living in rural areas in Pakistan are less likely to be enrolled in school than those living in urban areas. There may be several reasons for this. Firstly, in rural areas girls are more likely to be required to work (e.g. farming, family labour etc.), jobs in urban areas require some schooling, cultural norms regarding female education may differ for example in urban areas there tends to be more educated men who may prefer to marry an educated woman. In rural areas the reverse may be true. In addition to this parents in urban areas are more likely to be educated themselves and have income levels making them more likely to send their daughters to school. Research over the years has evidenced this difference in girls' and boys' enrolment rates in Pakistan and other developing countries and this has led to much research focusing on gender differentials in education.

These concerns with the quality of education in Pakistan have been attributed to the low quality of teaching within the country (Khamis and Sammons, 2004; Westbrook *et al.*, 2009). Teachers in Pakistan are relatively poorly paid thereby preventing motivated and academically motivate individuals from wanting to join the profession. Some authors perceive teaching at primary level as the last choice of government service in Pakistan and put forward the argument that therefore average and below average candidates tend to seek to join the teaching profession (Saeed and Mahmood, 2002). In addition to this recruitment can often be based more on issues of political economy than merit (Westbrook *et al.*, 2009). Low levels of teacher subject matter knowledge are widely reported (Aslam and Kingdon, 2011; Khamis and Sammons, 2004) and this has been coupled with indications of dwindling levels of motivation linked to the low social status of the profession, lack of a structured promotions mechanism and poor working conditions.

Research in rural schools in Pakistan by Behrman et al. (1997) that looked at which schooling inputs are important for student outcomes found that increasing exposure to teachers and improving teacher quality are both likely to have higher returns than those investments that improve physical infrastructure and equipment. In addition to this if teachers are differentially effective then the teachers to whom a child is exposed can really matter to a child's educational attainment and can end up countering or reinforcing social and family influences and, in some cases, further increase inequity in educational opportunity for many children. However, measuring teacher quality is a complex task because of the wide array of competencies and skills that teachers require. It depends on many observable as well as

unobservable characteristics as well as intangible factors such as classroom interactions and motivation. Teacher quality in the very narrow sense has been defined by Eide et al. (2004) as the ability of a teacher to produce growth in their students' achievement; however, it is universally recognised that teacher quality is far wider than this and must include an evaluation of their ability to improve a much wider array of student outcomes of an intellectual, social, physical and emotional nature and not just simply test scores.

Within the literature there have been many approaches used to measure teacher quality. One of the main approaches used is based on the notion that student test scores are the best measure of a teacher's productivity and therefore of teacher quality and uses a more outputs based indicator of teacher quality. This approach follows a more agnostic view of teacher quality that focuses mainly on student outcomes. This approach examines the relationship between inputs, such as teacher certification, experience etc., and the resulting outputs (student test scores). Another type of approach used is based more on what teachers ought to know and the skills and competencies that they ought to have. This is more of behaviour and effort based approach to measuring teacher quality and examines issues such as a teacher's subject matter knowledge, aptitude to teach etc. This latter approach faces the challenge that it is very difficult to arrive at a conceptual framework that can identify professional standards for teachers that are owned by teachers and then to be able to measure a teacher's performance against these standards (various World Bank Policy Brief No. 2 to 8, 2009).

When measuring teacher effectiveness one must first account for those effects over which the teacher has no influence. It is then a measure of the extent to which the child's attainment differs from that predicted by those very influences over which the teacher has no control such as family background, prior attainment, school and class effects etc. (Chevalier, Dolton and Levacic, 2005). There are two dominant approaches that have been used over the years to measure teacher effectiveness. The first of these is that which uses an educational production function to examine the relationship between measurable teacher characteristics and the outcomes of those teachers' students. The foremost conclusion of these studies is that the standard teacher characteristics (on which most teacher recruitment is based) such as certification and experience, do not matter to pupil achievement (Hanushek and Rivkin, 2006). This approach has included methodologies ranging from instrumental variables (Kingdon and Teal, 2010; Sprietsema and Waltenberg, 2005) to randomised experimental methodologies (Glewwe and Kremer, 2006; Lavy, 2002). With most teacher recruitment

policies being based on observable teacher characteristics (Aslam and Kingdon, 2011) these findings are not only controversial but have also resulted in the issue of teacher quality being widely debated in the academic as well as policy realm. The second approach has been based on using data (be it for a given year or several years) on different groups of students taught by the same teacher and by using a teacher fixed effect to identify those teachers who consistently produce growth in student achievement. This approach estimates a *total* teacher effect and does not require identification of specific teacher characteristics that generate student learning. The studies that have used this approach find that although teacher quality does matter a great deal to student achievement it is again not those teachers' observable characteristics that explain the differences in student achievement (Hanushek *et al.*, 2005; Rivkin, Hanushek and Kain, 2005).

In examining teacher observable characteristics research has shown that teacher experience increases teacher effectiveness only in the first few years of teaching and the subject of specialisation only appears to matter for certain subjects taught. In this regards teachers have been shown to be differentially effective across subjects and their subject specific achievement in tests has been shown to increase pupil achievement significantly (Park and Hannum, 2001). Teacher achievement in test scores has been shown to have a significant impact on student outcomes. For example, research by Metzler and Woessman (2010) has shown that a one standard deviation increase in teacher achievement increases student achievement by 10 percent of a standard deviation. The issue of gender is also one which has received considerable attention from researchers over the years. Research to date has particularly focused on the role of female teachers in improving the attendance of female student in rural schools in developing countries. For example research in 1994 (Warwick and Jatoi, 1994) in Pakistan found that teacher gender has a stronger influence on maths outcomes of students than the student's own gender. They also find that this relates more to rural than urban schools where female teachers display the same if not better pupil outcomes. Also for Pakistan, Aslam and Kingdon (2011) find that female students benefit more from being taught by female teachers. They suggest various explanations including the possibility that 'preference' for same-sex students or deeply entrenched stereotypes influence the process through which knowledge is disseminated in the classroom which influences student learning. They also propose a 'role models' explanation: students of the same gender may perform better by being taught by same-sex teachers when they view them as role models. This hypothesis is especially convincing in light of cultural norms in Pakistan where mobility

restrictions especially after adolescence may contribute in making female teachers role models for their female students. This corroborates research in the US that show that demographic distance between the teacher and the student matters (Dee, 2005; Dee, 2006; Dee, 2007) as well similar findings for India using SchoolTELLS data presented in Chapter -. Therefore with evidence indicating that differential teacher effects exist and with no concrete answers as to how one would account for them fully using either an examination of observable teacher characteristics or practices alone, one must look towards more holistic and innovative foci of inquiry in order to identify, recruit and retain individuals of a high calibre into the teaching profession.

3. Data

In May 2011 a World Bank project in Pakistan conducted a survey similar to the SchoolTELLS survey in India (2007-8), albeit on a smaller scale. The main purpose of the study was to obtain reliable information that would allow researchers to investigate the relationship between learning levels of students and the factors that may influence them, such as teachers' characteristics and ability, children's characteristics and ability, classroom and school environment etc. This survey covered three districts (Faisalabad, Mianwali and Rahim Yar Khan) from the province of Punjab. It covered twenty villages from each district and two schools from each village totalling sample 120 schools overall. Prior to the main data collection a pilot study was conducted.

The following were included in the main data collection:

- 1) A school questionnaire. This included basic information on the school itself including information relating to school type, enrolment levels, resources, opening hours etc.
- 2) Detailed information on the teachers in the schools. A teacher questionnaire was also administered. This captured information on the teacher's age, qualifications, experience, political affiliations etc. as well as information on pedagogical style and time-on-task. The questionnaire also contained questions on teachers' views on various aspects of the teaching profession. In addition to this one could argue the most critical aspect of this set of information is that it also included a teacher test aimed at evaluating the teachers' ability to teach at the primary school level. Similar to India SchoolTELLS, the teacher tests aimed at evaluating the teachers' abilities in three key areas: subject matter knowledge, ability to explain and ability to spot mistakes.

- 3) Student questionnaires. Ten children from grade 3 and ten children from grade 5 were randomly chosen from each school and further information on them collected. This included information on the child themselves as well as their families. These children also sat achievement tests to assess their IQ using a short Ravens Progressive Test.
- 4) Classroom observation data. One grade 3 class and one grade 5 class from each school was also observed and information collected on facilities as well as teaching methods employed.

The final sample consists of information on 1262 students in 102 schools. The variables used in this analysis are described in Table 1. These include a wide range of student, school and teacher variables. As mentioned previously, literature on teacher effectiveness, particularly in Pakistan (Aslam and Kingdon, 2007), has shown that observable resume characteristics provide only a limited insight into differences in teachers' ability to impart knowledge. Therefore the richness of this dataset allows us to investigate further, other aspects about teachers that may be related to improved student outcomes. Of particular note is the information included in this dataset relating to teachers' perceptions about the profession, the school in which they teach, their own abilities and their reflections on the children whom they teach.

A wide range of individual child level variables are also included in the analysis. These include information on children's aspirations, ability, private tuition as well as additional details on their health in the last three years, their involvement with household chores as well as in the family business. Insights into the home were also obtained by collecting data on parental education, reading habits and interest in the child's education as well as the size of the home and numbers of books in the household. In addition to these variables shown in Table 1, additional variables on the child's household assets were also used in the analysis to control for household wealth. For example, this included information on whether the household had air-conditioning, tap water, cars etc.

Gender gaps in the outcomes of children in Pakistan have been the subject of research and policy interest for many decades. Whether the gender of the teacher plays any role in these gaps is therefore of relevance and interest to researchers and policy-makers alike. Therefore in line with the analysis of demographic distance between student and teacher presented in relation to India, similarly, this investigation also includes the use of a gender match variable.

This is a binary variable indicating whether the gender of the teacher and the student is the same. We also examine the stand- alone impact of teacher as well as student gender on student outcomes.

4. Econometric Identification and Estimation

In an ideal situation in order to estimate the impact of certain teacher characteristics on pupil achievement one would utilize the randomised trial methodology. In this situation pupils would be randomly allocated to teachers of different characteristics within a school. In the absence of such means other econometric means are used to estimate the differential effects of teachers on pupils. A conventional Ordinary Least Squares methodology is used in the first instance. Here an achievement production function is specified in the following form:

$$A_{ijkl} = \alpha + \beta X_i + \delta S_j + \lambda T_k + \varepsilon_{ijkl}$$

Where A_{ijkl} is the achievement of the i^{th} pupil in the l^{th} subject in the j^{th} school as taught by the k^{th} teacher. This achievement is determined by a vector of his/ her personal and family characteristics (X), school characteristics (S) and teacher characteristics (T). This final vector of teacher characteristics contains the variables of interest for the purposes of this analysis. For example, teacher qualifications, training, gender etc. Non-random allocation of teachers to students can bias the results when estimating the causal impact of these characteristics on pupil achievement. For example it may be that teachers with lower qualifications are posted to more remote rural schools. This richness of our dataset allows us to exploit the variation of teachers within schools and use a school fixed effects estimation to control for this non-random matching of teachers to pupils and schools. This approach allows us to control for observed as well as unobserved school factors that may affect pupil achievement and hence reduce the endogeneity bias. This school fixed effects specification is as follows:

$$A_{ijkl} = \alpha + \beta X_i + \lambda T_k + (\mu_j + \varepsilon_{ikl})$$

Where μ_j is the observed and unobserved school-level characteristics, which do not vary within schools. This estimate also may be biased due to possible non-random matching of teachers to pupils within a school. In rural Pakistan schools tend to have one class per grade

so this non-random matching if at all present would be across grades within a school as opposed to within grades. In addition children in rural areas tend to attend the nearest and only available school. However it must be noted that even this within schools estimate can result in biased results due to both pupil and teacher unobservable remaining in the error term. Unfortunately, unlike in the India SchoolTELLS data, teachers do not vary as much within one grade across subjects and therefore a pupil fixed effects analysis as conducted with the India data is not possible.

5. Results

5.1 Descriptive Statistics

Table 2 provides the Descriptive Statistics for the key variables used in this analysis. From this table we can see that the children scored 67.5 points out of a total of 149 in the tests. The mean mathematics score was 48 percent and the mean language score was 39 percent (total score achievable in language=54, total score achievable in mathematics=95). Just under half of the children in the sample attended a private school and 68 percent were taught in schools that were run on a monograde basis. Of those children within the dataset over half of them (54.5 percent) were male and the majority were from households whose main language is Punjabi. Children's ability as measured by Ravens Progressive Matrices Tests indicates a mean score of 8.4 out of a total of 27 (31 percent). Controlling for child ability is a major issue with cross sectional data of the type that we have, however, the Ravens score allows us to address this to a certain extent, albeit in an imperfect manner. Of the children questioned only 25 percent indicated that they were taking private tuition. Approximately a third of children stated that they were involved in household domestic work and the same amount also indicated that they assisted with taking care of children/babies in the family. Around 16 percent of the children indicated being involved in the family business. It should however be noted that unlike India SchoolTELLS, this data on the households was not collected in the households themselves from adult members of the household, but rather this information was asked of the children themselves in the school. This is one major disadvantage of the household data in that certain variables (such as parental education) may be prone to measurement error.

In regards to the teachers in the dataset, over half of them are male with just over 85 percent of children being taught by teachers of their own gender. On average the teachers have

twenty years of experience with only 0.05 percent indicating that they have no teacher training certificate of any kind. Around 36 percent of the teachers have completed PTC training. On average the teachers have had 11.7 days of training the past one year. Teachers were also asked about their families and 36.6 percent indicated having children under 5 years of age and around 55 percent indicated having children aged between 6 and 14 years old. The teachers' mean score in the tests administered for language and maths were 69 and 58.5 percent respectively. This data reveals that on average teachers in rural Punjab Pakistan are relatively better than their counterparts in India in terms of both mathematics and language test scores, and are also more consistent in their competencies and in teaching the two subjects. It should, however, be noted that SchoolTELLS-India was conducted in two of the most economically and educationally disadvantaged states while SchoolTELLS-Pakistan was conducted in Punjab, one of the most well-off and educationally advantaged provinces of the country. However, despite the fact that the teachers in Pakistan appear to have higher levels of subject matter knowledge and competency this does not seem to be translated into higher levels of student learning. The tests administered to teachers and children included some questions that were the same in the student and the teacher tests. Investigation into these questions indicate that in areas where teacher scores are high student scores in those same areas is still low indicating a poor level of transmission of knowledge from teacher to student. For example, 82 percent of the teachers were able to correctly explain long division. In contrast however, only 33 percent of their students were able to answer the very same question correctly. Similarly within the language test, whilst 64 percent of the teachers were able to explain the meaning of difficult words with precision, only 11 percent of the children they teach could do so. It must also be noted that the teacher test did also highlight some worrying findings in relation to teacher competency as well. One such example is that of the teachers tested an alarming 33% of them could not accurately complete a two-digit addition question. It is concerning when teachers themselves do not have the competencies to teach the curriculum as expected and even in situations where there isn't this lack of knowledge there appears to be an inability to transfer knowledge to pupils in a competent manner resulting in low student test scores.

As mentioned previously, due to large gender gaps in educational outcomes, the gender of teachers has played an important role in the analysis of student outcomes. Following this line of inquiry, Table 3 examines how the teachers within the Pakistan SchoolTELLS dataset differ across gender in certain key characteristics. Four percent of male teachers have an

education less than tenth grade whereas nearly none of the female teachers have this low a level of education. However, significantly more male than female teachers indicate completion of Grade 12 and possession of a Bachelors' degree than females. Only around 13 percent of male teachers possess a Masters degree; this is significantly less than female teachers of whom 21 percent indicate possession of the same. Possession of no teacher training does not appear to differ across gender lines however the gender gap in wages of male as compared to female teachers shows an incredibly high and significantly pro-male bias with male teachers on average earning 210,734 rupees per year and female teachers earning only 184,978 rupees per annum. Teacher subject matter knowledge and competency as measured by the tests administered do not appear to differ along teacher gender lines. Female teachers in our data also appear to have more political involvement than their male counterparts with only 11 percent of male teachers indicating they are actively involved in a political party as compared to 16 percent of female teachers who indicate this. The data also allows teacher gender to be examined from the students' perspective. It was found that 76% of female students preferred to be taught by a female teacher and 63% of male students preferred to be taught by a male teacher. When the children were asked whether schooling was equally important for girls as for boys, 60% of girls and 73% of boys felt that this was the case, 34% of girls felt that it was more important for girls and 18% of boys felt that it was more important for boys.

With previous research indicating that teacher effectiveness may be related to more nuanced factors such as teaching processes and teacher attitudes, this investigation looks further into teacher attitudes and views to examine whether these impact on teachers' ability to teach and the resultant student outcomes and also whether these attitudes vary along gender lines. Table 4 explores these issues in further detail. Levels of dissatisfaction with salary and facilities appear the same across the genders despite the fact that female teachers are paid so much less than male teachers. Male teachers display more faith in political leaders than female teachers however female teachers say they are more actively involved in teacher unions. As much as 98 percent of female teachers indicate a preference for performance-related pay. Although statistically significantly less, as many as 94 percent of male teachers also indicate this preference. Similarly high results are seen when looking at teacher preference for salary reductions for absence with 83 percent of male teachers agreeing with this and 80 percent of female teachers doing the same. In general male teachers are significantly more satisfied with their own skills and knowledge and their use of new

teaching techniques. However what is worrying is that more than half of both male and female teachers indicate having problems with mathematics teaching. More male than female teachers indicate that they believe boys are more passionate about their studies than girls however there is no such gender difference in their opinions of children's maths capabilities in particular. What is of most concern, however, is that over 60 percent of both male and female teachers think that boys are more capable in maths. Female teachers also appear to take more proactive action in relation to the children in that more of them claim to send annual reports to parents and more of them tend to inquire about student absence. It should be noted that means for both of the genders for these aspects are nonetheless high. Around half of teachers view parents as being attentive to their children's education, with female teachers exhibiting more negative views in this regard. The difference is more apparent in regards to teachers' opinions on parental views on teachers punishing children with only 41 percent of female teachers agreeing that parents would not object as compared to 56 of male teachers agreeing the same. These are important findings for research into teacher effectiveness. For example, if, as is the case here, more male teachers are of the opinion that parents do not object to punishment of their children this may impact on their teaching style. They may therefore be more strict and harsh towards students and students may as a result of this fear them more than female teachers. This could therefore result in differing student outcomes. As we can see there are several such areas where teachers differ in their views along gender lines therefore not only must one control for the gender of the teacher but one must also control for these very views and opinions in order to disentangle the web of teacher effectiveness more fully.

5.2 Ordinary Least Squares

The ordinary least squares results are presented in Table 5. As expected when one examines the results across all schools children in class 5 perform better than those in class 3. Private schooling also appears to have a positive impact on student learning with children who attend a private school achieving a score 0.188 standard deviations higher than those attending a government school. This result is in line with previous research (Alderman, Orazem and Paterno, 2001; Arif and Saqib, 2003; Aslam and Kingdon, 2007; Das, Pandey and Zajonc, 2006). Similarly it is found that children whose home language is that of the state in which they are educated also perform better than those whose home language is different. Children aspirations are positively related to performance however ability is found to be negatively

related to performance when one looks across all schools. The biased nature of the ordinary least squares analysis, as discussed previously, could provide an explanation for the puzzling nature of the latter result. Children who state that they are involved with the family business perform 0.262 standard deviations worse than those who do not. The nature of this relationship is as expected as one would presume that those children who have the added pressure of working in the family business may be doing so to the detriment of their school performance. There could be several reasons for this large and significant impact. Firstly it may be that school attendance suffers because these children are working or that those children with the burden of this work are more tired and therefore perform worse than those children that do not have to dedicate time to the family business. Several other child and household variables have been included in the analysis. None of these appear to significantly impact on the child achievement however the inclusion of them allows us to control for a wider array of factors that could impact on child achievement and therefore helps reduce the bias in the above specification.

Several teacher variables have been included in the analysis. Male teachers appear to be related to worse student outcomes than female teachers as do those with higher maths test scores. The number of days of teacher training attended in the last year is positively related to student outcomes as is the teachers' own language score. In relation to the teachers' opinions on various matters, several of these variables appear to be significantly related to student outcomes. However as these results in the ordinary least squares analysis are biased (as discussed earlier) by unobservables at the school, child, teacher and household level, the nature and effect of these variables can be more accurately understood by examining the school fixed effects analysis.

5.3 School Fixed Effects Analysis

Table 6 presents the results from the school fixed effects analysis. From these results we can examine further the relationship between teachers, their characteristics and beliefs, and the potential impact that this can have on their students' academic performance. Our school fixed analysis allows us to more accurately examine this relationship in that the rural schools which we look at only have one grade 3 and one grade 5 classroom so any selection bias from within school sorting of teachers is minimised. Teacher experience is shown to be positively and significantly related to student performance. However this finding must be interpreted

with caution as it may not be the increase in teacher experience per se that improves student outcomes but may well be that teachers who are more effective at renewing their contracts are also more effective teachers because they possess an unobserved characteristic that is positively related to both student outcomes and teaching tenure (Aslam and Kingdon, 2007). The students of male teachers perform significantly better (by 0.323 standard deviations) than those taught by female teachers irrespective of the gender of the child. It has been suggested that the impact of pre-service training is questionable and any positive initial effects of pre-service training can fade over time as teachers become socialised into the profession, in line with this our investigations also show that initial teacher training does not impact on student outcomes. However, we do find that being taught by a PTC trained teacher appears to have a negative impact on student outcomes with their students obtaining results 0.354 standard deviations lower than other students. As far as in service training is concerned we find similarly significant results for the benefit of students in that the number of teacher training days attended in the last year is shown to positively affect student outcomes.

The tests conducted on teachers in math and language aimed at understanding levels of teacher skills and subject – matter knowledge in the schools within the sample. The inclusion of these test results within the school fixed effects specification indicate that these factors do significantly affect student outcomes with the results indicating that the teachers language score is negatively related to student outcomes whilst teacher maths scores are positively related to student outcomes. The former affects student test results by -0.171 standard deviations whereas the latter affects student outcomes by 0.380 standard deviations. The subject specific effects are further investigated in the following section.

Parents of young children face immense pressures on their emotional and physical wellbeing and therefore including variables that indicate the ages of the children of teachers can help researchers gain insight into whether or not this impacts on their professional work. As one would expect the students of teachers who have very young children (under five years of age) perform significantly worse (-0.271 standard deviations) than those taught by teachers who do not have young children. Students of teachers whose children are older (six to fourteen years of age) perform very significantly better (0.562 standard deviations). This can be explained by the fact that these teachers have attained relevant expertise and a skill set pertinent to working with children through their experience as parents whilst at the same time do not face the strains and demands of young children in the home.

With this and other research indicating that teacher observable characteristics have limited if any impact on student outcomes, more innovative suggestions have been put forward with regards to what makes some teachers more effective than others. In line with this train of thought, we have looked deeper into the relationship between teacher, student and schools to try to understand not only what motivates (or demotivates) teachers but also what it is about some teachers that makes them more capable than their peers. Motivational theory focuses on monetary and non-monetary rewards and whether financially incentivising employees can improve performance. However, the nature of the teaching profession and the potential effects of its altruistic nature call into question whether financial motivation is enough to inspire those in the teaching profession to perform. Our analysis of the SchoolTELLS data in Pakistan reveals that not only does teachers' salary not appear to significantly affect their students' performance but even the teachers' levels of satisfaction with their salary rates do not significantly impact student outcomes. Teachers were also asked within the survey about their opinions on whether they agreed that teachers producing better student results should receive higher pay and those who were absent often should face deductions in pay. Whether or not teachers agreed with the former (i.e. that teachers pay should be related to pupil performance) does not appear to be significantly related to pupil performance. As one would expect, teachers who disagree with penalising teachers with salary reductions for non-attendance are also associated with lower pupil performance. A limitation of cross-sectional such that we have is that we cannot accurately control for teacher absence rates. However one would presume that those teachers who are absent more frequently are more likely to oppose such measures that would negatively affect them and therefore we can to some extent interpret this as showing the potential (albeit expected) negative impact of teacher absence on student performance. However of key importance is the fact that teachers' opinions even on other matters also seem to affect their students' performance; and in many cases this impact is not only significant but sizeable as well.

Teachers who are dissatisfied with the school's facilities are associated with student performance -0.44 standard deviations less than those who are satisfied with facilities in the workplace. This effect is likely to be due to the fact that teacher dissatisfaction with facilities can be presumed to be highly correlated with low levels of resources/ facilities in a particular school and it is this and not the teachers' resultant dissatisfaction that is impacting negatively on student outcomes. Teachers who state that they disagree with the statement that teachers

in their district have a lot of problems have significantly higher student test scores than those who agree with this statement. . Teacher opinions on whether political leaders are effective in resolving teacher matters do not significantly affect their students' outcomes. However politicisation of teachers does seem to impact on student outcomes. Those teachers who are associated with political parties and those that are active in teacher unions have a significant negative impact on student learning with test scores that are lower than for those taught by less politically active teachers.

Teachers who are confident in their maths teaching capabilities have students who perform significantly better than those who acknowledge that they have difficulties in teaching this subject. Satisfaction with one's general skills and knowledge does have a significant impact on a teacher's effectiveness in improving test scores as measured by our research. Interestingly those teachers who state that they do not use new training techniques in their teaching are shown to have student outcomes that are significantly higher than those who do. One would presume that these are older more experienced teachers who are perhaps more set in their teaching ways. In that case this result is in line with our previous finding that more experienced teachers are more effective in imparting learning and are therefore associated with student test scores that are higher than those of their less experienced counterparts. We find teachers who disagree with the statement that they send annual reports to parents have lower test scores than those who agree with this statement. The unexpected direction of this relationship may be due to the unclear wording in the questionnaire with teachers interpreting this to mean that they "only send reports annually" as opposed to sending reports "at least annually".

Gender matching of teachers and students in Pakistan according to our findings is not of significance. The non- significance of the gender match variable is also corroborated by the finding that teachers' opinions on boys' (versus girls') academic capabilities and abilities are all shown as not being significantly related to student test scores. As mentioned previously a large proportion of both male as well as female teachers are of the opinion that boys are more capable in maths than girls and more significantly a higher percentage of male teachers than female teachers are of the opinion that boys are more enthusiastic about their studies. However, neither of these aforementioned biases appears to significantly impact on student test scores suggesting that although teachers in Pakistan may hold some gender biases about their pupils' capabilities these do not appear to impact on the results of their children when all

children scores are merged together for the analysis. However, children in Pakistan also appear to prefer to be taught by a teacher of their same gender. This may be indicative of cultural norms as opposed to any perceived discrimination they think they would face, however, in order to investigate whether teacher effects vary by pupil gender further analysis separated by child gender is carried out in the next section.

5.4 Further analysis by subject and by pupil gender

Teachers may be differentially effective across subject areas and therefore the analysis is also carried out separately for students' language and maths scores. Table 7 presents the results of this analysis. Interestingly children's home language appears to affect their own maths scores however it does not seem to affect their language scores. Those children with higher academic aspirations also have significantly higher mathematics scores as one would expect. With regards to the teacher variables, teacher experience appears to improve student language scores and have no significant impact on student maths scores. The positive impact of male teachers as found previously appears to be restricted to student language scores and there does not appear to be differential gender effectiveness in maths scores. The negative results of PTC training appear to be restricted to maths outcomes of students as does the positive impact of teacher training days. The previous findings on teachers' own test scores also stands when one separates the analysis by subject. We continue to find that teacher language scores have a negative relationship with both student maths and language scores and that teacher maths scores have a positive relationship with both student maths as well as language scores. The significant relationship between the variables on new training techniques and salary deductions also appear to affect only student language and not maths scores. This is similar for the variable relating to whether teachers disagree with the statement that boys are more capable in maths.

The analysis was further broken down to see if these variables have a differential effect on male children as compared to female children. The results are shown in Table 8. Grade 5 boys have significantly higher scores than their younger counterparts as one would expect. Worryingly this is not the case for girls as the results indicate that class 5 results are not significantly different than class 3 results implying that girls do not appear to be learning significantly more during the time between these two grades. Punjabi speaking girls appear to be at a disadvantage as compared to girls whose home language is not Punjabi. In contrast

home language does not seem to matter for boys. Engagement in domestic work is significantly positively related to girls' test scores as is looking after younger children for boys' test scores. Regular reading of newspapers positively impacts on sons' educational outcomes but not on daughters'. Teacher in service training days have a significant impact on girls' test scores and does the teachers' maths score. With a backdrop of concern regarding the mathematical abilities of girl students and all teachers this is a very important finding as teacher maths scores have a disproportionately large impact on the results of their female students. The negative impact of a teacher's young children seems to only manifest in his/her female student and does not appear to affect the scores of her male students. Older children of a teacher have a similar impact on both genders of students. Crucially the variable on teacher opinions and political economy issues appear to be significant mostly only for female children. For example the negative relationship mentioned earlier with relation to teacher unions and involvement in political parties is only relevant and significant for female pupil outcomes and not for male pupil outcomes. The fact that teachers view all children as having the capability to perform well in maths is important for female children and does not affect the outcomes of male children. One must be careful in interpreting the coefficient on teacher inquiry into student absence as it is probably the case that where there are high levels of pupil absences teachers tend to inquire more about student absence and those are the very children who would have lower test scores.

6. Conclusion

In examining data from rural primary schools in Pakistan we find that student outcomes are significantly affected by the teachers who teach them. We find that in line with previous research, observable teacher characteristics are not what make teachers differentially effective but that their ability to teach, subject matter knowledge and attitudes to teaching matter more. Of fundamental importance is the fact that these attitudes appear to affect female student outcomes disproportionately more than male student outcomes. With a background of concern about the quantity and quality of education that girl children receive, this is of great consequence from a policy perspective. If teachers' beliefs and attitudes impact on student outcomes, and in particular certain students, their role as such needs to be further understood by policy makers, training providers and schools alike. At the national level, consideration of the concerns and views of teachers can help to provide insight to improve teaching practice through relevant and appropriate teacher recruitment and retention

policies. On the part of training providers, research into this field can help training providers ensure that both pre-service and in-service training address the needs, views and concerns of practitioners and keep them motivated and professional. School management practises and policies can also be used to help foster positive and non-biased attitudes amongst staff, thereby helping to improve the outcomes of all students. It can be concluded that equity in education across gender, ethnicity race and/or religion should not be about competition across the various demographic groups but more about providing all children with the opportunities they are entitled to. To take the issue of gender as an example, in some situations the issue to be addressed may relate to girls' being disproportionately affected (e.g. in relation participation rates and access to schooling) in other situations it may be boys' underachievement (e.g. literacy levels for boys unacceptably low). In either situation the aim is not to pit one group against the other but more about ensuring that all children (irrespective of gender, ethnicity or religion) have access to good quality educational opportunities and that their achievement levels are appropriate for their stage of schooling.

Tables

Table 1: Description of Variables

Variable	Description of variable
Student test score	Student's total test score
Student math score	Student's maths test score out of a total of 35
Student language score	Student's language test score out of a total of 39
Class 5	Child is in Grade 5
Private School	Child attends a private school
Monograde	Teaching in the school is in monograde classes
Age of child	Age of child
Male Child	Child is male
Father Education	Highest level of education achieved by father
Mother Education	Highest level of education achieved by mother
Child Punjabi Speaking	Is Punjabi the language that is mainly spoken with the child at home?
Child Urdu Speaking	Is Urdu the language that is mainly spoken with the child at home?
Ravens Test Score	Child's test score in Ravens Progressive Matrices Test
Child's Highest Education Wish	Index from 1 to 7 of child's educational aspirations (higher the number the higher the child's educational aspirations.
Private Tuition	Child attends private tuition
Serious Illness past 3yrs	Child has had a serious illness in the past three years
Domestic Work	Child helps with domestic work such as cooking/washing etc.
Looking after children/babies	Child helps look after other children and/or babies
Family Business	Child works for the family business
Number of Books at Home	The number of books the child estimates they have at home
Father reads newspaper	Child's father reads the newspaper daily
Parents Rarely Inquire	Parents/other family members rarely inquire about the child's school work
No of people in House	Number of people who live in the same household as the child (grandparents, aunts, uncles etc. who share the same kitchen)
Rooms in House	Number of rooms in the house
Teacher Experience	Teacher years of experience
Teacher Experience Squared	Teacher years of experience squared
Teacher Male	Teacher is male
Teacher Twelfth	Teacher has completed twelfth grade
Teacher Bachelors	Teacher has a Bachelors Degree
Teacher PTC Training	Teacher has PTC training certificate
Teacher No Training Certificate	Teacher has no teacher training
Teacher Training Days	Number of training days the teacher has attended in the last year
Teacher Salary Log	Log of Teacher annual salary
Teacher language score	Teacher language score
Teacher math score	Teacher math score

Children under 5	Teacher has children below the age 5 years old
Children 6 to 14	Teacher has children aged between 6 and 14 years old
Dissatisfied with salary	Teacher is dissatisfied with salary
Dissatisfied with facilities	Teacher is dissatisfied with the status of facilities in the workplace
Associated PP	The teacher is actively associated with a political party
Teacher Problems	Teacher agrees that teachers in the district have lots of problems and difficulties
Leaders Effective	Teacher agrees that generally local political leaders are successful in solving teacher problems
Teachers active in unions	Teacher agrees that teachers in his/her own district participate actively in union activities
Performance related pay	Teacher agrees that teachers whose students achieve better results should be rewarded by a better salary
Salary reduction for absence	Teacher agrees that teachers who are often absent should be faced with reductions in their salary
All students capable in maths	Teacher believes that all children have the capability to learn mathematics
Use new training techniques	Teacher states that they try to use new teaching techniques
Satisfied with own skills and knowledge	The teacher is satisfied with their own knowledge and teaching techniques
Have difficulties in Maths teaching	The teacher feels that they sometimes have difficulties in addressing students' maths queries
Boys more passionate about studies	The teacher fully or partially agrees that boys are more passionate about their studies as compared to girls
Boys more capable in maths	The teacher fully or partially agrees that boys are more capable in maths
Send reports annually to parents	The teacher says that they try to send an annual student progress report to the parents of the children they teach
Inquire about student absence	The teacher says that if a child remains absent from school for more than a week then they themselves try to enquire the reasons behind the absence
Parents are attentive	The teacher fully or partially agrees that parents in the village are attentive towards the quality of the education of their children
Parents no objection to teachers punishing	The teacher fully or partially agrees that parents do not object if their children are punished by the teacher
Gender Match	Binary variable indicating that the gender of the child and teacher are the same

Table 2: Descriptive Statistics

Variable	No. of Observations	Mean	Std. Dev.	Min	Max
Student test score	1877	67.54822	25.95207	0	149
Student math score	1877	46.38359	0.9994541	0	95
Student language score	1862	21.17293	13.30251	0	54
Class 5	1880	0.4851064	0.4999111	0	1
Private School	2072	0.4618726	0.4986645	0	1
Monograde	2072	0.6814672	0.4660198	0	1
Age of child	1880	9.944681	1.517373	7	13
Male Child	1880	0.5446809	0.4981321	0	1
Father Education	1863	1.834138	1.766703	0	7
Mother Education	1865	0.8069705	1.294282	0	7
Child Punjabi Speaking	2072	0.534749	0.4989115	0	1
Child Urdu Speaking	2072	0.0612934	0.2399257	0	1
Ravens Test Score	1877	8.413426	3.773518	1	27
Child's Highest Education Wish	1878	5.127796	1.595032	1	7
Private Tuition	1859	0.2528241	0.4347479	0	1
Serious Illness past 3yrs	1880	0.1680851	0.3740413	0	1
Domestic Work	1880	0.3	0.4583795	0	1
Looking after children/babies	1880	0.3329787	0.4714044	0	1
Family Business	1880	0.1574468	0.3643184	0	1
Number of Books at Home	1880	15.9883	12.35861	0	75
Father reads newspaper	1879	0.1660458	0.3722208	0	1
Parents Rarely Inquire	1861	0.426115	0.4946438	0	1
No of people in House	1880	8.303723	3.514705	1	30
Rooms in House	1880	3.137766	1.719766	1	41
Teacher Experience	1582	20.46587	10.45074	1	45
Teacher Experience Squared	1582	528.0006	441.3256	1	2025
Teacher Male	1582	0.5417193	0.498414	0	1
Teacher Twelfth	2072	0.1206564	0.3258061	0	1
Teacher Bachelors	2072	0.3016409	0.459081	0	1
Teacher PTC Training	2072	0.367278	0.4821795	0	1
Teacher No Training Certificate	2072	0.0506757	0.2193875	0	1
Teacher Training Days	1582	11.75158	9.713914	0	200
Teacher Annual Salary	1573	198961.1	81900.74	12000	540000
Teacher language score	1573	26.91926	10.20885	0	39
Teacher math score	1573	20.49332	8.988513	0	35
Children under 5	1573	0.366815	0.4820887	0	1
Children 6 to 14	1573	0.5499046	0.4976615	0	1
Dissatisfied with salary	1573	0.5753338	0.4944494	0	1
Dissatisfied with facilities	1573	0.5092181	0.500074	0	1

Associated PP	1573	0.1328671	0.339539	0	1
Teacher Problems	1578	0.8846641	0.3195281	0	1
Leaders Effective	1578	0.3802281	0.4855967	0	1
Teachers active in unions	1571	0.5569701	0.496902	0	1
Performance related pay	1563	0.9673704	0.1777219	0	1
Salary reduction for absence	1549	0.8173015	0.386544	0	1
All students capable in maths	1582	0.7901391	0.407338	0	1
Use new training techniques	1577	0.9695625	0.1718424	0	1
Satisfied with own skills and knowledge	1582	0.9633375	0.1879911	0	1
Have difficulties in Maths teaching	1556	0.5494859	0.4977051	0	1
Boys more passionate about studies	1562	0.3111396	0.463108	0	1
Boys more capable in maths	1582	0.659292	0.4740972	0	1
Send reports annually to parents	1578	0.8193916	0.3848153	0	1
Inquire about student absence	1581	0.9595193	0.1971461	0	1
Parents are attentive	1582	0.5493047	0.4977204	0	1
Parents no objection to teachers punishing	1556	0.4910026	0.5000798	0	1
Gender Match	1390	0.8582734	0.3488951	0	1

Table 3: Gender differences in key teacher characteristics

TEACHER		Male	Female	t-stat of difference
Educated to: Below tenth	Mean	0.0398	0.0028	-4.927***
	SD	0.1956	0.0527	
Twelfth	Mean	0.1792	0.1321	-2.553**
	SD	0.3837	0.3389	
BA	Mean	0.4415	0.3408	-4.088***
	SD	0.4969	0.4743	
MA	Mean	0.1265	0.2128	4.613***
	SD	0.3326	0.4096	
First Division	Mean	0.3677	0.4033	1.449
	SD	0.4825	0.4909	
No teacher training certificate	Mean	0.0632	0.0695	0.501
	SD	0.2435	0.2545	
Teacher language test score	Mean	26.7764	27.0890	0.605
	SD	10.5612	9.7785	
Teacher maths test score	Mean	20.3642	20.6467	0.621
	SD	8.9950	8.9847	
Annual salary		210733.6000	184978.1000	-6.289***
		78585.72	83597.15	
Associated PP	Mean	0.1077	0.1627	3.210***
	SD	0.3102	0.3694	

Table 4: Teacher Opinions

Agrees that:		Female teacher	Male teacher	t-stat of diff
Dissatisfied with salary	Mean	0.5855	0.5667	0.7507
	SD	0.4930	0.4958	
Dissatisfied with facilities	Mean	0.5202	0.5000	0.7967
	SD	0.4999	0.5003	
Teacher Problems	Mean	0.8897	0.8806	0.5622
	SD	0.3135	0.3245	
Leaders Effective	Mean	0.3212	0.4309	-4.4832***
	SD	0.4673	0.4955	
Teachers active in unions	Mean	0.5899	0.5300	2.3781**
	SD	0.4922	0.4994	
Performance related pay	Mean	0.9443	0.9868	-4.7247***
	SD	0.2295	0.1140	
Salary reduction for absence	Mean	0.8340	0.8040	1.5191
	SD	0.3723	0.3972	
All students capable in maths	Mean	0.7775	0.8009	-1.1385
	SD	0.4162	0.3995	
Use new training techniques	Mean	0.9468	0.9883	-4.784***
	SD	0.2246	0.1076	
Satisfied with own skills and knowledge	Mean	0.9444	0.9789	-3.6358***
	SD	0.2294	0.1437	
Have difficulties in Maths teaching	Mean	0.5660	0.5389	1.0675
	SD	0.4960	0.4988	
Boys more passionate about studies	Mean	0.2254	0.3832	-6.7866***
	SD	0.4181	0.4864	
Boys more capable in maths	Mean	0.6704	0.6464	0.999
	SD	0.4704	0.4784	
Send reports annually to parents	Mean	0.8452	0.7993	2.3611**
	SD	0.3620	0.4008	
Inquire about student absence	Mean	0.9847	0.9402	4.5415***
	SD	0.1228	0.2372	
Parents are attentive	Mean	0.5063	0.5878	-3.2483***
	SD	0.5003	0.4925	
Parents no objection to teachers punishing	Mean	0.4098	0.5649	-6.1541***
	SD	0.4921	0.4961	

Table 5: Ordinary Least Squares

VARIABLES	Student z-score
Class 5	0.188*** (0.0646)
Private School	0.124* (0.0709)
Monograde	0.108 (0.0703)
Age of Child	-0.0288 (0.0219)
Male Child	0.0722 (0.0768)
Father Education	0.0294 (0.0192)
Mother Education	0.00290 (0.0234)
Child Punjabi Speaking	0.182*** (0.0653)
Child Urdu Speaking	0.0465 (0.115)
Ravens zscore	-0.0484* (0.0276)
Child's Highest Education Wish	0.0509*** (0.0184)
Private Tuition	0.109 (0.0773)
Serious Illness past 3yrs	-0.116 (0.0781)
Domestic Work	-0.0284 (0.0717)
Looking after children/babies	-0.0794 (0.0727)
Family Business	-0.262*** (0.0772)
Number of Books at Home	-0.000376 (0.00225)
Father reads newspaper	0.0334 (0.0784)
Parents Rarely Inquire	0.0412 (0.0632)
No of people in House	0.00241 (0.00774)
Rooms in House	-0.00167 (0.0118)
Teacher Experience	-0.00142 (0.0115)
Teacher Experience Squared	2.00e-05

	(0.000251)
Teacher Male	-0.171**
	(0.0829)
Teacher Twelfth	0.170*
	(0.0928)
Teacher Bachelors	0.116*
	(0.0635)
Teacher PTC Training	0.0681
	(0.0719)
Teacher No Training Certificate	-0.117
	(0.157)
Teacher Training Days	0.0104**
	(0.00421)
Teacher Salary Log	0.0529
	(0.0656)
Teacher zscore language	0.0943***
	(0.0294)
Teacher zscore maths	-0.0623**
	(0.0314)
Children under 5	-0.0757
	(0.0662)
Children 6 to14	-0.0169
	(0.0605)
Dissatisfied with salary	0.221***
	(0.0735)
Dissatisfied with facilities	-0.271***
	(0.0663)
Associated PP	-0.132
	(0.0919)
Teacher Problems	-0.258***
	(0.0860)
Leaders Effective	0.00518
	(0.0880)
Teachers active in unions	0.126*
	(0.0708)
Performance related pay	0.161
	(0.108)
Salary reduction for absence	0.0585
	(0.0672)
All students capable in maths	-0.0726
	(0.0645)
Use new training techniques	-0.103
	(0.145)
Satisfied with own skills and knowledge	-0.135
	(0.0959)
Have difficulties in Maths teaching	0.220***
	(0.0684)
Boys more passionate about studies	-0.370***

	(0.0912)
Boys more capable in maths	0.269***
	(0.0697)
Send reports annually to parents	0.124*
	(0.0665)
Inquire about student absence	-0.0119
	(0.0768)
Parents are attentive	-0.0934
	(0.0721)
Parents no objection to teachers punishing	0.275***
	(0.0757)
Gender Match	0.0961
	(0.0767)
Constant	-1.450*
	(0.837)
Observations	1,262
R-squared	0.203

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: School Fixed Effects

VARIABLES	Student zscore
Class 5	0.0805 (0.0675)
Monograde	-0.0657 (0.114)
Age of Child	-0.0152 (0.0200)
Male Child	-0.00745 (0.0909)
Father Education	0.00389 (0.0170)
Mother Education	0.00234 (0.0217)
Child Punjabi Speaking	-0.118 (0.0888)
Child Urdu Speaking	-0.147 (0.133)
Ravens zscore	0.0132 (0.0310)
Child's Highest Education Wish	0.0292 (0.0182)
Private Tuition	0.00736 (0.0716)
Serious Illness past 3yrs	-0.0897 (0.0725)
Domestic Work	0.157** (0.0715)
Looking after children/babies	0.0489 (0.0740)
Family Business	0.0125 (0.0865)
Number of Books at Home	-0.00181 (0.00247)
Father reads newspaper	0.0759 (0.0682)
Parents Rarely Inquire	0.00672 (0.0671)
No of people in House	-0.00235 (0.00755)
Rooms in House	0.00307 (0.0138)
Teacher Experience	0.0351* (0.0210)
Teacher Experience Squared	-0.000640 (0.000458)
Teacher Male	0.323*

	(0.183)
Teacher Twelfth	0.0703
	(0.146)
Teacher Bachelors	-0.0743
	(0.120)
Teacher PTC Training	-0.354**
	(0.141)
Teacher No Training Certificate	0.610
	(0.425)
Teacher Training Days	0.0185*
	(0.00994)
Teacher Salary Log	-0.0666
	(0.147)
Teacher zscore language	-0.171**
	(0.0695)
Teacher zscore maths	0.380***
	(0.108)
Children under 5	-0.271**
	(0.134)
Children 6 to14	0.562***
	(0.153)
Dissatisfied with salary	0.0556
	(0.149)
Dissatisfied with facilities	-0.441***
	(0.157)
Associated PP	-0.475**
	(0.229)
Teacher Problems	-0.794***
	(0.271)
Leaders Effective	0.0635
	(0.236)
Teachers active in unions	-0.597**
	(0.236)
Performance related pay	-0.135
	(0.319)
Salary reduction for absence	-0.420**
	(0.202)
All students capable in maths	0.118
	(0.216)
Use new training techniques	0.623*
	(0.373)
Satisfied with own skills and knowledge	-0.120
	(0.232)
Have difficulties in Maths teaching	0.499***
	(0.163)
Boys more passionate about studies	-0.116
	(0.265)
Boys more capable in maths	0.245

	(0.191)
Send reports annually to parents	-0.821***
	(0.198)
Inquire about student absence	0.340
	(0.226)
Parents are attentive	-0.0215
	(0.210)
Parents no objection to teachers punishing	0.0980
	(0.199)
Gender Match	0.0680
	(0.0837)
Constant	0.683
	(1.793)
Observations	1,262
Number of u_schoolid	102
R-squared	0.108
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 7: School Fixed Effects analysis separated by subject

VARIABLES	Student Language zscore	Student Maths zscore
Class 5	0.110 (0.0681)	0.0574 (0.0676)
Monograde	-0.110 (0.116)	0.0179 (0.114)
Age of Child	-0.0206 (0.0201)	-0.00957 (0.0200)
Male Child	-0.0318 (0.0914)	0.0181 (0.0911)
Father Education	-0.00751 (0.0172)	0.0112 (0.0171)
Mother Education	0.00312 (0.0218)	0.00225 (0.0218)
Child Punjabi Speaking	-0.0230 (0.0891)	-0.183** (0.0890)
Child Urdu Speaking	-0.0402 (0.135)	-0.234* (0.134)
Ravens zscore	0.00532 (0.0312)	0.0170 (0.0310)
Child's Highest Education Wish	0.0158 (0.0185)	0.0352* (0.0182)
Private Tuition	-0.0101 (0.0718)	0.0262 (0.0717)
Serious Illness past 3yrs	-0.102 (0.0728)	-0.0550 (0.0727)
Domestic Work	0.145** (0.0720)	0.148** (0.0717)
Looking after children/babies	0.0618 (0.0743)	0.0204 (0.0741)
Family Business	0.0117 (0.0873)	-0.000566 (0.0866)
Number of Books at Home	-0.00237 (0.00248)	-0.00134 (0.00247)
Father reads newspaper	0.0750 (0.0687)	0.0626 (0.0683)
Parents Rarely Inquire	-0.0397 (0.0676)	0.0416 (0.0672)
No of people in House	-0.00144 (0.00760)	-0.00180 (0.00756)
Rooms in House	0.00277 (0.0138)	0.00311 (0.0138)
Teacher Experience	0.0572*** (0.0211)	0.00848 (0.0210)
Teacher Experience Squared	-0.00108** (0.000461)	-8.50e-05 (0.000459)

Teacher Male	0.322*	0.282
	(0.183)	(0.183)
Teacher Twelfth	-0.00142	0.108
	(0.147)	(0.146)
Teacher Bachelors	0.0317	-0.178
	(0.121)	(0.120)
Teacher PTC Training	-0.167	-0.448***
	(0.142)	(0.142)
Teacher No Training Certificate	0.959**	0.271
	(0.428)	(0.426)
Teacher Training Days	0.0128	0.0193*
	(0.00999)	(0.00996)
Teacher Salary Log	-0.0922	-0.0403
	(0.148)	(0.148)
Teacher zscore language	-0.201***	-0.123*
	(0.0697)	(0.0697)
Teacher zscore maths	0.407***	0.304***
	(0.108)	(0.108)
Children under 5	-0.216	-0.298**
	(0.135)	(0.134)
Children 6 to14	0.637***	0.472***
	(0.157)	(0.153)
Dissatisfied with salary	0.243	-0.113
	(0.150)	(0.149)
Dissatisfied with facilities	-0.293*	-0.502***
	(0.158)	(0.158)
Associated PP	-0.619***	-0.278
	(0.230)	(0.229)
Teacher Problems	-0.758***	-0.735***
	(0.272)	(0.271)
Leaders Effective	0.0813	0.0725
	(0.237)	(0.236)
Teachers active in unions	-0.561**	-0.580**
	(0.238)	(0.236)
Performance related pay	-0.167	-0.0625
	(0.320)	(0.319)
Salary reduction for absence	-0.539***	-0.300
	(0.205)	(0.203)
All students capable in maths	0.164	0.0389
	(0.217)	(0.217)
Use new training techniques	0.785**	0.464
	(0.376)	(0.374)
Satisfied with own skills and knowledge	-0.165	-0.0891
	(0.234)	(0.232)
Have difficulties in Maths teaching	0.485***	0.450***
	(0.164)	(0.164)
Boys more passionate about studies	-0.0212	-0.176
	(0.267)	(0.265)

Boys more capable in maths	0.320*	0.162
	(0.192)	(0.192)
Send reports annually to parents	-0.862***	-0.681***
	(0.200)	(0.198)
Inquire about student absence	0.293	0.361
	(0.227)	(0.226)
Parents are attentive	0.0749	-0.108
	(0.211)	(0.210)
Parents no objection to teachers punishing	0.0606	0.0909
	(0.199)	(0.199)
Gender Match	0.119	0.0122
	(0.0841)	(0.0839)
Constant	0.515	0.665
	(1.798)	(1.797)
Observations	1,253	1,262
R-squared	0.100	0.109
Number of u_schoolid	102	102

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

Table 8 School Fixed Effects analysis separated by Student Gender

VARIABLES	Female Student zscore	Male Student zscore
Class 5	-0.113 (0.119)	0.229** (0.115)
Monograde	0.0575 (0.179)	-0.155 (0.195)
Age of Child	0.00575 (0.0312)	-0.0178 (0.0281)
Father Education	-0.00786 (0.0241)	0.0150 (0.0263)
Mother Education	0.00340 (0.0323)	-0.0270 (0.0327)
Child Punjabi Speaking	-0.252* (0.140)	-0.0216 (0.126)
Child Urdu Speaking	-0.281 (0.201)	-0.156 (0.195)
Ravens zscore	0.0284 (0.0465)	0.0397 (0.0463)
Child's Highest Education Wish	0.0359 (0.0273)	0.00643 (0.0269)
Private Tuition	-0.0504 (0.103)	-0.00934 (0.111)
Serious Illness past 3yrs	-0.138 (0.105)	0.0247 (0.108)
Domestic Work	0.212** (0.102)	0.0204 (0.108)
Looking after children/babies	-0.0429 (0.106)	0.209* (0.117)
Family Business	-0.0304 (0.158)	0.0390 (0.115)
Number of Books at Home	0.000492 (0.00380)	-0.00157 (0.00358)
Father reads newspaper	0.0570 (0.0984)	0.179* (0.105)
Parents Rarely Inquire	0.0648 (0.105)	-0.0858 (0.0989)
No of people in House	-0.00539 (0.0118)	-0.000644 (0.0105)
Rooms in House	0.00128 (0.0168)	-0.0116 (0.0272)
Teacher Experience	0.138 (0.121)	0.0752 (0.0537)
Teacher Experience Squared	-0.00456 (0.00297)	-0.00133 (0.00113)
Teacher Male	1.010 (0.732)	0.520 (0.460)
Teacher Twelfth	-1.425	0.277

	(0.869)	(0.813)
Teacher Bachelors	0.491	-0.177
	(0.319)	(0.349)
Teacher PTC Training	-0.383	-0.511
	(0.419)	(0.524)
Teacher No Training Certificate	1.841	-0.264
	(1.446)	(1.471)
Teacher Training Days	0.146**	0.000294
	(0.0673)	(0.0339)
Teacher Salary Log	0.756	-0.777
	(0.656)	(0.484)
Teacher zscore language	-0.149	-0.247
	(0.343)	-0.363
Teacher zscore maths	1.065***	0.56
	(0.383)	-0.461
Children under 5	-0.596***	-0.297
	(0.222)	(0.289)
Children 6 to14	1.297***	1.859***
	(0.298)	(0.698)
Dissatisfied with salary	-0.767	-0.831
	(0.521)	(0.518)
Dissatisfied with facilities	0.223	-0.463
	(0.544)	(0.696)
Associated PP	-1.818**	-0.807
	(0.904)	-0.65
Teacher Problems	-1.315**	0.161
	(0.603)	(0.954)
Leaders Effective	0.00467	0.0320
	(0.647)	(0.441)
Teachers active in unions	-2.060***	-0.282
	(0.736)	(0.632)
Performance related pay	0.855	-0.632
	(1.265)	(0.861)
Salary reduction for absence	-0.950	0.00579
	(0.654)	(0.757)
All students capable in maths	2.932**	-1.067
	(1.212)	(0.954)
Use new training techniques	1.157	0.908
	(1.020)	(1.379)
Satisfied with own skills and knowledge	-1.074*	1.286
	(0.595)	(1.180)
Have difficulties in Maths teaching	1.026	0.0610
	(0.780)	(0.458)
Boys more passionate about studies	-2.357	0.714
	(1.456)	(0.992)
Boys more capable in maths	1.127	0.210
	(0.693)	(0.633)
Send reports anually to parents	-1.052	-1.518***

	(1.153)	(0.581)
Inquire about student absence	-3.202*	0.389
	(1.681)	(0.806)
Parents are attentive	-1.260**	-1.011
	(0.611)	(0.814)
Parents no objection to teachers punishing	0.693	-0.0921
	(0.952)	(0.744)
Constant	-8.418	7.598
	(9.043)	(5.885)
Observations	581	681
R-squared	0.199	0.156
Number of u_schoolid	67	72
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

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