EFFECT OF TEACHER TRANSFERS POLICY ON STUDENT LEARNING: EVIDENCE FROM INDIA*

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Abstract

In this paper, we study the impact of policy induced teacher transfers in government primary schools in India on student learning outcomes. We utilize a government policy implemented in an Indian state in 2016 providing us with an exogenous variation in teacher transfers. We leverage the variation in the intensity of the program to employ a difference-in differences estimation framework using a rich panel data on primary schools and find a significant negative impact of the teacher transfers program on student learning outcomes. In terms of mechanisms, we find that schools with larger transfers lose greater number of teachers, making pupil teacher ratio worse and also losing more qualified teachers.

Key words: Teachers, Schools, Transfers, Learning
JEL Classifications: I21, I28, M54

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1 Introduction

One of the Sustainable Development Goals set up in 2015 by the United Nations General Assembly is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Since teachers are an important input in the education production function, teacher management becomes crucial. One of the ways in which school education can be affected is through transfers of teachers across schools. Shifting of teachers can be done in government schools only since these require administrative control over a large number of schools across which reallocation is possible. Private schools on the other hand are individual profit making units making teacher transfers a non viable option. Teacher transfers in government schools occur due to both demand and supply side factors. Demand side factors include teachers' aversion to working in remote areas (Fagernäs and Pelkonen (2020), Kremer et al. (2005)), home location, family reasons, gender and caste segregation (Fagernäs and Pelkonen (2017)); whereas supply side factors include political factors, reward for good work, promotions and rationalization [1], on disciplinary grounds (NUEPA (2016)).

Using data from public primary schools from 91 countries, Walter (2020) finds that pupil teacher ratio (PTR) is low and varies little across schools in developed economies whereas in developing economies, PTRs are large and there is a huge variation across schools. High PTRs are found in areas with low levels of wealth and adult literacy, and poor school infrastructure. Thus, schools in rural areas are found to have high PTR compared to urban schools in developing economies. These findings can be looked at in conjunction with papers studying teacher preferences for school working environment. Using Italian teacher transfer application data, Barbieri et al. (2011) find that teachers tend to move away from schools in areas with high illiteracy rate, higher proportion employed in agriculture and schools away from home. Urban origin teachers have been found to be more averse to remote locations than rural origin teachers with women exhibiting stronger location preferences than men (Fagernäs and Pelkonen (2012)). As teachers' pay remain the same post transfer, school location features play an important non-pecuniary aspect. Such a preference for working in urban areas has been documented in African countries as well (Mulkeen (2005)). In this context, using Indian data, Agarwal et al. (2018) show that the local redistribution of educational resources via teacher transfers between neighboring public schools can improve equity in access to teachers.

In developing economies especially, a strong connection between political factors and teacher working has been documented. Powerful politicians and bureaucrats oblige

[1] The transfer of teachers to correct imbalance in the distribution of teachers and promote equity is referred to as rationalization

politically helpful teachers with transfers of their choice, regardless of school need, and punish disobedience with undesirable transfers (Sharma and Ramachandran (2009)). Beteille (2009) in her study finds that teachers need connections if they require a transfer and they are required to pay money to get a favourable post even after having a connection. Such links have been documented in other African countries as well (Asim et al. (2019)).

Teacher transfers can impact the schooling system in multiple ways. Teacher transfers from one school to another can lead to disruption in classes which can adversely impact student learning. This disruption could affect teachers as well as students since both will have to adjust to a new environment post the transfer[2]. If transfers result in moving teachers from overstaffed schools to understaffed schools leading to better Pupil Teacher Ratio, it may lead to better learning outcomes. Transfers can also change significantly the student teacher characteristics match in terms of gender, caste and performance. Teacher peer effects can also kick in impacting student learning significantly (Sun et al. (2017), Jackson et al. (2009)). The overall effect of teacher transfers on student learning is thus an empirical question which we try to answer in our study.

We leverage the Teachers Transfer Policy implemented in Haryana, a large Indian state with a population of 25.35 million[3]. The policy was implemented by the Government of Haryana in June, 2016. Under the policy, every teacher serving in a zone for at least five years has to be involuntarily transferred to another school. One of the aims of the transfer policy is to make transfers transparent and hence the entire process of transfer in and transfer out is conducted online using the Management Information System (MIS) portal. Other Indian states (Karnataka in 2007, Punjab in 2019, Assam in 2020) have also implemented online teacher transfers policy. In light of the other states implementing similar policies, understanding the impact of transfers policy on student learning outcomes becomes all the more important.

We use the District Information System for Education (DISE) data for accessing information on student academic performance quantified by the percentage of students in class 5 scoring above 60 % and other school, teacher and children characteristics averaged at the school level. We use the Management Information System (MIS) data set for creating our main independent variable which is the pool of eligible teachers in a school. Merging the two data sets, we create a balanced panel of 6,394 government primary schools from the

[2]This disruption could also be a function of the timing of transfers. If these occur at the start of the year, students might have to adjust less since students are used to being taught by a new teacher when they enter a new grade but if these occur during the middle of the year, the disruption may be more since a rapport between the teachers and students would have already been made. Thus, timing of the transfers may matter.

[3]As per 2011 census

year 2014-15 to 2017-18. Using this data, we see in figure 1 that under the teacher transfers policy, around 16000 transfers occurred during the academic year 2016-17, which is a major change compared to the other three years during which very low number of transfers take place. A teacher is categorised as transferred in year 2014-15 (analogously for other years) if she is in a school on April 1, 2014 and is observed in another school on October 31[4], 2014. We thus define 2014-15 and 2015-16 as pre - policy years and 2016-17 and 2017-18 as post policy years. Since existing studies have shown that transfers are correlated with political variables, we use the number of teachers in the eligible pool for transfer under the policy to estimate the impact. Our empirical methodology relies on using the variation in the intensity with which the policy impacts schools controlling for a series of fixed effects and time trends.

We find that teacher transfers lead to a significantly negative impact on student academic performance. In terms of the effect size of transfers on student academic performance, we find that a one standard deviation increase in the pool of eligible teachers in a school leads to a decrease in percentage of students scoring above 60 percent by 6.2 %. Put differently, our results show that if a school goes from no teachers in eligible pool to a maximum of 21 teachers in the eligibility pool, the percentage of first class holders decreases by a massive 61.7 %. Additionally, we find that the transfers policy leads to an increase in Pupil Teacher Ratio which could be one of the mechanisms for the negative impact we obtain. We also find heterogeneity in the effects of transfers, with schools with higher number of teachers and better Pupil Teacher Ratio at the baseline (2015 -16) driving this negative impact. Furthermore, we find that the composition of the class at the baseline also drives these results. Schools which had a lower proportion of girls enrolled in the baseline year and a lower proportion of students belonging to socially backward classes (Scheduled Class (SC) and Other Backward Classes (OBC)) were more likely to be impacted significantly negatively by the transfers.

Since, in DISE data, learning outcomes are reported by schools and may suffer from biased reporting, we also use Annual Status of Education Report (ASER) data which is collected by an independent NGO, Pratham. We are able to map a child surveyed under ASER to the district she studies in rather than the school she studies at. Hence using ASER, we create our independent variable of interest, that is, the pool of eligible teachers, at the district level. We find a statistically significant negative impact on reading score in the short term (2016-17). For the long term, we find a significant negative effect as well, although not very robust.

[4]October 31 is chosen as the date for classifying transfers since in 2016 (the policy year), transfers are issued around mid September and are executed by October 31.

We conduct multiple robustness checks to see if our results hold up. Firstly, we examine if the policy year with massive teacher transfers experienced a significant change in multiple school characteristics like boys' toilets , number of girls' toilets , classrooms, playground, library books, computers, road access, computer assisted learning (CAL) lab, number of working days and functional electricity. We do not find a significant change in any of these school characteristics building our confidence that the results are not driven by a significant change in school infrastructure in the policy year. Secondly, we also check if our results are robust to controlling for school characteristics that vary with time and we find that our results remain unchanged. Thirdly, we assign fake number of eligible teachers for each school keeping the original distribution of eligible teachers intact and look at the impact of randomised fake eligibility on student performance using 1000 simulated regressions. We find that the coefficients obtained using randomised eligibility are closer to zero and differ significantly from the actual coefficient ruling out the possibility of our results being driven by chance.

Our study contributes to multiple strands of literature. Firstly, we contribute to the literature that tries to understand the role of teachers as an input in the educational production function (Glewwe et al. (2011)). Secondly, existing analysis on the potential effects of teacher transfers on learning are limited in the context of developing countries. Grissom et al. (2014) evaluate an involuntary teacher transfer policy in Miami under which school principals choose teachers for a transfer. They find that principals in low performing schools could identify low performing teachers for a transfer. In India, Fagernäs and Pelkonen (2020) find significant increases in teacher transfers and moderate increases in hiring after the state assembly elections. They also find that this reorganisation of teachers led to a decrease in student learning. Our study, on the other hand, evaluates the impact of teacher transfers induced by an online teacher transfers policy implemented by the Government to make the process of transfers transparent and unaffected by political factors. Since teacher transfers are limited to government schools and we find that these lead to negative student learning outcomes, our findings can provide a new angle to the literature on the relative effectiveness of private versus public schooling (Muralidharan and Sundararaman (2015), Singh (2015)). Finally, more generally, we contribute to the literature investigating management practices in public sector institutions (Bloom et al. (2015), McCormack and Propper (2014), Rasul and Rogger (2018)).

The paper is organised as follows : we begin with a background of the education system in Haryana and the teachers transfer policy. Section 3 describes the data-sets used and the summary statistics of the variables used in our analysis. Section 4 discusses the empirical model, section 5 goes through the main results and section 6 explores if the results show

heterogeneity. In Section 7, we check if our results are robust to further checks. In section 8, we explore potential mechanisms for the effect and section 9 concludes.

2 Policy Background

The distribution of Government schools in Haryana is shown in figure 2. We find that all schools catering to primary classes in Haryana are stand-alone primary schools. Unlike higher grades, primary classes do not require subject specialisation and any teacher in a primary-only school can teach any subject from grades 1 to 5. Presence of schools offering classes 1 to 8 would have complicated our analysis since many a times, a teacher specialised to teach classes 6 to 8 is asked to teach a primary class due to teacher shortage. It would have been difficult to ascertain in that case if the teacher is teaching primary grades. Thus, such a distribution of schools helps in our analysis and we restrict to primary schools.

The teachers transfer policy was introduced in Haryana in June, 2016 so as to conduct government teacher transfers in the state in a transparent manner and to ensure that teachers serve in both rural and urban areas. In Haryana, all Government Schools of a district are categorized into seven zones for the purpose of transfer of teachers. The initial zones (1-5) are closer to cities and district and block headquarters whereas the latter ones (zones 6,7) cover more rural and backward areas[5]. Under the policy, any teacher, having spent at least five years in a particular zone, will have to shift involuntarily to another school. Furthermore, if the teacher is eligible for a transfer under the policy and is currently working in zones 1 to 5, she is transferred to a school in another zone whereas if she is working in zones 6 or 7, she is allowed to serve in these zones again. This is because zones 6 and 7 cover schools located in remote areas offering very less facilities with teachers mostly unwilling to serve in these zones. Appendix figure A1 shows the location of schools in zones 1-5 and those in zones 6-7 separately. The figure shows that most zone 6-7 schools cover border areas of the district, away from the main city areas.

School wise vacancies are assessed before carrying out the transfer exercise. All teachers then select zones in the order of their preference. The teachers further opt for a preference ordering across available schools, so that their claim could be considered against multiple vacancies within a zone. In case the teacher does not get her preferred choice, she is given any available school in the same zone. In case there is no school available in the said zone, she is considered for the next zone of preference and so on. Appendix table A2 shows movements

[5]In Appendix table A1, we list down the definition of zones for 11 Haryana districts. For districts Bhiwani, Faridabad, Fatehabad, Gurugram, Hisar, Jhajjar, Mewat, Rewari, Sirsa, Sonepat & Yamunanagar where the above stated zoning is not suitably applicable, district zoning is as per Annexure-I in the policy document.

of teachers between zones. We can see that there is a significant displacement of teachers in terms of distance as well as characteristics of the school they have been transferred to. Around 20% teachers have been transferred from Zone 7, which consists of schools in the most backward areas to zones 1 and 2. Similarly, around 25% teachers have been transferred from Zone 2, which consists of schools closer to district headquarters and are more developed, to Zone 7. Thus, for a significant proportion of teachers, transfers entail a significant change in working conditions.

As discussed above, teacher transfer out of a school is a function of duration of stay in a particular zone. Transfer in a school, in turn , is based on the total composite score of points earned by a teacher, out of 78 points. Age is given the highest weightage of 58 points, out of total 78 points. To account for categories like women, women headed households, widows, widowers, differently abled persons, serious ailment, and teachers showing improvement in results, a privilege of maximum 20 points can be availed by the teachers of these categories (detailed scores in appendix table A3). Since maximum weightage is given to age, senior teachers are more likely to get transferred to a school of their liking. All transfers have to be implemented within 15 days of issuance. The transfer exercise is carried out through application software with 1 % cases checked manually on random basis.

The policy was implemented to streamline teacher transfers as there were reports of massive corruption[6] involved in teachers transfers. There is widespread corruption in teacher transfers in Government schools, with teachers having links with local politicians and willing to pay for transfers more likely to be transferred to a school and area of their choice. This policy made transfers more transparent as every transfer along with the score determining the transfer is visible on the Management Information System (MIS) portal. Every teacher is able to see the scores of other teachers and thus determine her score relative to other teachers scores limiting political factors determining these transfers.

3 Data & Summary Statistics

To create our main independent variable, we use the Management Information System (MIS) data which is a proprietary data of the Department of Education, Haryana provided to us under the Chief Minister's Good Governance Associates (CMGGA) Programme. MIS data has the teacher profile of all government school teachers in Haryana. We are able to track each teacher right from her date of joining the system and can ascertain the schools in which she has served along with the duration of service in each school. We use this to create our *Eligibility* variable. Under the Teachers Transfer Policy, drives are run for bulk

[6] Newspaper Article (Hindustan Times)

transfers. In 2016, a drive was run for transfers of primary teachers and these transfer orders were published in mid September 2016. A teacher is classified as 'eligible' for the Teacher Transfer Policy if she has served for more than five years in the same zone right before the transfer drive. Thus, we find out the number of teachers in a school who have been serving in the same zone between August 31, 2011 and August 31, 2016. Those who joined after August 31, 2011 are automatically flagged as ineligible for a transfer since they wouldn't have completed five years of service by August 31, 2016. Thus, we find out the total teachers eligible for transfer in a school. Similarly, we use the MIS data to calculate the total number of teachers in a school on the first day (1^{st} April) of every academic year.

We use the District Information System for Education (DISE) data for the academic years 2014-15 to 2017-18 for accessing information on our dependant variable which is the percentage of students scoring above 60 % in class 5 in a school and various other school, teacher and children characteristics. The data has detailed information on facilities provided by government primary schools like library, playground, computers, Computer Assisted Learning (CAL) Lab to name a few. It also provides us with information on grade level composition in terms of proportion of girls and students belonging to the socially backward classes (Scheduled Caste (SC) and the Other Backward Classes (OBC)). For every year, the data includes a teacher level file which we use to calculate the average age and experience of teachers in a school in an academic year.

Finally, we merge the MIS and DISE datasets to create a balanced school-level panel for the years between 2014-15 to 2017-18 containing 6,394 government primary schools. Table 1 shows the summary statistics for variables used in our analysis categorised into student academic performance, children characteristics, school characteristics and teacher characteristics.

Looking at the academic performance of students in class 5, we find that in the first year of our panel 2014-15, only around a quarter of the students are able to score more than 60 percent in class 5 examinations. We see an improvement in these first class percentages over time, with the overall percentage almost doubling from 25.9 % in 2014-15 to 49.6 % in the academic year 2017-18. There is heterogeneity in the performance of boys and girls as well. In 2014-15, around 29 % of girls are first class holders whereas the number for boys is around 8 percentage points lower at 21.8 %. We see an improvement in the percentage of first class holders among both boys and girls, between 2014-15 and 2017-18, with the level difference of around 8 percentage points remaining the same.

The composition of classes within children characteristics reveals that classes are almost equally split between boys and girls and on an average 80 % of students belong to socially backward classes (SC and OBC). 6 % primary-only government schools in Haryana are boys-

only, 7 % are girls-only and a large 87 % are co-educational schools. PTR has been falling overtime from 32.3 in 2014-15 to 24.6 in 2017-18. We see a dip in total students enrolled in these schools over the years from around 143 students per school in 2014-15 to around 111 in 2017-18. This is in line with the studies showing greater demand for private schools among parents over time. On an average, around 2.9 teachers per school were eligible for the teachers transfer policy in the year 2016. The total number of teachers at the start of the academic year 2016-17 was 3.6, which seems to suggest that a large percentage of total teachers were eligible for transfers. We also see that school characteristics like number of computers, library books, playground, toilets are changing over time. In the latest year in the panel, that is, 2017-18, the average teacher age was around 41 years with an average teaching experience of around 13 years.

The student learning outcomes in DISE data are reported by the school management. These schools may have an incentive to show themselves in a good light which may raise concerns about the reporting bias in the learning outcomes. To overcome this concern, we additionally use the Annual Status of Education Report (ASER) data which has been collected every year since 2005 except for 2015. It is an annual survey that aims to provide reliable estimates of children schooling status and basic learning levels for each state and rural district in India. It is a household-based survey rather than school-based. For our analysis, we use data from the years 2013-14, 2014-15, 2016-17 and 2018-19[7].

Children in the age group 5-16 are tested in basic reading and basic arithmetic[8]. The survey also collects child level characteristics like age, class, sex and household level characteristics like total members, whether the household has access to TV, newspaper, mobile, electricity etc. Village level characteristics like the presence of pucca road, electricity, post office, bank, private health clinic etc are also recorded in the survey. Since we wish to look at children in government primary-only schools, we only retain observations of children studying in classes 1 to 5 in a government school. Based on this data set containing 9549 children over the four years, we present the summary statistics from ASER data in table 2. We see an improvement in the reading and math score of children over the years with the average reading score increasing from 2.93 in 2013-14 to 3.25 in 2018-19 and the average math score increasing from 2.77 in 2013-14 to 2.95 in 2018-19.

[7]In 2017, the Survey went 'Beyond Basics' and collected data on children in the 14-18 age group. Hence, we don't use data from 2017-18 since it excludes children in primary grades.

[8]The reading score allotted to a child is based on the following code : 1 = Child could not read anything; 2 = Child can identify letters; 3 = Child can read words; 4 = Child can read a Standard 1 level text; 5 = Child can read a Standard 2 level text. For mathematics , the code used is : 1 = Child could not do any arithmetic; 2 = Child can recognise numbers 1-9; 3 = Child can recognise numbers 11-99; 4 = Child can do two digit subtraction; 5 = Child can do division (3-by-1 form).

3.1 Correlates of Teacher Eligibility

Since we are using teacher eligibility to look at the effect of transfers on student learning, next we try to understand what factors it is associated with. In table 3, we regress the number of teachers eligible in a school for a transfer under the Teachers Transfer Policy on broadly three set of characteristics in the pre policy baseline year 2015-16, calculated at the school level : school facilities, teacher characteristics and student characteristics. We find that bigger schools are more likely to have a higher number of eligible teachers since we see a significant positive correlation of eligible teachers with total teachers, total students and number of classrooms. This is expected since bigger schools will have more teachers creating a larger pool for eligible teachers.

We also find that schools functioning in rural areas are more likely to have a higher number of eligible teachers. Few school characteristics like number of library books and number of computers are positively correlated with the number of eligible teachers. We also find schools with older teachers and less experience to have more eligible teachers. The above exercise of looking at the correlates of eligible teachers suggests that the number of teachers eligible for a transfer in a school is not random and is correlated positively with the size of schools and other school characteristics. We use these findings in our empirical specification when we control for baseline characteristics interacted with year fixed effects.

4 Empirical Model

This section discusses an empirical model to test the impact of teacher transfers on student academic performance. Since existing studies show that being transferred in and out of schools is correlated with political factors, we use the pool of eligible teachers under the Teachers Transfer Policy to identify the effect of transfers on student academic performance[9]. We consider the following as our main specification:

$$Score_{sbzt} = \alpha_1 + \sum_{t=-1}^{2} \beta_t \, Eligible_{sbz} * Acad\,Year_t + BaselineChar_{sbz} * Acad\,Year_t + \rho_z * t + \gamma_t + \delta_s + \epsilon_{sbzt} \quad (1)$$

[9]The correlation between teachers eligible for a transfer and those transferred out of the school is 78 %. Also, we use the variation in the number of eligible teachers for a transfer rather than the proportion of teachers eligible since we don't find enough variation in the proportion of eligible teachers. In around 60 % schools, all teachers are eligible for a transfer.

where $Score_{sbzt}$ represents the percentage of students in class 5 scoring above 60 % in school s in block[10] b in zone z in academic year t. In the above specification, t taking values from -1 to 2 indicate years 2014 - 15, 2015 - 16, 2016 - 17, 2017 - 18 respectively with t being 2015 - 16 (the latest pre policy year) taken as the base year.

We leverage the varying intensity with which the policy impacts schools to estimate the impact of transfers on student academic performance and thus interact the number of eligible teachers in a school with academic year t. We control for year fixed effects (γ_t) to take into account any factors impacting schools that are common across different years. We also control for school fixed effects (δ_s) to take into account all unobservable time invariant factors at the school level that affect student academic performance. We introduce trends by zone ($\rho_z * t$) to allow for schools in different zones to follow a trend in the student academic performance. Since we find that teacher eligibility is correlated with total teachers, teacher age and teacher experience in table 3 , we also control for these three baseline (2015-16) school characteristics interacted with time fixed effects ($BaselineChar_{sbz} * Acad\ Year_t$). We weight all our regressions by the total students in a school in the year 2015-16 and cluster the standard errors at the block level.

Our coefficients of interest are $\beta_{2016-17}$ for short term effect and $\beta_{2017-18}$ for long term impact on student learning. To check for pre existing trends in student academic performance differing by the number of eligible teachers in a school, we examine the significance of $\beta_{2014-15}$. Our estimates should be taken as Intent to Treat estimates since transfers are taking place at the primary level and our dependant variable is measured at grade 5 level.[11]

5 Main Results

We estimate our main specification presented in equation (1) and report results in column (3) [12] of table 4. We add controls parsimoniously as we go from the left to right specifications in the table. In column (1), we include school fixed effects and year fixed effects and find that coefficient of # Eligible * 2016-17 is significantly negative. In column (2), we add time trends based on zone and find that the significant negative coefficient remains. In our main specification, presented in column (3), we further add time fixed effects based on three baseline (2015-16) variables - total teachers, total students and teacher age. We see that our coefficient of interest remains statistically significant and negative.

[10] A block is an administrative unit smaller than a district which is a smaller administrative unit than a state in India. Haryana has 22 districts and 133 blocks.

[11] Using our data, we can map a teacher to the primary school she is teaching in and not to the exact grades.

[12] In column (4), we control for the time varying school characteristics and find that our results hold up. More on this in section 7 on Robustness Checks.

The coefficient of # Eligible * 2014-15 in all specifications in the table is found to be insignificant and shows that there was no pre-existing trend in academic performance of students in class 5 varying across schools with different number of eligible teachers. This builds our confidence in the assumption that the schools would have had a similar trend between 2015-16 and 2016-17 had there been no policy, reinforcing that the impacts are not driven by confounding pre-trends and the effect could be attributed to the teacher transfers induced by the policy.

We also find that the coefficient of # Eligible x 2017-18 is not significant in any of the specifications in table 4. This could imply that the negative effect of transfers were short lived being seen only for the academic year in which the transfers take place and that the loss in learning is compensated within an year. Additionally, this could also be because the negative effect of transfers is relevant only for certain grades and since the class 5 kids in 2017-18 must have been in class 4 when the policy was implemented, we don't see an impact through the coefficient on 2017-18. Due to unavailability of data on academic performances of students in other grades, we are unable to check the above.

We report the full set of results in Appendix table A4. In the table, year fixed effects show that academic performance has been increasing significantly every year from 2014-15 except for 2016-17. In our main specification presented in column (3), we also find that schools in zones 1,2 and 4 are experiencing an upward trend in scores over time. The reference category for zone time trends is zone 7. We see that compared to zone 7 which covers the most backward areas, the relatively better off zones 1 , 2 , 3 and 4 are experiencing an increasing trend in academic performance of students.

In terms of the effect size of transfers on student academic performance, we find that a one standard deviation increase in the pool of eligible teachers in a school leads to a decrease in percentage of students scoring above 60 % by 6.2 %. Additionally, if a school goes from no teachers in eligible pool to a maximum of 21 teachers in the eligibility pool, the percentage of first class holders decrease by a massive 61.7 %.

5.1 More Evidence using ASER

In the last section, we demonstrated that there is worsening of student academic performance- as quantified by the percentage of students in class 5 in a school scoring above 60% reported in DISE, which is self reported by schools. There may be concerns about schools over-reporting learning outcomes. Thus, we use the student performance data from ASER collected by an independent NGO, Pratham to check if our findings hold up. Since ASER is a household survey, we can't link the learning outcome of the child to the school in which she studies.

Hence, we aggregate our main independent variable, that is, the number of eligible teachers in rural areas at the district and define the number of teachers eligible in the district per 100 students as our main independent variable.

ASER provides information on reading and math scores of children in the age group 5-16. We use the standardised reading and math scores and present our results in table 9. Panel A reports the effect on reading scores and Panel B on math scores. We start with a basic specification with year fixed effects and district fixed effects in column (1). In column (2), we add interactions of means of three characteristics - teacher experience, total teachers and teacher age calculated at the district level in baseline year (2014 -15) with academic year. In column (3), we add zone trends by interacting the proportion of schools in each zone in the district in which the child studies with time. In column (4), we add control for child characteristics including gender, age and class followed by column (5), addding controls for household level variables like total members and a wealth index based on indicators for electricity connection, toilet, mobile, TV, newspaper, motor vehicle, reading material and computer usage using principal component analysis. Finally, in column (6), we add controls for village characteristics including indicators for Anganwadi, bank, electricity, post office, pucca road, govt primary health clinic, private health clinic and private school.

We find a strong negative impact on reading in the short term, as can be seen through the coefficient of # Eligible (District) * 2016-17. There is an evidence of a long term (2018-19) negative impact on reading as well that is not very robust since we don't find significance in the first three columns. With respect to math scores, in panel B, we observe negative coefficients but not statistically significant for both short and long term.

6 Heterogeneity Analysis

In this section, we assess if there is heterogeneity in the impact of transfers on student academic performance. Firstly, in table 5, we examine the impact of transfers by gender[13]. Since the coefficient of # Eligible x 2014-15 is statistically insignificant for all specifications in the table, we find that there are no pre-existing trends for both the dependant variables. Using our main specification in columns (3) and (6), we learn that the transfer leads to a significant negative effect on the academic performance for both boys and girls. A one standard deviation increase in the number of teachers in an eligible pool lead to a 5.3 % decrease in the percentage of first class holders among girls and a 6.5 % decrease in percentage of first class holders among boys .

Secondly, in table 6, we check if there is heterogeneity in the effects on learning based

[13]Number of observations drop in this table because of the presence of boys-only and girls-only schools.

on baseline (2015-16) school characteristics. We interact the variable # Eligible x 2016-17 with an indicator variable for schools with above median Pupil Teacher Ratio (PTR) in 2015-16 to see if the effects vary across schools with different baseline PTR. Column (1) shows that the negative effect is seen only for schools with below median PTR showing that the schools which were doing better in terms of pupil teacher ratio pre policy are being negatively impacted by the transfer policy. In column (2), we find that the above median schools(in terms of baseline total students) experienced a decrease in the student learning outcomes. Next we check if the composition of students in class 5 in the base year drives our results. We see that schools with lower than median proportion of students belonging to socially backward classes (OBC & SC, column (3)) and lower than median proportion of girls in class 5 (column (4)) see a significantly negative impact on student academic performance due to the transfer policy.

7 Robustness Checks

As mentioned in the section on summary statistics , we see that there is temporal variation in characteristics within a school. We conduct three robustness checks to bolster our empirical analysis. Firstly, we test if any other school variable significantly changes in the policy year and may explain the negative impact on learning outcomes. In table 8, we check if there is an impact on school characteristics like number of Boys' Toilets, number of Girls' Toilets , number of Classrooms, presence of Playground, number of Library Books, number of Computers, whether the school is accessible through a road, presence of a Computer Assisted Learning (CAL) Lab, number of working days and presence of electricity connection in the school. Studying the coefficient of # Eligible x 2016-17 in all the ten columns, we find that none of the school characteristics change significantly in the policy year. This builds our confidence in our main results reinforcing that the negative impacts on student learning outcome is being driven by the transfers and not by a significant deviation in other school characteristics.

Secondly, we control for various school characteristics in a time varying manner. The results for this robustness check are presented in appendix table A5. We group school characteristics into three with group I including number of boys' toilets, number of girls' toilets, availability of playground, electricity , Computer Assisted Learning (CAL) lab, group II including number of classrooms, library books and computers and group III including whether the school is approachable by a road and the number of workdays in the school year. Controlling for these groups sequentially, we see that the results in all three specifications qualitatively remain the same.

Thirdly, we perform a placebo test by randomly assigning number of eligible teachers to different schools keeping the actual distribution of eligible teachers intact. We then estimate the coefficient of *Eligible * Acad Year* for the year 2016-17 using our main specification (equation (1)). The randomisation helps us estimate the effect of transfers on student learning by chance and hence we expect that coefficients obtained using these fake eligibility numbers should be close to zero and significantly different from the coefficient we get by using actual eligibility numbers. We repeat this exercise of assigning random fake eligibility and estimating the coefficient a 1000 times and graph these coefficients using a histogram in figure 4. The difference between coefficients obtained using randomisation and the actual coefficient, represented using a red vertical line help in allaying our doubts about obtaining the negative effect on student learning by chance.

8 Mechanisms

In this section, we check for potential mechanisms driving our main results. Since the transfers policy lead to shifting of teachers, we check for changes in teacher characteristics. In table 7, we look at the impact of the Transfers Policy on teacher variables like total teachers (on September 30), Pupil Teacher Ratio, number of teachers with a graduation degree or above and number of teachers with a professional degree. We find that transfers lead to a significant decrease in the total number of teachers in schools with higher number of eligible teachers leading to an increase in Pupil Teacher Ratio. Additionally, the teachers who move out are more qualified in terms of holding a graduate degree or a professional degree leading to a significant decline in the number of qualified teachers. In appendix table A6, we find that transfers do not significantly impact other teacher characteristics like experience, age, number of teachers belonging to General, Scheduled Caste and Other Backward Categories ruling out these teacher characteristics as mechanisms.

Another phenomenon potentially explaining our results is that students switch schools because of transfers. Specifically, it could be that good students switch to schools with less transfers to avoid the disruption caused by large transfers. To investigate this, we check if transfers lead to a non random attrition among students. In appendix table A7, Columns (1) and (2) show evidence of no significant change in enrolment and the likelihood of appearing in exam. Next, in columns (3) to (5), we check if there is any significant change in the composition of class 5 students in terms of proportion of girls in class 5 or proportion of students in class 5 belonging to Other Backward Classes or Scheduled Caste and we don't find any significant impact.

Thus, our results point towards schools being intensively affected by transfers displaying

significant loss in student learning outcomes. Next we check if the overall learning across all schools in Haryana decreases in the policy year. We run a simple regression of our dependant variable, that is, the percentage of students scoring above 60 % on the year dummies with 2015-16 used as the reference category, school fixed effects and observations weighted by the number of students in 2015-16 (base year) and standard errors clustered at the block level. The margins for each academic have been plotted in figure 3. We find that before the policy,student performance is improving between 2014-15 to 2015-16. In the policy year though, we see a dip in learning outcomes compared to 2015-16 which reverses in 2017-18 since we see better performance in 2017-18 compared to 2015-16. This shows that the overall student performance deteriorates in the policy year.

9 Conclusion

Existing studies in both developed and developing economies have documented teacher preference for working in schools with better amenities and high performing students. In developing countries especially, where the variation in school characteristics across regions is huge, this has lead to rural schools being deficient in teachers with a high pupil teacher ratio. Additionally, studies have also linked teacher movement across schools with political factors. To deal with the twin issue of teachers unwilling to work in rural areas and requiring political connections for a favourable transfer, governments have started implementing policies to structure teacher transfers. In this study, we look at the impact of such a policy induced teacher transfers on students' academic performance. Developing countries have made good progress in primary enrollment but huge learning gaps remain. Given the crucial role played by teachers in determining learning outcomes of school children, it is really important to understand how these teacher transfers impact learning.

To answer the question, we create a school level balanced panel data set containing 6,394 primary-only schools in Haryana, a state in India with a population of 25.35 million. We use the Teachers Transfer Policy implemented in Haryana in 2016 to improve transparency in transfers which are otherwise shown to be highly correlated with political factors in developing economies (Sharma and Ramachandran (2009), Beteille (2009), Asim et al. (2019)). The policy led to mass transfers of teachers in primary-only schools in Haryana in 2016. We first correlate teacher eligibility for the policy with school, teacher and child level characteristics and find that the number of eligible teachers in a school is not random. We then utilise the variation in the intensity with which the policy impacts schools to assess the above impact. We find that the teacher transfers lead to a worsening of students' learning outcomes using two datasets - DISE and ASER. We find significant heterogeneity in our

results based on the baseline school characteristics and also see that the adverse impacts are present for both boys and girls.

In light of these results, one has to be cautious while pitching for teacher transfers policy since it increases transparency in the conduct of transfers but not without a cost. Our study finds the evidence of a strong negative impact on student learning in the short term. Future work can delve deeper into understanding whether the timing of transfers matter. It could be the case that some of this disruption can be mitigated if the transfers are conducted at the starting of the year instead of mid-year as was the case with teachers transfer policy. Future work can also involve collecting data on teacher satisfaction with these transfers since the policy does give weight-age to teacher preferences for zones and schools. It might be interesting to see if this transparency in teacher transfers is beneficial to teachers even though students experience significant learning losses in the short term.

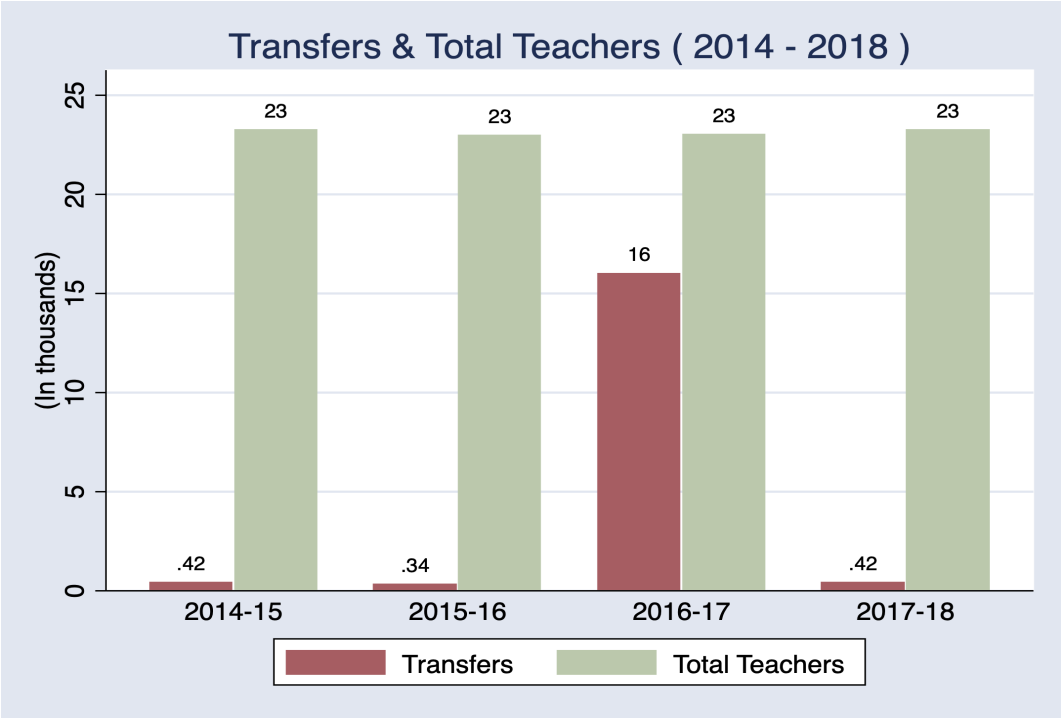

Figure 1: *Notes* : A teacher is categorised as transferred in year 2014-15 if she is in a school on April 1, 2014 and is observed in another school on October 31, 2014. Total teachers in school in 2014-15 represent the total teachers observed in a school on April 1, 2014. Both variables have been defined analogously for the academic years 2015-16, 2016-17 and 2017-18.

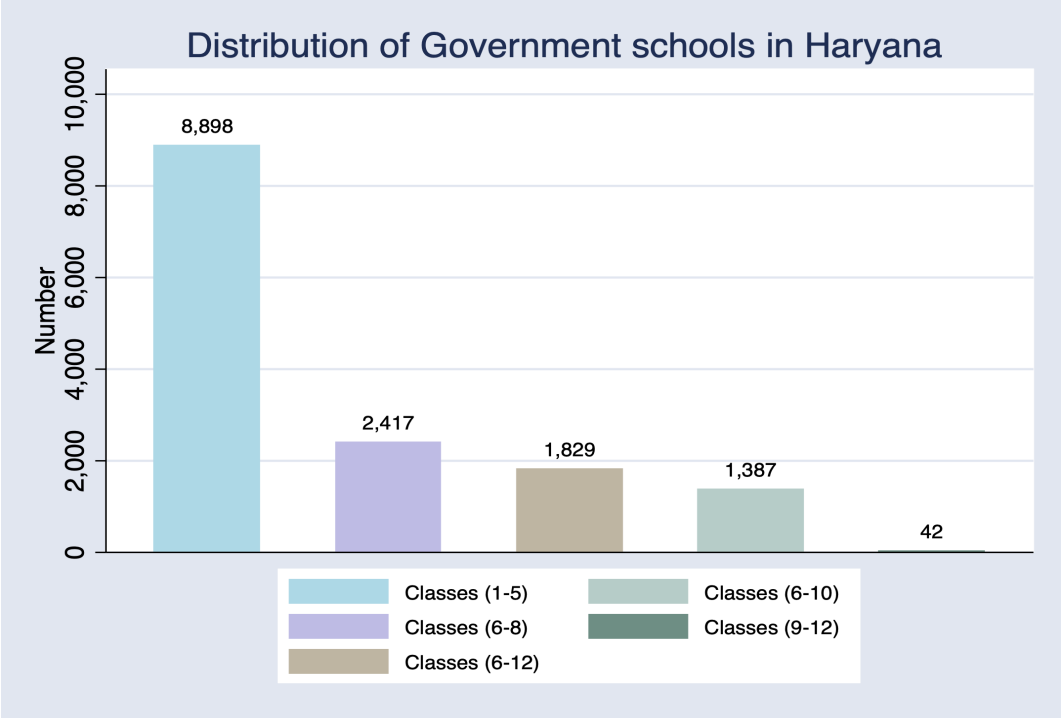

Figure 2: *Source :* DISE (2015-16)

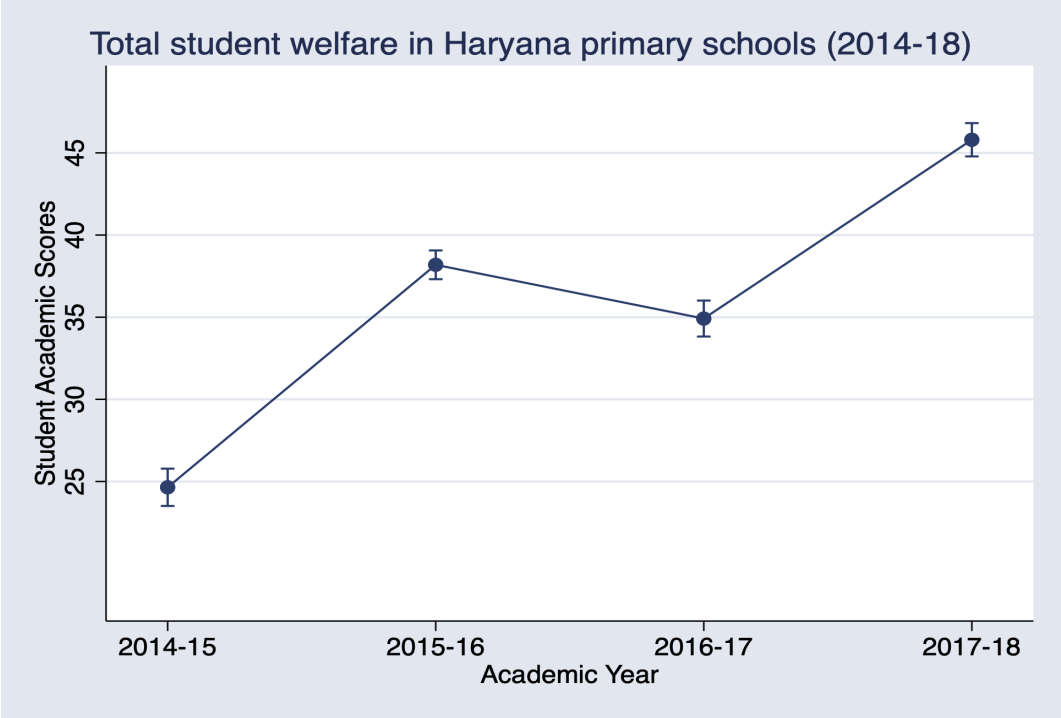

Figure 3: *Sources :* DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS
Notes : We run a simple regression of our dependant variable, that is, the percentage of students scoring above 60 % on year dummies with 2015-16 being the reference, school fixed effects, observations weighted by number of students in 2015-16 (base year) and standard errors clustered at the block level. The margins for each academic year have been plotted in this figure.

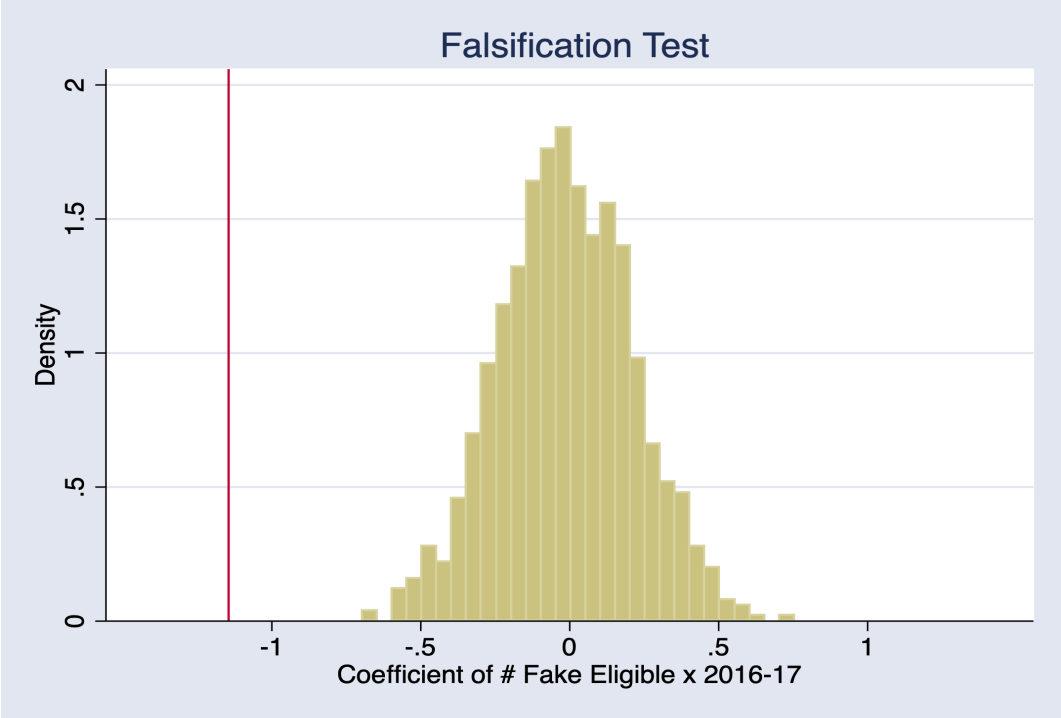

Figure 4: *Sources* : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS
Notes : The graph plots coefficients of *Eligible * Acad Year* for the year 2016-17 using specification in equation (1) from 1000 simulated regressions looking at the impact of randomised eligibility on student learning. The red vertical line at -1.1 represents the estimate using actual eligibility.

Table 1: Summary Statistics : Datasets MIS & DISE

	2014-15			2015-16			2016-17			2017-18			Pooled		
	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD
Student Performance															
Score	6394	25.96	26.77	6394	40.93	27.39	6394	39.09	27.30	6394	49.63	26.75	25576	38.90	28.35
Boys : Score	5846	21.83	27.31	5865	37.03	30.07	5845	34.01	29.90	5833	44.66	30.46	23389	34.38	30.58
Girls : Score	5903	29.34	30.48	5929	44.71	30.90	5912	43.50	31.10	5913	53.91	29.93	23657	42.87	31.84
Children Characteristics															
Girls (Prop.) in 5	6394	0.51	0.23	6394	0.51	0.24	6394	0.52	0.24	6394	0.52	0.24	25576	0.52	0.24
OBC students (Prop.) in 5	6394	0.37	0.29	6394	0.37	0.29	6394	0.35	0.29	6394	0.34	0.29	25576	0.36	0.29
SC students (Prop.) in 5	6394	0.43	0.27	6394	0.43	0.28	6394	0.45	0.29	6394	0.46	0.29	25576	0.44	0.28
Girls (Prop.) in 1-5	6394	0.51	0.20	6394	0.52	0.20	6394	0.52	0.20	6394	0.52	0.20	25576	0.51	0.20
OBC students (Prop.) in 1-5	6394	0.37	0.27	6394	0.36	0.27	6394	0.34	0.27	6394	0.33	0.27	25576	0.35	0.27
SC students (Prop.) in 1-5	6394	0.43	0.25	6394	0.45	0.26	6394	0.46	0.27	6394	0.47	0.28	25576	0.45	0.27
School Characteristics															
Pupil Teacher Ratio	6390	32.31	17.58	6303	32.65	19.33	6321	31.09	22.45	6390	24.59	12.47	25404	30.15	18.59
# Computers	6394	0.07	0.72	6394	0.07	0.73	6394	0.07	0.71	6394	0.07	0.78	25576	0.07	0.73
# Library Books	6394	569.20	449.27	6394	577.59	421.77	6394	565.06	400.76	6394	542.43	395.16	25576	563.57	417.46
Ind : Playground	6394	0.78	0.41	6394	0.80	0.40	6394	0.80	0.40	6394	0.83	0.38	25576	0.80	0.40
Ind : Electricity	6394	0.99	0.11	6394	0.99	0.11	6394	0.99	0.12	6394	0.99	0.10	25576	0.99	0.11
Workdays	6394	235.44	5.55	6394	235.03	3.87	6394	231.32	2.58	6394	226.46	3.57	25576	232.06	5.42
CAL Lab	6394	1.99	0.10	6394	1.99	0.09	6394	1.99	0.09	6394	1.99	0.09	25576	1.99	0.09
# Girls' Toilets	6394	1.69	1.27	6394	1.80	1.32	6394	1.90	8.52	6394	1.83	1.32	25576	1.81	4.40
# Boys' Toilets	6394	1.46	1.08	6394	1.57	1.07	6394	1.57	1.07	6394	1.60	1.10	25576	1.55	1.08
# Classrooms	6394	5.26	2.74	6394	5.30	2.75	6394	5.34	2.73	6394	5.38	2.77	25576	5.32	2.75
Approachability by Road	6394	0.98	0.14	6394	0.98	0.14	6394	0.98	0.14	6394	0.98	0.14	25576	0.98	0.14
Total students	6394	143.43	131.67	6394	117.43	102.81	6394	110.68	97.45	6394	111.27	102.27	25576	120.70	110.20
Boys' Schools	6394	0.06	0.24	6394	0.06	0.24	6394	0.06	0.23	6394	0.06	0.23	25576	0.06	0.24
Girls' Schools	6394	0.07	0.26	6394	0.07	0.26	6394	0.07	0.25	6394	0.07	0.25	25576	0.07	0.25
Co-educational Schools	6394	0.87	0.34	6394	0.87	0.34	6394	0.88	0.33	6394	0.88	0.33	25576	0.87	0.33
Teacher Characteristics															
Total Teachers	6394	4.32	3.11	6394	3.60	2.42	6394	3.57	2.36	6394	4.32	3.11	25576	3.95	2.80
# Eligible	6394	2.92	2.12	6394	2.92	2.12	6394	2.92	2.12	6394	2.92	2.12	25576	2.92	2.12
Teacher Age	6394	38.64	4.60	6394	39.64	4.60	6394	40.64	4.60	6394	41.28	4.49	25576	40.05	4.68
Teacher Experience	6394	10.20	4.56	6394	11.20	4.56	6394	12.20	4.56	6394	12.81	4.49	25576	11.60	4.65

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : CAL Lab indicates the presence of a Computer Assisted Learning Lab in the school. Both Total Teachers and Pupil Teacher Ratio have been calculated for September 30 of each year. Score represents the percentage of students in class 5 in a school scoring above 60%.

Table 2: Summary Statistics : ASER

	2013-14			2014-15			2016-17			2018-19			Pooled		
	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD
Student Performance															
Reading	2667	2.93	1.48	2348	3.03	1.52	2208	3.13	1.48	2326	3.25	1.46	9549	3.08	1.49
Math	2667	2.77	1.24	2348	2.79	1.26	2208	2.85	1.23	2326	2.95	1.19	9549	2.84	1.23
Children Characteristics															
Age	2667	8.16	1.93	2348	8.20	1.92	2208	8.12	1.90	2326	8.03	1.91	9549	8.13	1.92
Female	2667	0.54	0.50	2348	0.52	0.50	2208	0.52	0.50	2326	0.52	0.50	9549	0.53	0.50
Class	2667	3.17	1.42	2348	3.16	1.40	2208	3.14	1.41	2326	3.07	1.39	9549	3.14	1.41
Village Characteristics															
Anganwadi	2667	0.99	0.08	2348	0.96	0.21	2208	0.98	0.13	2326	0.97	0.18	9549	0.98	0.15
Bank	2667	0.36	0.48	2348	0.40	0.49	2208	0.46	0.50	2326	0.42	0.49	9549	0.41	0.49
Post Office	2667	0.48	0.50	2348	0.48	0.50	2208	0.51	0.50	2326	0.44	0.50	9549	0.48	0.50
Electricity	2667	0.99	0.07	2348	1.00	0.04	2208	1.00	0.00	2326	0.99	0.08	9549	1.00	0.06
Pucca Road	2667	0.93	0.26	2348	0.94	0.23	2208	0.94	0.24	2326	0.97	0.17	9549	0.94	0.23
Govt Primary Health Clinic	2667	0.54	0.50	2348	0.49	0.50	2208	0.48	0.50	2326	0.46	0.50	9549	0.49	0.50
Private health Clinic	2667	0.47	0.50	2348	0.45	0.50	2208	0.38	0.48	2326	0.36	0.48	9549	0.42	0.49
Private School	2667	0.55	0.50	2348	0.54	0.50	2208	0.58	0.49	2326	0.56	0.50	9549	0.56	0.50
Household Characteristics															
Total Members	2667	6.90	2.83	2348	6.93	3.20	2208	6.86	2.92	2326	7.18	3.58	9549	6.97	3.14

Sources : ASER (2013-14, 2014-15, 2016-17, 2018-19)

Notes : All village characteristics are indicator variables taking value 1 if the facility is available in the village and 0 otherwise.

Table 3: Correlates of Teacher Eligibility

	(1) # Eligible
Total Teachers	0.749***
	(0.0278)
Teacher Age	0.00703*
	(0.00378)
Total students	0.000469
	(0.000696)
Teacher Experience	-0.00985**
	(0.00435)
SC students (Prop.)	-0.0135
	(0.0789)
Girls (Prop.)	0.0475
	(0.0819)
OBC students (Prop.)	-0.0245
	(0.0770)
# Girls' Toilets	0.0174
	(0.0108)
# Boys' Toilets	0.00779
	(0.0147)
Approachable by Road	0.110
	(0.0684)
Ind : Library	0.262
	(0.255)

# Library Books	0.0000547*
	(0.0000326)
Ind : Playground	-0.0335
	(0.0322)
# Classrooms	0.0258***
	(0.00882)
Ind : Rural	0.533***
	(0.0743)
Pupil Teacher Ratio	-0.00218*
	(0.00114)
Electricity : No	-0.221
	(0.155)
Electricity : Yes (Non functional)	-0.0778
	(0.0680)
# Computers	0.0451*
	(0.0240)
Observations	6303
R-squared	0.83
Zone Fixed Effects	Yes
Block Fixed Effects	Yes

Sources : DISE (2015-16), MIS

Notes : # Eligible indicates the number of teachers eligible for a transfer in a school under the Teachers Transfer policy. The independent variables have been measured in the baseline year (2015-16).

Table 4: Impact of Transfers on Student Academic Performance

	(1) Score	(2) Score	(3) Score	(4) Score
# Eligible x 2014-15	0.0143	0.0196	-0.839	-0.832
	(0.338)	(0.336)	(0.599)	(0.591)
# Eligible x 2016-17	-0.798**	-0.804**	-1.152**	-1.161**
	(0.333)	(0.334)	(0.508)	(0.511)
# Eligible x 2017-18	-0.205	-0.216	0.309	0.286
	(0.302)	(0.301)	(0.599)	(0.592)
Observations	25576	25576	25576	25576
R-squared	0.47	0.47	0.47	0.47
Mean Outcome	35.89	35.89	35.89	35.89
Year Fixed Effects	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes
Zone Trends	No	Yes	Yes	Yes
BaselineChar Year FE	No	No	Yes	Yes
SchoolChar	No	No	No	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : The dependant variable *Score* represents the percentage of students in class 5 in a school scoring above 60%. BaselineChar FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015 -16) with academic year. School characteristics include number of boys' toilets, girls' toilets, availability of playground, library, Computer Assisted Learning lab, number of classrooms, library books, computers and approachability by road. Standard errors, in parentheses, are clustered at block level. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Heterogeneity of effects based on Gender

	Girls			Boys		
	(1) Score	(2) Score	(3) Score	(4) Score	(5) Score	(6) Score
# Eligible x 2014-15	0.234	0.239	-0.598	-0.128	-0.124	-0.880
	(0.338)	(0.336)	(0.615)	(0.356)	(0.355)	(0.660)
# Eligible x 2016-17	-0.661*	-0.667*	-1.070*	-0.809**	-0.813**	-1.048*
	(0.342)	(0.343)	(0.569)	(0.335)	(0.335)	(0.544)
# Eligible x 2017-18	-0.143	-0.153	0.246	-0.179	-0.187	0.378
	(0.294)	(0.294)	(0.636)	(0.345)	(0.344)	(0.670)
Observations	23657	23657	23657	23389	23389	23389
R-squared	0.46	0.46	0.46	0.43	0.43	0.43
Mean Outcome	39.48	39.48	39.48	31.81	31.81	31.81
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Zone Trends	No	Yes	Yes	No	Yes	Yes
BaselineChar Year FE	No	No	Yes	No	No	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : The dependant variable *Score* represents the percentage of students in class 5 in a school scoring above 60%. BaselineChar Year FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015 -16) with academic year. Standard errors, in parentheses, are clustered at block level. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Heterogeneity of effects based on baseline (2015-16) School Characteristics

	(1) Score	(2) Score	(3) Score	(4) Score
# Eligible x 2014-15	-0.851	-0.840	-0.838	-0.838
	(0.599)	(0.600)	(0.600)	(0.600)
# Eligible x 2016-17	-1.044**	-0.469	-1.101**	-1.130**
	(0.521)	(0.591)	(0.530)	(0.483)
# Eligible x 2017-18	0.326	0.322	0.318	0.319
	(0.596)	(0.597)	(0.597)	(0.597)
# Eligible x 2016-17 x PTR (Above Median)	-0.130			
	(0.230)			
# Eligible x 2016-17 x Students (Above Median)		-0.708**		
		(0.331)		
# Eligible x 2016-17 x OBC & SC (Above Median)			-0.0643	
			(0.206)	
# Eligible x 2016-17 x Girls (Above Median)				-0.0209
				(0.225)
Observations	25212	25576	25576	25576
R-squared	0.47	0.47	0.47	0.47
Mean Outcome	35.87	35.89	35.89	35.89
Year Fixed Effects	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes
Zone Trends	Yes	Yes	Yes	Yes
BaselineChar Year FE	Yes	Yes	Yes	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : *PTR (Above Median)* represents schools having above median Pupil Teacher Ratio in the base year (2015-16). *Students (Above Median)* represents schools with above median enrolled students in the base year (2015-16). *OBC & SC (Above Median)* represents schools with above median proportion of enrolled students belonging to backward categories in the base year (2015-16). *Girls (Above Median)* represents schools with above median proportion of enrolled girl students in the base year (2015-16). The dependant variable *Score* represents the percentage of students in class 5 in a school scoring above 60%. BaselineChar Year FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015 -16) with academic year. Standard errors, in parentheses, are clustered at block level. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Impact of Teacher Transfers on Student Performance : Mechanisms

	(1) Total Teachers	(2) PTR	(3) Above Graduation	(4) Professional Degree
# Eligible x 2014-15	-0.0108	1.465	-0.0597*	-0.0567*
	(0.149)	(0.946)	(0.0313)	(0.0301)
# Eligible x 2016-17	-0.340***	4.606**	-0.214**	-0.226***
	(0.0948)	(2.230)	(0.0848)	(0.0797)
# Eligible x 2017-18	0.0193	0.877	0.123	0.132
	(0.153)	(0.741)	(0.163)	(0.153)
Observations	25576	25404	25576	25576
R-squared	0.89	0.51	0.86	0.90
Mean Outcome	6.05	36.38	5.12	6.29
Year Fixed Effects	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes
Zone Trends	Yes	Yes	Yes	Yes
BaselineChar Year FE	Yes	Yes	Yes	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : The dependant variable *Score* represents the percentage of students in class 5 in a school scoring above 60%. BaselineChar Year FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015 -16) with academic year. School characteristics include number of boys' toilets, girls' toilets, availability of playground, library, Computer Assisted Learning lab, number of classrooms, library books, computers and approachability by road. Standard errors, in parentheses, are clustered at block level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Robustness : Does any other school characteristic change in the policy year ?

	(1) Boys' Toilets	(2) Girls' Toilets	(3) Classrooms	(4) Playground	(5) Books
# Eligible x 2014-15	0.0106	-0.0188	0.0477	0.00290	-1.813
	(0.0121)	(0.0185)	(0.0385)	(0.00356)	(3.349)
# Eligible x 2016-17	0.0169	0.0222	-0.0182	0.00274	-0.829
	(0.0148)	(0.0486)	(0.0459)	(0.00259)	(1.944)
# Eligible x 2017-18	0.0225	-0.0168	-0.0405	0.0186**	-0.528
	(0.0257)	(0.0220)	(0.0562)	(0.00842)	(3.050)
Observations	25576	25576	25576	25576	25576
R-squared	0.88	0.35	0.93	0.87	0.92
Mean Outcome	1.80	2.15	6.86	0.79	603.00
	(6) Computers	(7) Road Access	(8) CAL	(9) Workdays	(10) Electricity
# Eligible x 2014-15	-0.000681	-0.000582	-0.00183	0.0611	-0.000551
	(0.00160)	(0.000606)	(0.00149)	(0.124)	(0.00184)
# Eligible x 2016-17	-0.000675	0.000674	-0.000968	0.137	0.00179
	(0.000813)	(0.000661)	(0.00156)	(0.101)	(0.00185)
# Eligible x 2017-18	-0.00505	0.00113	0.0000380	0.159	-0.00246
	(0.00906)	(0.000768)	(0.00231)	(0.122)	(0.00180)
Observations	25576	25576	25576	25576	25576
R-squared	0.94	0.87	0.88	0.61	0.61
Mean Outcome	0.18	0.99	1.99	232.08	0.99
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes
Zone Trends	Yes	Yes	Yes	Yes	Yes
BaselineChar Year FE	Yes	Yes	Yes	Yes	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : CAL indicates the presence of a Computer Assisted Lab in the school. BaselineChar Year FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015 -16) with academic year. Standard errors, in parentheses, are clustered at block level. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Impact of Teacher Transfers on Reading & Math : ASER

	(1) Z-score	(2) Z-score	(3) Z-score	(4) Z-score	(5) Z-score	(6) Z-score
Panel A : Reading						
# Eligible (District) x 2013-14	-0.0889**	-0.0576	-0.0520	-0.0604	-0.0546	-0.0575
	(0.0409)	(0.0524)	(0.0598)	(0.0418)	(0.0409)	(0.0402)
# Eligible (District) x 2016-17	-0.133*	-0.144*	-0.159*	-0.178***	-0.181***	-0.183***
	(0.0653)	(0.0811)	(0.0800)	(0.0438)	(0.0476)	(0.0496)
# Eligible (District) x 2018-19	-0.125	-0.0880	-0.0877	-0.0942*	-0.144***	-0.142***
	(0.0940)	(0.0889)	(0.0752)	(0.0523)	(0.0474)	(0.0456)
Observations	9549	9549	9549	9549	9549	9549
R-squared	0.07	0.08	0.08	0.38	0.40	0.41
Panel B : Math						
# Eligible (District) x 2013-14	-0.0367	0.0292	0.0304	0.0190	0.0249	0.0370
	(0.0573)	(0.0585)	(0.0579)	(0.0485)	(0.0493)	(0.0486)
# Eligible (District) x 2016-17	-0.0327	0.0126	0.0000327	-0.0210	-0.0241	-0.0147
	(0.0625)	(0.0571)	(0.0613)	(0.0575)	(0.0535)	(0.0526)
# Eligible (District) x 2018-19	-0.127	-0.0506	-0.0428	-0.0475	-0.100**	-0.0962**
	(0.0837)	(0.0571)	(0.0560)	(0.0428)	(0.0428)	(0.0432)
Observations	9549	9549	9549	9549	9549	9549
R-squared	0.07	0.07	0.07	0.37	0.39	0.39
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
BaselineChar Year FE	No	Yes	Yes	Yes	Yes	Yes
Zone Trends	No	No	Yes	Yes	Yes	Yes
Child Characteristics	No	No	No	Yes	Yes	Yes
HH Characteristics	No	No	No	No	Yes	Yes
Village Characteristics	No	No	No	No	No	Yes

Sources : ASER (2013-14, 2014-15, 2016-17, 2018-19), MIS

Notes : BaselineChar Year FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2014 -15) with academic year. Zone Trends represent the interaction of proportion of schools in each zone in the district in which the child studies with time. Child Characteristics include gender, age and class. HH Characteristics include household level variables like total members and a wealth index based on indicators for electricity connection, toilet, mobile, TV, newspaper, motor vehicle, reading material and computer usage using principal component analysis. Village Characteristics include indicators for Anganwadi, bank, electricity, post office, pucca road, govt primary health clinic, private health clinic and private school. Standard errors, in parentheses, are clustered at district level. *** p<0.01, ** p<0.05, * p<0.1

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Appendix

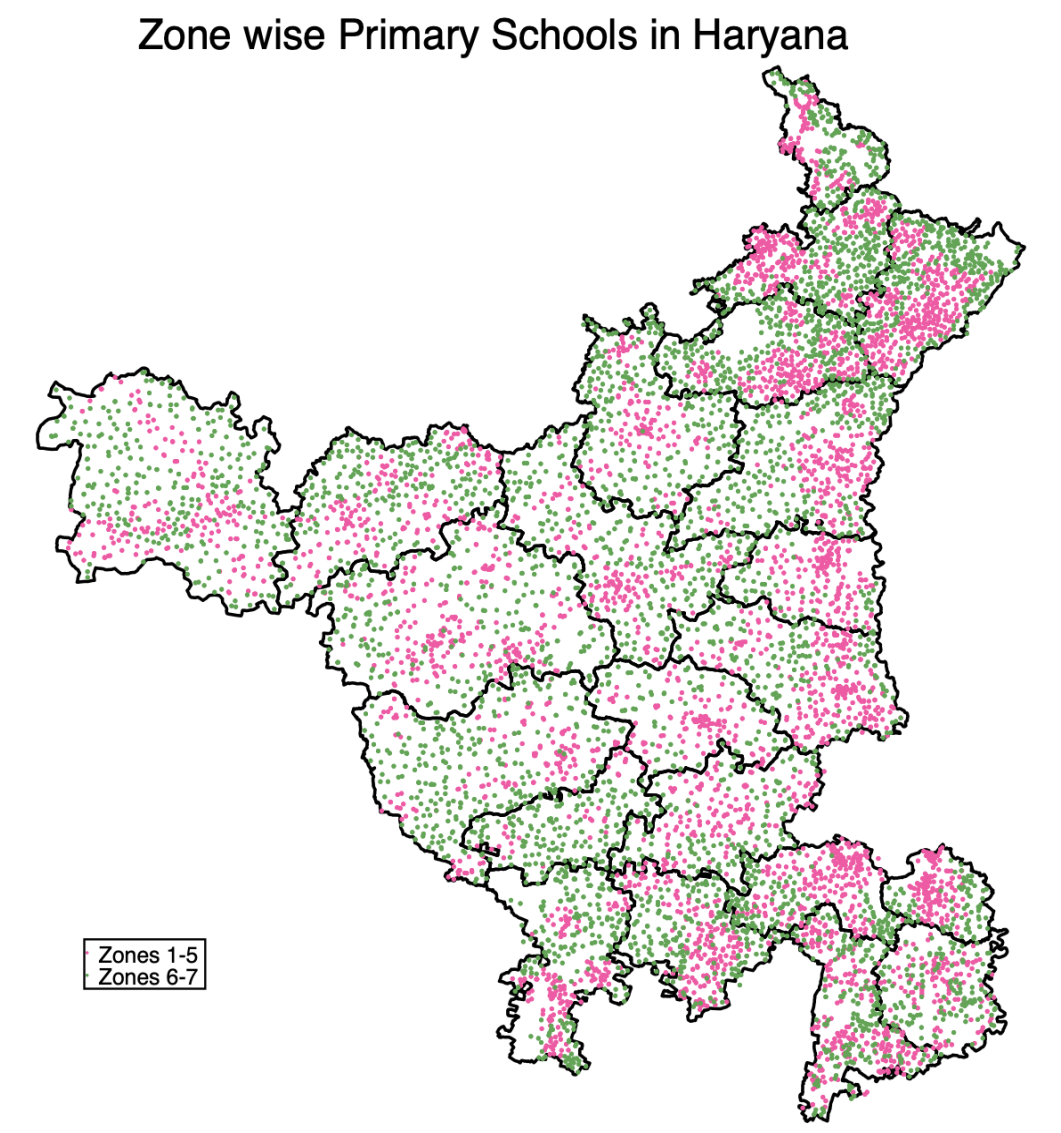

Figure A1: *Notes* : The pink dots represent primary schools in Haryana belonging to zones 1-5 whereas the green dots indicate Haryana primary schools in zones 6-7.

Table A1: Classification of Zones

Zone 1	Schools located within Municipal area of the City of District Headquarters.
Zone 2	Schools located within the 10 KM radius starting from the boundary of Municipal Area of District Headquarters.
Zone 3	Schools located in the City/ Town of Educational Block Headquarters except those which are co-located with District Headquarters.
Zone 4	Schools located on the State Highways or National Highways between 10 K.M. to 15 K.M. outside the M.C. area of the District Headquarters.
Zone 5	Schools located in the radius of 5 K.M. of Block Headquarters. Distance shall be measured from Main Bus Stand of the City.
Zone 6	Schools located between the radius of 5-10 K.Ms of Block Headquarters. Distance shall be measured from Main Bus Stand of the City.
Zone 7	All remaining schools located in the farthest area and not covered in above categories.

Source : Teacher Transfer Policy Document.

Table A2: Teacher Transfers across zones (in %)

				To Zone					
From Zone	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Total(%)	# Total
Zone 1	1.81	44.42	16.07	9.16	8.72	9.16	10.65	100	1605
Zone 2	30.36	0.79	7.78	10.5	11.99	13.03	25.56	100	2019
Zone 3	14.57	7.93	0.93	10.29	35.21	21.86	9.21	100	1400
Zone 4	16.01	16.01	8.72	1.08	18.64	15.77	23.78	100	837
Zone 5	6.98	10.57	17.74	4.98	1.48	38.04	20.22	100	2508
Zone 6	7.92	10.86	8.03	2.72	21.73	28.37	20.37	100	3461
Zone 7	7.04	13.12	4.87	3.05	13.08	15.55	43.29	100	4618

Source : MIS

Table A3: Score System for Transfers

Major Factor	**Sub-Factor**	**Maximum Points**	**Criteria for calculation**
Age	Eldest person shall get maximum points	58	Age in number of days / 365 (maximum four decimal points only)
Gender	Female	10	10 points to female teachers
Special Category female teachers	Widow / divorced / separated / unmarried female teacher more than 40 years of age / wife of serving Military personal / Paramilitary personal working outside the State	10	All female of this category shall be given 10 marks only
Special Category male teachers	Widower (A male who has lost his wife and has not re-married) and has one or more minor children and/ or unmarried daughter(s)	5	Eligible male widowers shall be given 5 points only. (in case of remarriage of self/ children becoming major/ daughter getting married, the employee will have to update his profile in the MIS and will not be eligible for this advantage any more)
Differently abled persons	Vision/Locomotors/ Deaf and Dumb	20	40% to 60% disability = 10 Marks, Above 60% to 80% = 15 Marks, Above 80% =20 Marks
Diseases of Debilitating Disorders	Self/ Spouse/ unmarried Children	10	Certificate issued by AIIMS (Including its branches in Haryana), PGI Rohtak, PGI, Khanpur Kalan, Kalpana Chawla Medical College, Karnal, PGI Chandigarh or Duly Constituted Medical Board only
Differently abled or mentally challenged children	Men/Women having Mentally challenged or 100% differently abled child	10	Men/Women teachers having mentally challenged or 100% differently abled children shall be provided maximum 10 points.
Well performing teachers	Teachers giving good results in the last board exam.	5	For results, following shall be the criteria for entitlement of points: 75% to 80 % = 1, 80% to 85% = 2, 85% to 90% = 3, 90% to 95% = 4, 95% to 100% = 5

Source : Teacher Transfer Policy Document

Table A4: Impact of Transfers on Student Academic Performance

	(1) Score	(2) Score	(3) Score
# Eligible x 2014-15	0.0143	0.0196	-0.839
	(0.338)	(0.336)	(0.599)
# Eligible x 2016-17	-0.798**	-0.804**	-1.152**
	(0.333)	(0.334)	(0.508)
# Eligible x 2017-18	-0.205	-0.216	0.309
	(0.302)	(0.301)	(0.599)
2014-15	-13.60***	-13.20***	-25.92***
	(1.627)	(1.768)	(6.927)
2016-17	0.168	-0.236	-2.264
	(1.409)	(1.413)	(6.394)
2017-18	8.497***	7.690***	9.940*
	(1.443)	(1.513)	(5.698)
Zone 1 x Time		1.012	1.840**
		(0.784)	(0.780)
Zone 2 x Time		1.027	1.346*
		(0.839)	(0.800)
Zone 3 x Time		0.566	1.200
		(0.764)	(0.782)
Zone 4 x Time		1.841**	2.289***
		(0.802)	(0.789)
Zone 5 x Time		-0.00653	0.0852
		(0.552)	(0.536)
Zone 6 x Time		-0.0286	0.123
		(0.722)	(0.718)
Teacher Experience x 2014-15			-0.194
			(0.232)
Teacher Experience x 2016-17			-0.284
			(0.221)
Teacher Experience x 2017-18			-0.147
			(0.190)
Teacher Age x 2014-15			0.365
			(0.220)

Teacher Age x 2016-17			0.124
			(0.206)
Teacher Age x 2017-18			-0.0139
			(0.179)
Teachers x 2014-15			0.812*
			(0.486)
Teachers x 2016-17			0.292
			(0.451)
Teachers x 2017-18			-0.527
			(0.490)
Constant	38.19***	37.34***	36.75***
	(0.436)	(0.968)	(0.926)
Observations	25576	25576	25576
R-squared	0.47	0.47	0.47
Mean Outcome	35.89	35.89	35.89
Year Fixed Effects	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes
Zone Trends	No	Yes	Yes
BaselineChar Year FE	No	No	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS
Notes : The dependant variable *Score* represents the percentage of students in class 5 in a school scoring above 60 %. Standard errors, in parentheses, are clustered at block level.
*** p<0.01, ** p<0.05, * p<0.1

Table A5: Robustness : Controlling for school characteristics

	(1) Score	(2) Score	(3) Score
# Eligible x 2014-15	-0.844	-0.832	-0.829
	(0.599)	(0.592)	(0.592)
# Eligible x 2016-17	-1.149**	-1.152**	-1.150**
	(0.508)	(0.509)	(0.511)
# Eligible x 2017-18	0.310	0.301	0.303
	(0.595)	(0.591)	(0.590)
Observations	25576	25576	25576
R-squared	0.47	0.47	0.47
Mean Outcome	35.89	35.89	35.89
School Characteristics	I	I + II	I + II + III
Year Fixed Effects	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes
Zone Trends	Yes	Yes	Yes
BaselineChar Year FE	Yes	Yes	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS
Notes : The dependant variable *Score* represents the percentage of students in class 5 in a school scoring above 60 %. BaselineChar FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015 -16) with academic year. School characteristics I include number of boys' toilets, girls' toilets, availability of playground, Computer Assisted Learning lab and electricity. School Characteristics II include number of classrooms, library books and computers. School Characteristics III include approachability by road and number of workdays. Standard errors, in parentheses, are clustered at block level.
*** p<0.01, ** p<0.05, * p<0.1

Table A6: Impact of Transfers on Teacher Characteristics

	(1) Teacher Experience	(2) Teacher Age	(3) General	(4) SC	(5) OBC
# Eligible x 2014-15	0.00213	0.00727	0.00479*	-0.000247	0.000279
	(0.00511)	(0.00598)	(0.00265)	(0.000868)	(0.00153)
# Eligible x 2016-17	-0.00429	-0.00679	-0.00382	-0.00127	0.000668
	(0.00493)	(0.00452)	(0.00262)	(0.00178)	(0.00123)
# Eligible x 2017-18	-0.0455	-0.0562	-0.00305	0.00681	0.000737
	(0.0342)	(0.0376)	(0.0297)	(0.0131)	(0.0139)
Observations	25576	25576	25576	25576	25576
R-squared	0.97	0.96	0.98	0.98	0.98
Mean Outcome	11.99	40.42	3.11	0.90	1.48
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes
Zone Trends	Yes	Yes	Yes	Yes	Yes
BaselineChar Year FE	Yes	Yes	Yes	Yes	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : The dependant variables *Teacher Experience* & *Teacher Age* represent average experience and average age of teachers teaching in the school. Dependant variables *General, SC, OBC* represent number of teachers in the school belonging to General, Scheduled Caste and Other Backward Classes Category respectively. BaselineChar Year FE represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015 -16) with academic year. Standard errors, in parentheses, are clustered at block level. *** p<0.01, ** p<0.05, * p<0.1

Table A7: Impact of Transfers on Student Characteristics

	(1) Enrollment	(2) Appear	(3) Girls	(4) OBC	(5) SC
# Eligible x 2014-15	0.431	-0.175	-0.00185	-0.00141	0.000629
	(0.571)	(0.775)	(0.00166)	(0.00158)	(0.00250)
# Eligible x 2016-17	-0.194	0.0219	0.000626	-0.00186	-0.000443
	(0.486)	(1.006)	(0.00175)	(0.00181)	(0.00172)
# Eligible x 2017-18	-0.119	-0.422	0.00195	0.000329	0.000565
	(0.532)	(1.002)	(0.00201)	(0.00257)	(0.00271)
Observations	25576	25576	25576	25576	25576
R-squared	0.92	0.77	0.84	0.91	0.89
Mean Outcome	46.46	46.93	0.52	0.39	0.41
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes
Zone Trends	Yes	Yes	Yes	Yes	Yes
BaselineChar FE	Yes	Yes	Yes	Yes	Yes

Sources : DISE (2014-15, 2015-16, 2016-17, 2017-18), MIS

Notes : The dependant variable *Enrollment* represents student enrollment in class 5 , *Appear* represents class 5 students appearing in exam, *Girls* represent proportion of girls in class 5, *OBC* represents proportion of students in class 5 belonging to Other Backward Classes and *SC* represents proportion of students in class 5 belonging to the Scheduled Class. *BaselineChar Year FE* represent interactions of three characteristics - Teacher experience, total teachers and teacher age in baseline year (2015-16) with academic year. Standard errors, in parentheses, are clustered at block level. *** p<0.01, ** p<0.05, * p<0.1