Private School Entry, Sorting, and the Performance of Public Schools: Evidence from Pakistan

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Abstract

Private schooling has rapidly expanded in low-income countries, but public schools remain the primary provider of basic education. Does private school expansion have negative consequences for public school students? I use a rich longitudinal dataset of 112 schooling markets in rural Pakistan to provide empirical evidence of both parental and public schools responses to private school expansion. First, I find clear evidence of sorting: boys, students from wealthier households, and those who perform better are more likely to enroll in private schools. Second, I show that student academic performance in public schools, measured by school value-added for grades 3 to 5 students, remains unaffected following private school entry. However, most cream-skimming occurs in lower grades due to switching costs, which means it is important to look at students' outcomes in lower grades. I explore whether the consequences of private school entry on public education appear after the youngest cohorts of students progress through school. I find no negative impact of private school expansion on schooling outcomes of public school students in the long term. This paper highlights the determinants to switching schools and contributes to our understanding of the effects of private school expansion on public education in a low-income country.

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1 Introduction

The share of primary students enrolled in private schools in low- and middle-income countries has dramatically increased over the past twenty years. The rapid expansion of private education, accounting for 19.3% of enrollment in 2019 up from 9.9% in 1999, has consequences not only for the students who switch schools in search of better opportunities, but also for the students who stay in the public sector. Public schools remain the main provider of primary education, and we have a limited understanding of how private school expansion affects the quality of public education. Researchers have focused on evaluating private schools' contributions to student learning, or value-added, and the impact of increased school competition.[1] We know much less about how academic performance in public schools will change as the private sector becomes an increasingly important provider of primary education.[2]

If the increased availability of private education leads to cream-skimming, where private schools attract the highest-performing or wealthiest students, students who stay in public schools no longer benefit from exposure to higher-achieving peers (Altonji, Huang and Taber, 2015; Sacerdote, 2011; Epple and Romano, 1998). Alternatively, as more and higher-performing students select into private schools, public classrooms become smaller and more homogeneous, putting teachers in a better position to teach more students at an appropriate instructional level.[3,4] Private school expansion may also have

[1]The literature on school competition in low- and middle-income countries includes Andrabi et al. (2020*a*), Neilson (2020), Romero, Sandefur and Sandholtz (2020), Bau (2021), Barrera-Osorio et al. (2017), Muralidharan and Sundararaman (2015), Singh (2015), Hsieh and Urquiola (2006), and Angrist et al. (2002). For the interactions of public and private education in high-income countries, see among others Dinerstein and Smith (2020), Figlio, Hart and Karbownik (2020), Gilraine, Macartney and McMillan (2018), Epple, Romano and Urquiola (2017), Neilson and Zimmerman (2014), Bettinger (2011), Epple and Romano (2008), Ferreyra (2007), Hoxby (2002), Hoxby (2000), and Neal (1997).

[2]Related research mainly uses the implementation of school vouchers to obtain large variations in the market share of the private sector (Urquiola, 2016). I hypothesize that private school entry may have different effects on public education than vouchers because it may result in more sorting between public and private schools. Indeed, school vouchers often target the poorest students while new private schools are more likely to attract wealthier students because of their charging fees.

[3]See Bau (2021), Muralidharan, Singh and Ganimian (2019), Aucejo (2011), and Duflo, Dupas and Kremer (2011) on the importance of tailoring instructional levels to student ability and current knowledge.

[4]If private schools reduce the high student-teacher ratios common in public schools in low-income

little effect on public schools' outcomes if public schools have no financial incentive to retain students and improve school quality, or if peer effects and the decline in class sizes are too small to affect student performance.

The relative importance of these mechanisms and their net effect is an empirical question. To answer it, I analyze in two parts the consequences of private school expansion on the demand for and quality of public education in low-income countries. First, I ask whether there is sorting of students between public and private schools. I examine how private school entry affects student enrollment and classroom composition in primary public schools, documenting which types of students are more likely to switch into the private sector. Second, I investigate the short- and long-term effects of private school entry on the academic performance of students who remain in the public sector.

I use a rich longitudinal dataset on 112 rural villages from the Learning and Educational Achievements in Punjab Schools (LEAPS) project to study parental and school responses to private school expansion in Pakistan.[5] The LEAPS project collected the test scores of over 36,000 primary school students between 2003 and 2006, and in 2011. The dataset also contains detailed information on randomly selected households and all of the primary public and private schools in the 112 villages, each of which consists of a closed schooling market.[6] The main source of identifying variation, which will allow me to estimate the effect of private school expansion on various outcomes, is the entry of private schools over time and within schooling markets.

First, I find private school entry increases the likelihood of students switching out of the public sector. There is rich heterogeneity in this parental response: boys, students from wealthier households, and students who perform better in school are more likely to

countries, students may benefit from the smaller classrooms. There is some evidence of positive effects of reduced class sizes on academic achievement in low-income countries (Glewwe and Muralidharan, 2016; Case and Deaton, 1999; Angrist and Lavy, 1999). One exception is Duflo, Dupas and Kremer (2015), who find no effect of class size reductions on student performance.

[5]See Andrabi et al. (2008) for a detailed report on the LEAPS project.

[6]An important feature of the LEAPS project is that each village represents a single closed schooling market for primary education. Children almost always attend primary schools located in their village, implying that we should not be concerned about spillovers across villages.

exit public schools and enroll in private schools. Consistent with the presence of switching costs, younger students have a higher likelihood of switching schools. This finding suggests that the timing of private school entry matters, especially for parents of young children who are more responsive to private school entry. As a result, private school expansion may have heterogeneous effects on public school outcomes across grades, and classroom composition in public schools for older students is unlikely to be immediately affected by private school expansion. The analysis of switching behavior shows that the response to private school entry is strongest for the groups who, even in the absence of increased school choice, are more likely to switch out of the public sector.

After documenting patterns in these switching decisions by gender, socioeconomic status (SES), and academic achievement, I employ event study methods to explore how private school expansion affects public school enrollment and the composition of students in public schools. The fact that younger students are more likely to switch into the private sector translates into heterogeneous effects of private school entry on public school enrollment: an average 17 to 20 percent decrease in enrollment in grades 1 and 2, but no change in grades 3 to 5. Evidence of sorting is strongest for younger students, but I cannot measure compositional changes for these grades.[7] I do not observe significant compositional changes as measured by parental education and assets of students in grades 3 to 5 in the public sector. The prevalence of sorting among older students is too low to result in any significant changes in classroom composition in the public sector in the short term.

Second, I use test scores from a large sample of students enrolled in grades 3 to 5 to study the consequences of private school entry on the performance of public schools as captured by school value-added (SVA) estimates.[8] I find no effect of private school entry on the average performance of public school students enrolled in these higher grades.[9]

[7]The LEAPS project did not collect data on the socioeconomic status of students in grades 1 and 2.

[8]Similar to the collection of information on student socioeconomic status, the LEAPS project tested students enrolled in grades 3 to 5 only.

[9]Up to one year after the private school entry, the point estimates are small and not significant, but the

However, short-term analyses on the academic performance of grades 3 to 5 students may mask the impact of private school entry since, in the short term, only lower grades in the public sector experience either compositional changes or competitive pressures.

As a final step, I therefore extend the analysis using a follow-up survey carried out up to seven years following private school entries to understand their long-term consequences. In order to capture long-term effects on public school students who were in lower grades when the new private school opened, I compare the outcomes of students exposed to private school entry at different ages. Students who were younger at the time of private school entry are more likely to be enrolled in a private school relative to those exposed to the change in the schooling market when older. This result is consistent with what I find regarding parental responsiveness depending on the child's age. Students who stayed in public schools and were exposed to private school entry at a younger age have similar test scores and grade completion rates as public school students exposed at a later age. The long-term analysis complements the findings from the short-term analysis showing null effect of private school expansion on school-value added in public schools. It confirms that private school expansion does not on average lead to worse outcomes for students who remain in the public sector, despite a significant share of their higher-achieving peers exiting the public sector.

To summarize, despite the selection of certain student types into private schools, private school expansion appears to have no effect on the performance of public schools. Because public schools have no financial incentive to retain students, it is not surprising that they do not respond to pressure from private school competition. Furthermore, the reduction in class size may be too small to result in any significant change in test scores. Private school entry in rural Pakistan reduces public schools class size from 26 to 21 students per teacher on average. This reduction in student-teacher ratios is small

confidence intervals are large. Two years after private school entry, the point estimates suggest a positive 0.22 standard deviation effect on school value-added, and I can reject with 95% confidence the hypothesis that the effects are lower than -0.03 standard.

compared to Duflo, Dupas and Kremer (2015)'s findings, from 82 to 44 students per teacher, where test scores among grade 1 students also did not change. Lastly, even though I find strong evidence of sorting, the competing impacts of the loss of positive peer effects from cream-skimming and the more homogeneous classrooms may offset each other, explaining the null effects of private school entry on the performance of public schools.

The methodological implications of these results are important to highlight. To fully capture the effects of private school competition on the performance of public schools, researchers must either have test scores data for younger students or their test scores in the long term. The first four rounds of the LEAPS project, used for the short-term analysis in this paper, have test scores for older students enrolled in grades 3 to 5. I address this limitation by comparing schooling outcomes of individuals exposed to private school entry at different age. The long-term analysis presented in this paper is essential to understand the true effects of private school competition on public school outcomes. I complement the evidence presented in Bau (2021), who shows that test scores in public schools do not change following private school expansion. This paper contributes to Bau (2021)'s findings by uncovering the heterogeneous effects on public schools' enrollment by grade and showing that even in the long term, public school students who are more exposed to private school expansion as determined by their age at the time of the new school's opening are not negatively affected.

Settings with school voucher programs, which allow students to attend previously unaffordable private schools, are commonly used to understand the effects of private school expansion on public school outcomes (see Urquiola (2016) for a review of the literature). For example, Muralidharan and Sundararaman (2015) study a large voucher program in India that caused 23 percent of public school students to enroll in private schools. The authors show significant learning gains for students who switched to the private sector and, more importantly, no negative spillovers on students who remained

in the public sector. However, private school entry might lead to more cream-skimming than school vouchers. The opening of a new school directly affects the supply of private schooling and new private schools are not free. This increase in school choice may only appeal to those who can afford the tuition fees. School vouchers, in contrast, indirectly affect the supply of private schooling through large increases in private school enrollment. They often target the least wealthy, which is why we may expect different levels of sorting with private school entry. This paper provides additional evidence that private school expansion, in this case without vouchers, does not impede public education despite inducing sorting of high-achieving students into private schools.

Understanding how the provision of private education affects public education informs policymakers about how we should expect public and private schools to interact, and more generally, how to financially support the two sectors given the types of student who sort into private schools.[10] Private school subsidy programs have been successful in increasing student achievement (see for example Andrabi et al. (2020*a*) in the context of Pakistan and Romero, Sandefur and Sandholtz (2020) in the context of Liberia). This paper provides empirical evidence that private school expansion does not worsen the quality of public education despite cream-skimming. Holding public school funding constant, as is the case in this context, interventions to support to private schools may not harm the achievement of students who choose to remain in public schools.[11] As a result, if policymakers are concerned about the poor performance of public schools in low-income countries, the expansion of private schooling is not the issue. The findings in this paper suggest that restricting the provision of private education will not solve the poor performance of public schools because public schools are not responsive to the expansion of private schooling.

[10]There is also a growing related literature documenting the effects of public school expansion on private school outcomes. See for instance Andrabi et al. (2021), Dinerstein, Neilson and Otero (2020), Dinerstein and Smith (2020) and Khanna (2020).

[11]I find that private school entry does not change public school budgets. The null effects of private school entry on public school performance may not be robust to the reallocation of government funding from public to private schools.

The remainder of the paper is structured as follows. Section 2 describes the context and dataset. Section 3 discusses the empirical strategies. I present the results in Section 4 and discuss mechanisms in Section 5. I conclude in Section 6.

2 Context and Data

In this section, I present an overview of the public and private education system in rural Punjab, Pakistan.[12] I then discuss private school entry and the characteristics of new private schools. Finally, I describe the LEAPS project and the dataset used in this paper.

2.1 Public and Private Education in Rural Punjab

Primary education in Pakistan lasts five years, from grade 1 to grade 5. Primary school completion is lower than comparable low-income countries. In 2019, the primary completion rate was 73% compared to 90% in similar income-level countries (The World Bank, 2020*a*). In Pakistan, the provincial government administers primary education, making the province of Punjab one of the largest education systems in the world (Andrabi et al., 2021).[13] Public school funding is not attached to the number of students enrolled in public schools, and teachers' salaries account for more than 80% of public schools' budget (Bau and Das, 2020).

In rural Punjab, public school enrollment represents about 70 percent of primary school enrollment. Public schools are free and sex-segregated. In contrast, private schools, which account for approximately 28 percent of primary enrollment, are co-educational and charge a low tuition fee equivalent to a dime a day (Andrabi, Das and

[12]Pakistan is a low-income country of South Asia and is the fifth largest country by population. Pakistan's most populated province is Punjab, which has a population above 100 million people; this represents nearly 50% of the country's population.

[13]In more recent years, Punjab has been delegating several educational decisions to its districts (Andrabi, Das and Khwaja, 2008).

Khwaja, 2008).[14] Table 1 summarizes the characteristics of public and private schools in rural Punjab.

Teachers do not sort between public and private schools. Private schools' owners hire local teachers who are primarily unmarried and secondary educated women with lower labor market opportunities (Andrabi, Das and Khwaja, 2013). Public school teachers, in contrast, are civil servants and are rewarded according to their experience and education (Bau and Das, 2020). On average, public school teachers are paid three to five times the salary of private school teachers.

Finally, Andrabi et al. (2020*b*) show that private schooling increases test scores and civic values. On average, private schools have a higher school quality, measured by school value-added (SVA). There is a significant overlap with the distribution of public schools' SVA.

2.2 Private School Entry

Private schooling expanded rapidly in Pakistan in the early 2000s. The number of private schools increased from 3,300 to 32,000 schools between 1983 and 2000 (Andrabi, Das and Khwaja, 2008), and then to 47,000 private schools in 2005 (Andrabi et al., 2008). In Pakistan, private schools account for nearly 40 percent of primary school enrollment (Andrabi, Das and Khwaja, 2017), which makes Pakistan an appropriate context to study the impact of private school expansion on public education.[15]

Historically, private schools opened in villages that had government girls' secondary schools (Andrabi, Das and Khwaja, 2013). Bau (2021) shows that while private schools open and close in villages with a larger population, they do not open in villages with a higher population growth. There are no strict regulations to open a private school, and

[14]The remaining 2 percent comes from enrollment in non-governmental organizations and religious schools (madrasas). Andrabi et al. (2006) show that enrollment in madrasas accounts for 1 percent of total enrollment.

[15]In comparison, the share of students enrolled in private primary schools in high-income countries has remained constant between 11 and 13 percent over the past twenty years (The World Bank, 2020*b*).

school owners do not receive financial support from the government.

Private school entries and exits are common events in rural Punjab. Between 2003 and 2006, nearly one-third of the LEAPS villages had at least one new private school. By 2011, 60 percent of the villages had at least one new private school. Private school closures are also frequent: almost 80 percent of the LEAPS villages had a private school exit between 2003 and 2011.[16] Table 2 summarizes the number of private schools entries and exits that occurred between 2003 and 2011, and the number of villages with at least one private school entry or exit.[17,18]

New private schools are smaller but otherwise similar to existing private schools. Compared to existing private schools, new private schools have on average 50 students less and 33 students less at the primary level (see Columns (1) and (2) of Panel A in Table 3). On average, new private schools offer 0.7 grade less, but almost all new private schools offer all five levels of primary education.[19] New private schools have a higher basic facility index, but it is explained by the lower number of students enrolled in the school.[20] Finally, the number of teachers in new private schools is lower, and they are less likely to have teaching experience. Panel B of Appendix Table 3 shows that on average, teachers in new private schools have similar education, training backgrounds, test scores, gender, and age compared to teachers in existing private schools.

[16]In 2003, when the first round of data was collected, 312 private schools were open across the 112 villages. By 2011, 112 private schools had opened, and 127 private schools had closed. In contrast, public school entry is rare: only 16 public schools opened between 2003 and 2011. During the same time frame, 61 public schools closed. Public school closure mainly occurred between 2006 and 2011.

[17]The bottom of Figure 1 illustrates the number of villages with at least one private school entry or one private school exit between the five rounds of data.

[18]In 2003, the baseline year, characteristics of villages with a private school entry are not statistically different from characteristics of villages with no event (see Appendix Table A1).

[19]It is common for private schools to offer primary and secondary levels (i.e., grades 1 to 12). The significant difference between new and existing private schools is because new private schools are less likely to offer secondary level grades (i.e., grades 9 to 12).

[20]Following Bau and Das (2020), I construct the basic facility index using the principal component analysis on the number of permanent and semi-permanent classrooms per student, the number of toilets per student, the number of blackboards per student, and the sitting arrangement.

2.3 LEAPS Project

The Learning and Educational Achievements in Punjab Schools (LEAPS) project is a longitudinal study of 112 Pakistani villages with rich surveys on student test scores, randomly selected households, and all primary schools in those villages (Andrabi et al., 2008). The 112 LEAPS villages are located in three districts of Punjab (Attock, Faisalabad, and Rahim Yar Khan); and the average village has 3,500 inhabitants. Data were collected for four consecutive years between the academic years 2003 and 2006, and a follow-up took place in 2011. Figure 1 presents a timeline of data collection for student test scores, and household and school surveys.

Test Scores Dataset. The test scores dataset contains standardized test scores for three cohorts of approximately 12,000 students each.[21] Students are tested on their knowledge in mathematics, English, and Urdu, the vernacular. The first cohort of students was enrolled in grade 3 in 2003 and is followed for four consecutive years until 2006. The second cohort was enrolled in grade 3 in 2005 and is tested in 2005 and 2006. The third cohort was enrolled in grade 4 in 2011. Students from the third cohort are tested only in 2011. In addition, nearly 2,000 individuals aged 8 to 20 years old took the tests in 2011.[22] Finally, about half of the tested students answer additional surveys on their socioeconomic status.

The test scores dataset is used in three different ways. First, I construct measures of school-year school value-added (SVA) for public schools.[23] Second, I use data on students' socioeconomic status to study changes in classroom composition. Finally, I use the test scores dataset in 2011 to explore the long-term effects of private school entry.

Household Dataset. The household dataset follows 1,807 randomly selected house-

[21] Test scores are computed using item response theory. See Andrabi, Das and Khwaja (2017) for more information.

[22] Those individuals are the siblings of a subset of students in the first and second cohorts. They are linked to the household dataset. I denote this cohort the *Sibling* dataset.

[23] For the long-term school-level analysis, I instead obtain average test scores for all schools. SVA estimates can be constructed from 2004 to 2006 because lagged test scores are available only in those three consecutive years.

holds annually between 2003 and 2006, and then once in 2011.[24] In each village, the LEAPS team surveyed 16 to 21 households. In addition to collecting information on household assets, caste, and education attainment of all its members, the household surveys have the complete schooling history of children aged 5 to 15 years old. This information is used to understand switching behaviors across school types.

School Dataset. The school dataset has detailed information on all the primary schools in the 112 LEAPS villages. There are 859 public and private schools surveyed from 2003 to 2006. By 2011, 947 public and private schools ever appeared in the school dataset. Approximately 40 percent of schools are private, and less than 60 percent are public.[25] The school dataset contains information on enrollment, facilities, expenditures, and their GPS location. It also includes surveys on teachers and head teachers (or school owners for private schools), which I use to compare the characteristics of new and existing private schools. I also obtain information on school closures and openings in the 112 schooling markets using the school dataset.

3 Empirical Strategy

This section presents the empirical strategies used to study how private school entry affects switching behaviors, public school outcomes in the short term, and long-term schooling outcomes.

3.1 Switching Behaviors

To understand the magnitude of sorting between public and private schools, I ask what student characteristics predict the likelihood of switching schools and investigate how

[24]Households with a child eligible to be enrolled in grade 3 in 2003 were randomly selected to represent the enrollment distribution of children in grade 3. In particular, for one-quarter of households per village, the eligible child was not enrolled in school. For three-quarters of households, the child was enrolled.

[25]The number of religious schools is small: enrollment in madrasas accounts for 1 percent of total enrollment. See Andrabi et al. (2006) for more information. A few schools are from non-governmental organizations, and both madrasas and NGOs are excluded from the analysis in this paper.

private school entry affects switching behaviors. To answer this question, I first run the following regression to obtain descriptive statistics on the characteristics of students who switch schools or school types:

$$\begin{aligned} switch_{ivt} =& \beta_0 + \beta_1 female_i + \beta_2 ses\_index_{it} + \delta_1 \mathbb{1}(age_{it} = 6,7) + \delta_2 \mathbb{1}(age_{it} = 8,9) \\ &+ \delta_3 \mathbb{1}(age_{it} = 10,11) + \alpha_t + \nu_v + \Gamma RCT_{vt} + \varepsilon_{ivt} \end{aligned} \tag{1}$$

where $switch_{ivt}$ is a dummy that equals one if student i in village v in year t is enrolled in a different school or school type relative to the previous academic year $(t-1)$. $female_i$ is a dummy variable that equals 1 if student i is a female and ses_index_{it} is an index for socioeconomic status. I construct the index using the first principal component analysis and include information on parental education (i.e., whether the mother and the father have some education), household assets and whether the male head of the household is of high-caste.[26] The indicator variables $\mathbb{1}(age_{it} = 6,7)$, $\mathbb{1}(age_{it} = 8,9)$ and $\mathbb{1}(age_{it} = 10,11)$ are age group dummies, and 12 years old students are in the omitted category. I include year (α_t) and village (ν_v) fixed effects to control for time trends and differences across schooling markets. I also include a village-year control for the interventions that took places in the LEAPS villages (RCT_{vt}).[27] The sample is all children aged 6 to 12 years old (i.e. primary-school age) in the household surveys.[28] Children must be enrolled in school for at least two consecutive years between 2003 and 2006 to be in the sample.

Gender, socioeconomic status, and age are important characteristics to look at to study switching behaviors. Girls are less likely to be enrolled in school, and parents are

[26] I follow Karachiwalla (2018) to determine whether the household head is considered of low or high-caste.

[27] See Andrabi, Das and Khwaja (2017) for the report card intervention in which they provided information to schools and parents about school performance. See Andrabi et al. (2021) for the public school grants intervention in which public schools in randomly selected villages received large grants.

[28] In addition to restricting the sample by age, I look at two samples based on the estimated grades in which children are enrolled in. Grades are not collected in all rounds. The first sample includes children enrolled in grades 0 to 5, which adds nearly 1,000 observations to the second sample of children enrolled in grades 1 to 5.

sensitive to distance to school, especially for their daughters (Carneiro, Das and Reis, 2019; Muralidharan and Prakash, 2017). A new private school in the village will reduce the distance to the nearest school for some households. Carneiro, Das and Reis (2019) also show that parents are sensitive to school fees. Students from wealthier backgrounds are more likely to switch schools (Bau, 2021) and socioeconomics status will be a relevant characteristic to study to understand sorting between public to private schools. Finally, the likelihood of switching may differ for children of different ages. In the presence of switching costs, we would expect older children to be less likely to switch schools.

I then investigate how private school entry affects switching behaviors. Using the same sample of children aged 6 to 12 years old, I interact children characteristics from equation 1 with a dummy for private school entry that equals one if the village had a private school entry in year t or in a prior year. I also include interactions with private school exit.

Finally, to understand the role of student performance as a predictor of switching schools, I use the sample of tested students enrolled in grades 3 to 5 and run the same regressions as equation 1 including interactions with private school entry and exit. Tested students were not asked about their caste. I construct the socioeconomic status index variable using information on whether each parent has some education and household assets. Furthermore, most students are between 9 and 11 years old. I control for age and include dummy variables for grades and their interactions with private school entry and exit.

3.2 Public Schools Responses

In this section, I present the empirical strategy used to understand the short-term public schools' responses to private school entry in the short term. I focus on school-level outcomes and events that took place between the academic years 2003 and 2006 (see Figure 1).

I conduct an event study analysis using the following regression specification:

$$y_{jvt} = \beta_0 + \gamma_1 Entry_{v,t-3} + \gamma_2 Entry_{v,t-2} + \gamma_3 Entry_{v,t} + \gamma_4 Entry_{v,t+1} + \gamma_5 Entry_{v,t+2} + \alpha_t + \nu_v + \Gamma RCT_{vt} + \varepsilon_{jvt} \quad (2)$$

where y_{jvt} is the outcome of interest for public school j in village v at time t. $Entry_{v,t}$ equals 1 if a private school entry occurred in the current year t. I look at pre-trends up to three years prior to a private school entry ($Entry_{v,t-s}$). $Entry_{v,t+s}$ equals 1 one ($s = 1$) and two ($s = 2$) years after a private school opened in village v.[29]

I control for time fixed effects (α_t), village fixed effects (ν_v) and a village-year control for the interventions that took places in the LEAPS villages (RCT_{vt}). The regression specification is similar to Bau (2021) who also uses an event study analysis to show the effects of private school expansion on the variance of test scores in private schools.

I study the effects of private school entry on three outcomes of interest: public schools' enrollment, classroom composition, and academic performance. For enrollment, I focus on primary level enrollment in public schools obtained from the school surveys. The test scores surveys have information on the socioeconomic status of students enrolled in grades 3 to 5. I construct an index for socioeconomic status using parental education and household assets. I use the first principal component analysis and obtain the average index for each school in each year as a proxy for classroom composition. For public school performance, I follow Andrabi et al. (2020*b*) and construct SVA estimates by estimating the following regression:

$$y_{igst} = \beta_0 + \lambda_g y_{igs,t-1} + SVA_{st} + grade_{it} + \epsilon_{igst} \quad (3)$$

where y_{igst} is test scores in mathematics, English or Urdu for student i enrolled in grade g, school s and at time t. I include lagged test scores in the same school subject interacted

[29] The regression also includes similar controls for private school exit.

with grade ($\lambda_g y_{igs,t-1}$) and grade fixed effects ($grade_{it}$). The parameter of interest is SVA_{st}, a school-year fixed effect. I average SVA estimates across the three school subjects to obtain the main outcome of interest for public school performance.

I also study the heterogeneous effects of private school entry by gender and distance by interacting the variables $Entry_{v,s}$ in equation 2 with dummy variables for the gender of the school and whether the school is at a near distance to the new private school. I use the share of female students in the first round (i.e., 2003) to determine whether a public school is predominantly composed of female students (i.e., a gender ratio of 50 percent or more). For each public school in villages with a private school entry, I calculate the distance to the new private school and create dummy variables for whether the public school is above or below 500 meters to the new private school.

3.3 Long-Term Analysis

To explore the long-term effects of private school entry on public education, I first conduct an event study analysis adding public schools' outcomes from the follow-up data collected in 2011:

$$y_{jvt} = \beta_0 + \sum_{s=-7}^{7} \gamma_s Entry_{v,t+s} + \alpha_t + \nu_v + \Gamma RCT_{vt} + \varepsilon_{vt} \tag{4}$$

where the regression specification is similar to equation 2. I note that t is available for only five different rounds of data (i.e., four consecutive rounds between 2003 and 2006 and the follow-up round in 2011). The outcomes of interest are public schools' enrollment and classroom composition measured by a socioeconomic status index.[30] I cannot estimate SVA in 2011 because lagged test scores are not available for students tested in that year. Instead, I use average test scores as a measure of public school performance.

[30] Again, the socioeconomic index is constructed using parental education and household assets. I use the first principal component analysis and obtain the average index for each school in each year.

To further explore the long-term effects of private school entry on students' academic performance and educational attainment, I compare schooling outcomes for individuals who were younger when a private school opened in their village. I use the sample of individuals aged 8 to 14 years in the follow-up round of the test scores dataset. I run the following regression specification:

$$y_{iv} = \beta_0 + \beta_1 Young\_at\_Entry_{iv} + age_i + female_i + \nu_v + \varepsilon_{iv} \tag{5}$$

where y_{iv} is the outcome of interest for individual i in village v in 2011. There are three outcomes of interest: whether i was last enrolled in a private school, i's average test score, and the highest grade completed by i.[31] $Young\_at\_Entry_{iv}$ is a dummy variable that equals one if i was seven years old or less when a private school entered their village.[32] I also control for age (age_i), gender ($female_i$) and village fixed effects (ν_v). The coefficient of interest is β_1, the effect of being exposed to a private school entry at a young age relative to being older when a new private school opened in the village.

4 Results

This section is divided into two parts. First, I present the effects of private school entry on student mobility, public school enrollment, and classroom composition in public schools. Second, I analyze public school performance in response to private school expansion in the short and long terms.

[31] For average test scores and highest grade completed, I restrict the sample to individuals who were last enrolled in a public school.

[32] The decision to use seven years old as the threshold for exposure to private school entry is motivated by the analysis on switching behaviors in Section 4.

4.1 Student Mobility, Enrollment and Classroom Composition

Student Mobility

Switching schools is common: 35 percent of students aged 6 to 12 years old switched schools at least once between 2003 and 2006.[33] In addition, 10 percent of students who ever enrolled in a public school switched to the private sector, and 25 percent of students who ever enrolled in a private school switched to the public sector.

Younger students (i.e., 6 and 7 years old) are more likely to switch schools and exit the public sector. As students get older, their likelihood of switching out of public schools diminishes. Table 4 shows the correlations between student characteristics and the likelihood of switching schools (Columns (1) and (2)) and school types (Columns (3) and (6)). Students aged 6 to 11 years old are more likely to switch out of the public sector than students aged 12 years old (the omitted category) (see Columns (3) and (4) of Table 4). I conduct a simple test that the age coefficients are different and display the p-values at the bottom of Table 4. Students aged 6 and 7 years old are at least twice more likely to switch than any older students. There is no significant difference in the likelihood of switching out of public schools for students aged 8 to 11 years old.[34] In contrast, age is not a significant determinant of exiting private schools (see Columns (5) and (6) in Table 4). Overall, younger students are clearly more mobile than older students, suggesting important dynamics in the decision to switch school.

Boys and students from wealthier backgrounds (i.e., students with a higher socioeconomic index) are more likely to exit public schools (see Columns (3) and (4) of Table 4). Furthermore, students who exit private schools are on average less wealthy than

[33] In comparison, Welsh (2017) analyzes student mobility in the United States. The author finds that 95 percent of students switched school at least once between grades K to 8, and a third of fourth-graders changed school within two years. Students in urban areas are twice more likely to switch schools than students in rural areas. Student mobility in rural Pakistan is therefore comparable to the high student mobility rates in the United States.

[34] The result is robust to a specification that includes households fixed effects. In other words, even within the same household, the youngest are more likely to switch out of public schools (see Appendix Table A2).

students who stay in private schools (see Columns (5) and (6) of Table 4). This result indicates clear evidence of sorting among students who switch school types.

Private school entry increases the likelihood that younger students switch from public to private schools. Table 5 presents the effects of private school entry on the likelihood of switching schools by student characteristics. Columns (3) and (4) of Table 5 focus on switches from public to private schools. Students aged 6 and 7 years old are more likely to switch out of the public sector, and private school entry increases their likelihood of switching out of the public sector. In contrast, private school exit has no differential effects for students of different age groups among those who exit the *private* sector (see Columns (5) and (6) of Appendix Table A3).[35] In the next subsection, I will explore whether private school expansion has heterogeneous effects on public education by grades.

Private school entry increases the likelihood that wealthier students switch out of public schools (see Columns (3) and (4) of Table 5). In fact, younger (i.e. 6 or 7 years old) and wealthier students are more likely to switch out of the public sector following a private school entry (see Table 6 in which I interact the age dummies with the socioeconomic index).[36]

Table 7 presents additional evidence of sorting between the public and private sectors: among third to fifth-graders enrolled in public schools, students with higher test scores and higher socioeconomic status are more likely to exit the public sector. Similarly, students with lower test scores and lower socioeconomic status are more likely to exit the private sector. Private school entry increases the likelihood that students with higher test scores and higher socioeconomic status switch schools (see Column (1) of Table 7).

[35]There is evidence that private school exit has a marginally significant effect on the likelihood of switching into public schools for children aged 10 and 11 years old. The point estimate on the interaction of private school exit and children aged 10 and 11 years old is not significantly different from the other age groups.

[36]In the Appendix, I show robust evidence using logistic (Appendix Table A4) and probit (Appendix Table A5) regressions. I also present the effects of private school entry on the likelihood of switching schools within households (see Appendix Table A6). The point estimates in the household specification are less precisely estimated but are of similar range and direction.

Private school entry also increases the likelihood that students who perform better in school switch from public to private schools (see Column (2) of Table 7).[37]

Overall, I find clear evidence of sorting between public and private schools. Boys, younger and wealthier students, and high achievers are more likely to exit public schools and enroll in private schools. Furthermore, private school entry increases the likelihood of switching from public to private school among young students and students who perform better in school. Private school exit does not lead to similar levels of sorting by age. We should not be surprised of this result. When a private school closes, students in all grades must exit, which is less likely to be correlated with age.

The analysis on switching behaviors shows that student mobility is higher among the youngest, even within households (see Table 4 and A2). When deciding whether to switch schools or not, parents may take several factors into consideration, such as price, distance, and school quality (Carneiro, Das and Reis, 2019; Andrabi et al., 2020*b*). Reducing distance to school might be an important factor for the youngest who might not be able to walk long distances. Furthermore, older students might be more reluctant to leave their school, and in particular their school friends. If parents face a fix cost to switch their child to a new school, we expect that this cost is relatively higher for older students. In other words, due to switching costs, the overall benefits of switching to a new school will be lower for older students. It is worth noting that older students are approaching middle school, which is not offered in all public schools. Parents might be planning that their older children will be soon switching (or dropping) school. Therefore, it is reasonable to observe that they are more responsive to private school entry for their younger children.

In the next subsection, I explore how student mobility and private school entry affect public school enrollment and classroom composition.

[37] Appendix Table A7 suggests that it is students who perform better in English who are more likely to switch from public to private schools.

Public School Enrollment

The event study analysis presented in Figure 2 shows that private school entry leads to an average decline of 8 to 12 students in public schools one to two years after a new private school opens in a village.[38] New private schools are not opening in villages where public school enrollment is already dropping. Indeed, Figure 2 shows no pre-trend in primary public school enrollment up to three years prior to a private school entry event in the schooling market.

A significant decline in grades 1 and 2 public school enrollment explains the decline in primary public school enrollment (see Panel (a) of Figure 3). In fact, public school enrollment in grades 3 to 5 does not change following private school entry (see Panel (b) of Figure 3). Again, I find no pre-trend in enrollment. The heterogeneous effect on enrollment by grades is consistent with the findings from the previous subsection showing that private school entry increases the likelihood that younger students switch out of public schools.

I explore whether boys' public schools are more affected by private school entry. Public schools in Pakistan are sex-segregated. In the previous subsection, I showed that boys are more likely to exit public schools and enroll in private schools. We might expect that boys' public schools will be more affected by private school entry.

Consistent with the analysis on switching behaviors, I find a significant decline in enrollment at the primary level in boys' public schools and no changes in girls' public schools (see Appendix Figure A1). Again, the decline in enrollment in boys' public schools is explained by a significant decrease in enrollment in grades 1 and 2 (see the top panel of Appendix Figure A1). There is some evidence of a significant decline in enrollment in grades 3 to 5 in boys' public schools two years after entry. I do not find evidence of any changes in enrollment in girls' public schools (see the bottom panel of Appendix Figure A1).

[38]The average public school has 98.4 students enrolled at the primary level.

I am also interested in heterogeneous effects by distance, and ask whether public schools located relatively closer to the new private school are more affected by private school entry. Parents are sensitive to distance to schools when deciding which school to send their children (Carneiro, Das and Reis, 2019), which is why it is an important dimension to study.

Public schools located closer to the new private schools are more likely to be affected by private school expansion.[39] Relative to public schools located further, public schools within 500 meters of the new private school have a significant drop in enrollment of 20 to 37 students (see the top panel of Appendix Figure A2). Again, there is a significant decline in grades 1 and 2 enrollment. Enrollment in grades 3 to 5 significantly drops two years after private school entry (16 students less on average). There is no change in enrollment in public schools located further than 500 meters from the new private school (see the bottom panel of Appendix Figure A2).

Classroom Composition in Public Schools

There is no evidence that private school entry leads to a significant change in the public school composition of grades 3 to 5 students (see Figure 4). The magnitude of sorting for students enrolled in grades 3 to 5, the sample of students for which I have information on socioeconomic status, is not large enough to lead to significant changes in the composition of grades 3 to 5 public school students. The test scores dataset did not collect information on the socioeconomic status of students enrolled in grades 1 and 2.[40]

I look at the heterogeneous effects of private school entry on classroom composition in boys' public schools and public schools located closer where the decline in enrollment were stronger. There is evidence of a small decline in the average socioeconomic status

[39]The threshold used to determine closer public schools is 500 meters within the new private school. The results are robust to using different distance thresholds.

[40]To address this limitation, I exploit the fact that the second cohort of tested students is younger and exposed to private school entry at a younger age. I explore whether public school students exposed to entry at a younger age are from a lower socioeconomic status than students exposed to entry at an older age. See the Appendix for more details.

of students in boys' public schools two years after private entry (see Appendix Figure A3). I do not find significant changes in the average socioeconomic status of grades 3 to 5 students in public schools located closer (see Appendix Figure A4).

The small and insignificant effects on classroom composition are not inconsistent with the analysis on student mobility. Wealthier students are more likely to exit public schools, even in the absence of private school entry. When a new private school opens in the schooling market, wealthier students are not more likely to switch from public to private schools (see Column (2) of Table 7). Most importantly, I find evidence that younger and wealthier students were more likely to switch (see Table 6), but data on classroom composition in grades 1 and 2 is not available.

Summary

There is clear evidence of sorting between public and private schools. The analysis on switching behaviors showed that boys, students from wealthier households, and high achievers are more likely to enroll in private schools. Young students are also more likely to switch from public to private schools, and they are more responsive to private school entry. Following a private school entry, enrollment in grades 1 and 2 in public schools drops. I mostly observed declines in enrollment in boys' public schools and public schools located relatively closer to the new private school. There is no evidence of a significant change in classroom composition for grades 3 to 5 students enrolled in the public sector. Indeed, student mobility for students enrolled in those higher grades is lower compared to younger students, which is consistent with the presence of switching costs. The next section explores the effects of private school entry on the performance of public schools.

4.2 Performance of Public Schools

Short-Term Analysis

Following a private school entry, school valued-added (SVA) in public schools does not change as shown in the event study in Figure 5. Up to one year after the private school entry, the point estimate on SVA is -0.04 standard deviation and is not significant.[41] The performance of public schools two years after the private school entry increases by 0.24 standard deviation. The point estimate is statistically significant at the 10 percent level.[42]

I study the heterogeneous effects of private school entry on the performance of public schools by gender and distance. Private school entry does not have negative effects on SVA in boys or girls' public schools (see Appendix Figure A6). The large and positive point estimate on private school entry two years later is mainly observed in boys' public schools. Furthermore, there are no heterogeneous effects on public schools' SVA by distance (see Appendix Figure A7). The large increase in SVA two years after private school entry is observed in public schools located closer and further. The fact that we observe a peak in SVA even in public schools in which enrollment was not affected by private school entry suggests that the positive and large point estimate on SVA is *not* explained by private school entry.

I construct school-value added estimates using test scores for students enrolled in grades 3 to 5. Older students are less likely to switch schools, and private school entry did not lead to significant changes in public school enrollment in grades 3 to 5. In the Appendix, I explore whether younger tested cohorts have differential test scores in the short term. In the next subsection, I use the 2011 follow-up data to study if the effects of private school entry on public school test scores appear only after the youngest cohorts have progressed in school.

[41] I cannot rule out large negative effects: up to -0.20 standard deviation using 95 percent confidence intervals.

[42] Appendix Figure A5 shows that the increase in SVA is significant at the 5 percent level for SVA in English. This school subject was more likely to predict public school exit.

Long-Term Analysis

This section explores the long-term effects of private school entry using the 2011 follow-up test scores dataset. The short-term analysis showed that younger students are more likely to switch from public to private schools and that enrollment in public schools drops only in grades 1 and 2. The null effects on SVA observed in the short term could be explained by low student mobility among tested students enrolled in grades 3 to 5. In this section, I first extend the event study analysis by including private school entries between 2006 and 2011.[43] I then explore if individuals exposed to private school entry when younger have different schooling outcomes.

I find no evidence of negative effects on average test scores in public schools up to seven years after private school entry. The third cohort of students is tested in 2011 only. I cannot construct measures of school value-added for the extended event study analysis and use average school-level test scores instead. Figure 6 shows that, even after including entry events between 2006 and 2011, the results replicate for up to 2 years after a private school entry. Three years after private school entry, the point estimates are positive, not statistically significant, and range between -0.02 and 0.30 standard deviations. In the Appendix, I show the results are similar for boys' public schools and public schools located closer to new private schools (see Appendix Figures A10 and A11).[44]

Finally, individuals exposed to private school entry at a younger age (i.e., 7 years old or less) are more likely to be enrolled in private schools than individuals exposed to private school entry when older, and public school students do not have worse schooling outcomes. Columns (1) and (2) of Table 8 show that, relative to older children, children

[43] See Table 2 for a timeline of the number of villages with private school entry.

[44] In Appendix, I present the long-term effects of private school entry on enrollment and composition. The average primary school enrollment in public schools drops (see Panel (a) of Appendix Figure A8, and remains significantly lower for grades 1 and 2 (see Panel (b) of Appendix Figure A8). There is some evidence of a lagged decline in grades 3 to 5 enrollment, but the point estimates are not significant (see Panel (c) of Appendix Figure A8). Again, there is no pre-trend in public school enrollment. I also note in Appendix Figure A9 that there are no significant changes in the average socioeconomic status of students in public schools.

exposed to private school entry at seven years old or less were more likely to be enrolled in a private school.[45] This finding provides additional evidence that younger students are more likely to switch out of the public sector. Among those who remained enrolled in public schools, they do not have significantly different average test scores or years of schooling completed. Children aged 8 to 14 years old, who remained in the public sector and were younger when a private school opened in their village, had similar average test scores and completed the same number of years of education (see Columns (3) to (6) of Table 8).

5 Mechanisms

In this section, I explore the potential mechanisms that explain why private school entry does not affect the academic performance of public school students.

Public School Funding and Resources

Public schools do not have financial incentives to retain students, partly explaining why they may not respond to private school competition, as seen in other contexts (Hoxby, 2000). In Pakistan, the provincial governments determine public school funding and allocate resources across primary public schools. The event study analysis presented in Appendix Figure A12 shows that public school monthly expenditures do not change after a new private school opens. Interestingly, as students exit the public sector, public school expenditures remain constant. If the government of Punjab were to reduce public school budgets in response to private school entry, the null results observed on the performance of public schools might not be robust.

[45] Table 8 provides the results for two samples: the *Full* sample (all tested children in 2011) and the *Sibling* sample (individuals linked to the household surveys). It is worth noting that the age variation is primarily coming from the *Sibling* sample. Indeed, the third cohort of tested students is enrolled in grade 4 in 2011 and the majority of students are between 9 and 11 years old.

Class Size

The decline in public school enrollment might not lead to smaller classes if the public sector responds to private school entry and reallocates teachers to other public schools. Appendix Figure A13 shows that one year following a private school entry, the number of students per teacher drops by 4.4 students per teacher. At baseline, public schools had on average 25.8 students per teacher. The effects on student-teacher ratio are particularly significant in boys public schools (see Panel (b) of Appendix Figure A13).[46] The significant decline in class size suggests that the government of Punjab does not reallocate teachers to public schools that are not affected by private school entry.

A significant decline in class size could positively affect the performance of public schools if students benefit from smaller classrooms. However, the literature finds mixed evidence of the impact of lower student-teacher ratios on student test scores (Glewwe and Kremer, 2006; Hanushek, 1995). Duflo, Dupas and Kremer (2015) show that a reduction in class size from 82 to 44 students per teacher did not improve test scores among grade 1 students in Kenya. As a result, a drop from 25.8 to 21.4 students per teacher may not have meaningful effects on student academic performance. Furthermore, public school enrollment drops in grades 1 and 2 only, and test scores are collected for students enrolled in grades 3 to 5. I do not directly observe test scores for students enrolled in grades 1 and 2, where mobility between public and private schools is higher. The benefits of smaller class sizes could be observed in those lower grades only, although the effects might be small given Duflo, Dupas and Kremer (2015)'s findings.

[46] Panel (c) of Appendix Figure A13 shows the results for public schools located closer to new private schools (i.e., within 500 meters). The point estimates are not significant, but class size also drops by approximately five students per teacher.

Peer Effects and Classroom Composition

Students may benefit from having high-achieving peers in the classroom.[47] Policymakers might be concerned about a loss in positive peer effects as private school expansion increases sorting between public and private schools.

Appendix Table A7 shows evidence that following a private school entry, public schools lose students who perform better in English. If high-achievers in English had positive spillovers on their peers, we would expect a relatively lower SVA in English among students who remain in public schools. Panel (a) of Figure A5 suggests otherwise. Two years after private school entry, SVA in public schools improves in English the most, providing additional evidence of no negative consequences of sorting. It does not mean that peer effects are negative: students could benefit from high-achieving peers on other dimensions than test scores.

In fact, teachers might have more homogeneous classrooms in English only, making it easier to teach at an instructional level that benefits more students in the classroom (Duflo, Dupas and Kremer, 2011). The suggestive evidence presented on English test scores is somewhat aligned with the idea that more homogeneous classrooms are a relevant mechanism and may offset the loss in positive peer effects.

6 Conclusion

In low- and middle-income countries, the role of the private sector in educating young children has dramatically increased in the past years. In Pakistan, for example, the number of private schools increased from 3,300 to 47,000 schools between 1983 to 2005. Private schooling expansion led to a growing literature that studies private school competition and school performance in low-income countries, but little is known about the

[47] See Epple and Romano (1998) and Sacerdote (2011) for a review of the literature on peer effects.

effects of private school entry on public education.[48]

This paper studies how an increase in the number of low-cost private schools affects sorting between public and private schools and the performance of public schools in rural Pakistan. I showed that private schools engage in cream-skimming: boys, students from wealthier backgrounds and high achievers are more likely to exit public schools and enroll in private schools. Furthermore, consistent with the presence of switching costs, younger students are more likely to switch schools. Higher student mobility among younger students translates into clear heterogeneous effects on public school enrollment by grades. A decline in grades 1 and 2 enrollment explains the significant decline in public school primary enrollment. I find no change in grades 3 to 5 enrollment in public schools. Student learning for those who stay in the public sector is not negatively affected by private school expansion, both in the short and long term. The point estimates on school value-added and long-term average test scores in public schools are positive. What is clear is that private school expansion does not worsen public education.

The fact that student mobility is higher for younger students has important methodological implications. Researchers interested in school competition and school choice should consider the heterogeneous effects of private school expansion on students enrolled in different grades. In particular, the costs of switching schools that parents face should be taken into consideration when analyzing school choice. In the LEAPS project, test scores are available for students enrolled in grades 3 to 5, where mobility between public and private schools is lower. This data limitation implies that I do not directly observe the short-term effects of private school expansion on the academic performance of grade 1 and 2 students. The long-term analysis presented in this paper suggests that students who stayed in public schools and were exposed to private school entry at a younger age were not performing significantly lower on average. Future research

[48]See for instance Andrabi et al. (2020*b*), Joshi (2020), Neilson (2020), Bau (2021), Muralidharan and Sundararaman (2015), Singh (2015), and Muralidharan and Kremer (2008) that address the question of interactions between public and private schools in low-income countries.

should explore further dynamics effects of private school competition on public education across all levels.

The null result of private school expansion on the quality of public education is policy-relevant. Governments and policymakers might be concerned about whether private school expansion worsens public education if sorting occurs. The evidence presented in this paper shows that an additional private school in schooling markets has no negative effects on the performance of public schools up to seven years after private school entry. In rural Pakistan, private schools were not financially supported by the government at the time of data collection. Furthermore, public school funding did not change as a result of private schooling expansion. Future research should explore the robustness of the null results to contexts with different allocations of school resources.

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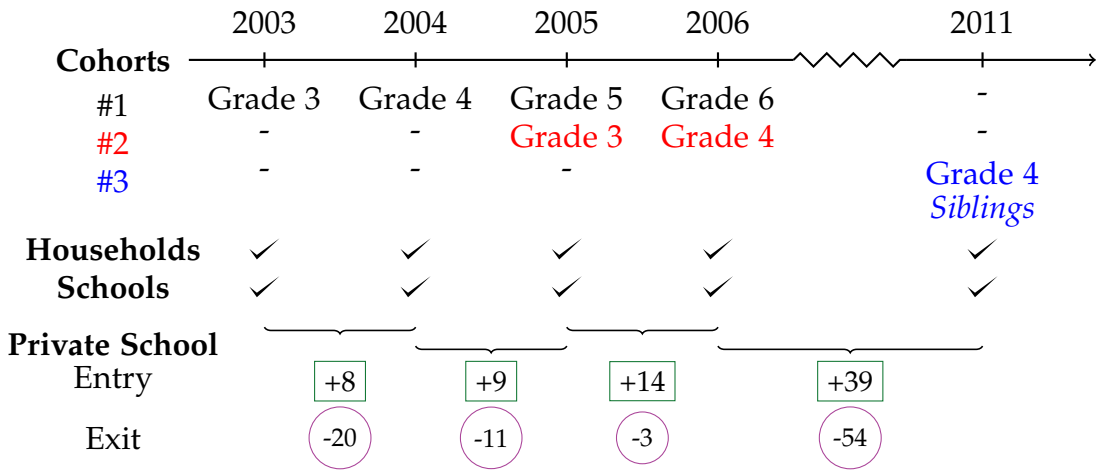
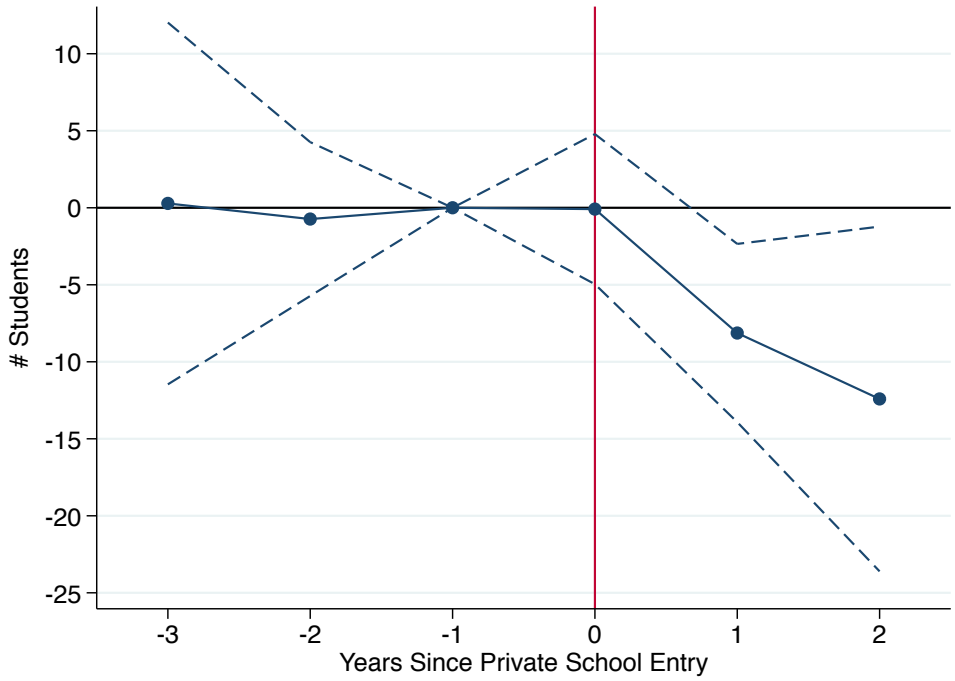
7 Figures

Figure 1: Timeline of Data Collection, Private School Entry, and Private School Exit



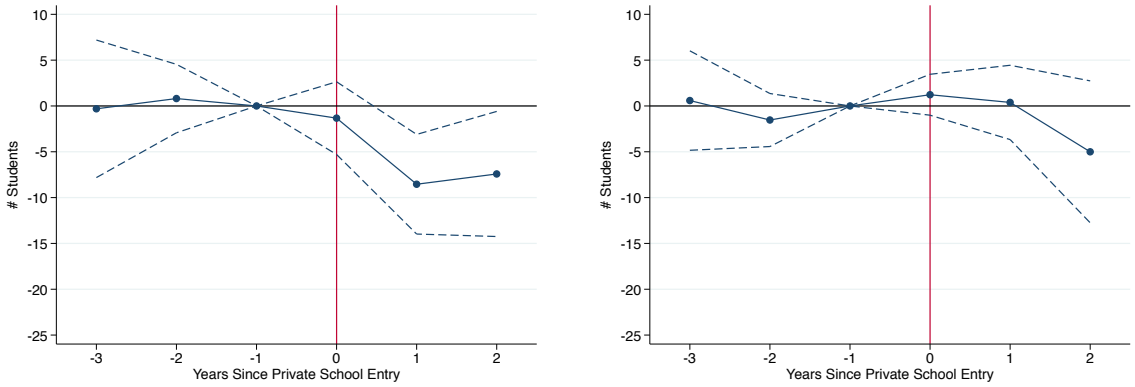
Notes: This figure presents the timeline of data collection, private school entry, and private school exit over the five rounds of data. *Cohorts* shows the grades in which each cohort of tested students is enrolled. *Households* and *Schools* indicate with a check mark the years in which the household and school surveys are collected. Private school entry is the number of villages with a private school entry (in the green box with + sign), and private school exit is the number of villages with a private school exit (in the purple circle with − sign). See Table 2 for more details on the number of private schools entries and exits.

Figure 2: Private School Entry and Primary Enrollment in Public Schools



Notes: This event study graph shows the effect of private school entry on primary enrollment in public schools. It plots the γ estimates from equation 2. The outcome is the number of students enrolled in grades 1 to 5 in public schools. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard deviations are clustered at the village level.

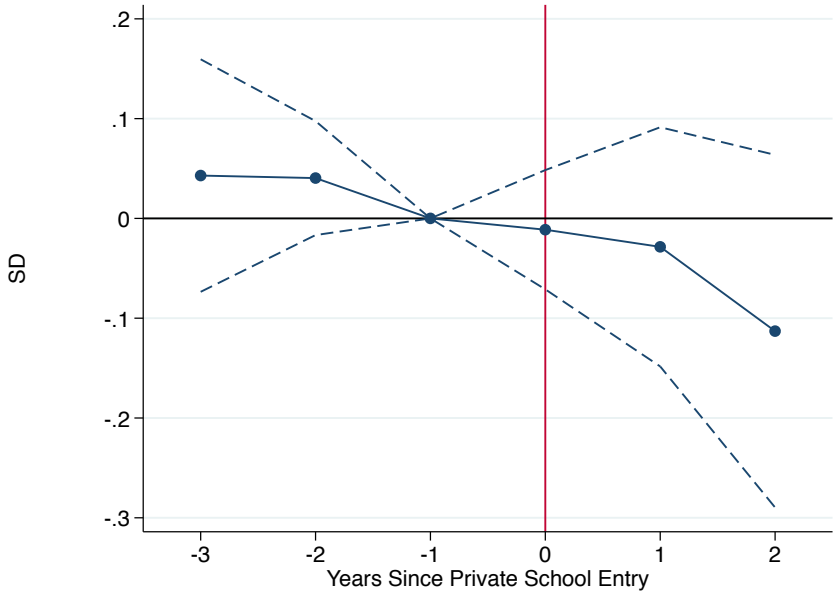
Figure 3: Private School Entry and Primary Enrollment in Public Schools by Grades



(a) Grades 1 & 2 (b) Grades 3 to 5

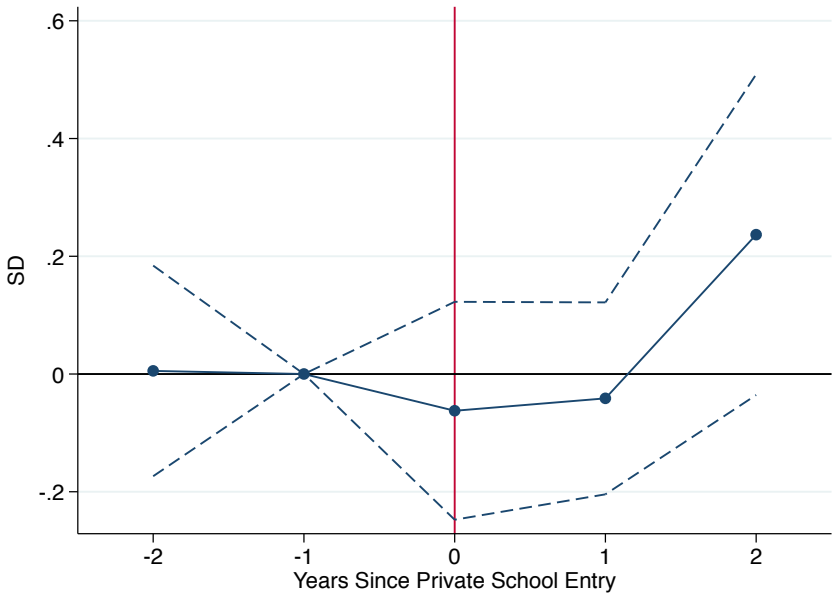
Notes: This event study graph shows the effect of private school entry on enrollment in public schools in grades 1 and 2 (left panel) and grades 3 to 5 (right panel). It plots the γ estimates from equation 2. The outcome on the left panel is the number of students enrolled in grades 1 and 2 in public schools. On the right panel, the outcome is the number of students enrolled in grades 3 to 5. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard deviations are clustered at the village level.

Figure 4: Private School Entry and Classroom Composition in Public Schools



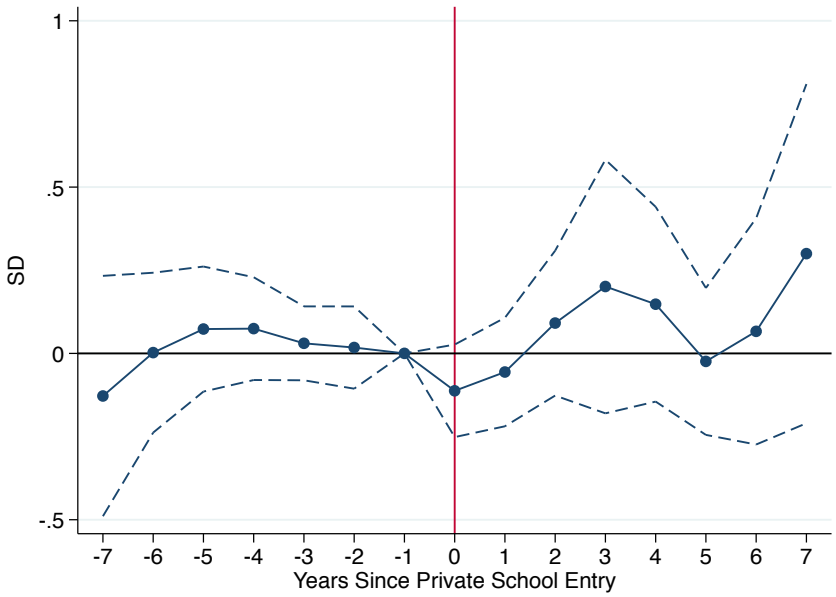
Notes: This event study graph shows the effect of private school entry on the classroom composition of students in public schools. It plots the γ estimates from equation 2. The outcome is a socioeconomic status (SES) index for students enrolled in grades 3 to 5 in public schools. The SES index is constructed using the first principal component analysis on parental education and assets. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard deviations are clustered at the village level.

Figure 5: Private School Entry and School Value-Added in Public Schools



Notes: This event study graph shows the effect of private school entry on school value-added in public schools. It plots the γ estimates from equation 2. The outcome is the average school value-added in public schools for students enrolled in grades 3 to 5 (i.e. the school-year fixed effect, SVA_{vt}, from equation 3). The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard deviations are clustered at the village level.

Figure 6: Private School Entry and Test Scores in Public Schools in the Long Term



Notes: This event study graph shows the long-term effect of private school entry on average test scores in public schools. It plots the γ estimates from equation 4 and includes events between 2007 and 2011 (see Table 2). The outcome is the average test scores in public schools. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard deviations are clustered at the village level.

8 Tables

Table 1: Characteristics of Public and Private Schools in Rural Punjab, Pakistan

	Public Schools	**Private Schools**
Number of Schools per Village	4.4	2.8
Primary Enrollment	$\sim$ 70%	$\sim$ 28%
Gender	Sex-segregated	Co-educational
Fees	Free	Low cost
Teachers	Civil servants	Local, unmarried, secondary educated women
Salary	Reward experience and education	One fifth to a third of public schools' wages
School Quality (SVA)	Lower; Large range	Higher
Location	Village periphery	Village center

Sources: Author's calculations using the LEAPS school surveys for the *Number of Schools per Village* and *Primary Enrollment*. See also Andrabi et al. (2008), Andrabi, Das and Khwaja (2008), Bau and Das (2020), and Andrabi et al. (2020*b*).

Table 2: Timeline of Private School Entries and Exits

	Years							
	2004	2005	2006	2007	2008	2009	2010	2011
	Panel A: Private School Entry							
Number of Schools	8	12	17	21	5	12	16	21
Number of Villages	8	9	14	13	4	6	8	8
	Panel B: Private School Exit							
Number of Schools	21	18	5	N/A	N/A	N/A	N/A	83
Number of Villages	20	11	3	N/A	N/A	N/A	N/A	54

Notes: *Number of Schools* show the number of private schools that entered (Panel A) or exited (Panel B) in each year. An entry in 2004 is a school that was not open in 2003, but is open in 2004. An exit in 2004 is a school that was open in 2003-04, but is not open in 2004. *Number of Villages* show the number of villages with a private school entry (Panel A) or exit (Panel B). The number of entries and exits between 2004 and 2006 is determined using the *school surveys* between 2003 and 2006. The number of entries between 2007 and 2011 is determined using the year of construction of the school from the 2011 *school survey*. Between 2007 and 2011, 83 private schools closed in 54 different villages. The year of closure is not available between 2007 and 2011.

Table 3: Characteristics of New Private Schools

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Enroll.	Primary Enroll.	Grades	Basic Facility	Extra Facility	Tuition Fee	Test Scores	SES Index
Panel A: School Characteristics								
New Private School	-50.219***	-32.802***	-0.711*	0.479**	-0.161	20.204	-0.105	-0.084
	(11.446)	(6.110)	(0.363)	(0.223)	(0.215)	(93.159)	(0.091)	(0.120)
Mean Outcome	151.916	77.046	8.501	0.747	1.178	1335.129	0.287	0.468
Adjusted R^2	0.271	0.240	0.306	0.252	0.222	0.412	0.276	0.308
Observations	1193	1193	1189	1189	1188	1191	1168	1167
Clusters	108	108	108	108	108	108	108	108
Panel B: Teachers Characteristics								
	# Teachers	# Primary Teachers	Exp. Teaching	BA or more	Some Training	Test Scores	Share Female	Age
New Private School	-1.437**	-0.680*	-0.115**	0.052	0.005	0.047	-0.072	-0.300
	(0.551)	(0.362)	(0.052)	(0.042)	(0.054)	(0.167)	(0.045)	(0.892)
Mean Outcome	7.352	5.766	0.414	0.231	0.261	0.041	0.781	25.356
Adjusted R^2	0.277	0.220	0.162	0.177	0.158	0.089	0.502	0.173
Observations	1193	1193	1191	1191	1183	1159	1191	1191
Clusters	108	108	108	108	108	108	108	108

Notes: This table presents the characteristics of new private schools compared to existing private schools. The sample is new and existing private schools open between 2003 and 2006. The explanatory variable *New Private School* is a dummy that equals 1 if the private school is new in the given year. Panel A shows schools' characteristics and Panel B shows teachers' characteristics. **Panel A**: *Total* and *Primary Enroll.* are enrollment in grades 1 to 12 and grades 1 to 5, respectively. The number of grades offered (*Grades*) ranges between grades 0 and 12. *Basic* and *Extra Facility* are indices for school facilities following Bau and Das (2020). *Tuition Fee* is the average annual fee for students at the primary level (in rupees). *Test scores* is the average school-level test scores and *SES Index* is an index constructed using the first principal component analysis on parental education and assets. **Panel B**: The outcome variables # *Teachers* and # *Primary Teachers* are the average number of teachers and primary school teachers, respectively. *Exp. Teaching* is the share of teachers with more than three years of teaching experience. *BA or more* is the share of teachers with a BA or more, and *Some Training* is the share of teachers with any training. *Test Scores* is the average teachers' test scores. *Share Female* is the share of female teachers in the school and *Age* is the average age of teachers. All regressions include year and village fixed effects. Standard errors are clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Table 4: Descriptive Statistics of Students Switching Schools

	Switch School		**Out of Public**		**Into Public**	
	(1)	(2)	(3)	(4)	(5)	(6)
	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5
6-7 years old	0.043**	0.034*	0.052***	0.043***	-0.025	-0.038
	(0.017)	(0.017)	(0.009)	(0.010)	(0.027)	(0.029)
8-9 years old	0.018	0.010	0.024***	0.022***	-0.007	-0.020
	(0.014)	(0.015)	(0.007)	(0.007)	(0.023)	(0.023)
10-11 years old	-0.008	-0.010	0.018**	0.017**	-0.016	-0.021
	(0.013)	(0.013)	(0.007)	(0.007)	(0.023)	(0.023)
Female	-0.014	-0.008	-0.018***	-0.012**	-0.011	-0.017
	(0.010)	(0.011)	(0.006)	(0.006)	(0.017)	(0.018)
SES Index	0.002	0.005	0.016***	0.016***	-0.021**	-0.018**
	(0.006)	(0.006)	(0.004)	(0.004)	(0.009)	(0.009)
Mean Outcome	0.217	0.207	0.048	0.044	0.138	0.133
p-value 6-7 vs. 8-9	0.056	0.111	0.002	0.017	0.301	0.368
p-value 6-7 vs. 10-11	0.000	0.004	0.000	0.004	0.609	0.365
p-value 8-9 vs. 10-11	0.009	0.042	0.176	0.387	0.457	0.948
Year & Village Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.078	0.079	0.045	0.041	0.081	0.076
Observations	8755	7912	6454	5820	2576	2338
Clusters	112	112	112	112	110	110

Notes: This table shows the characteristics of students who switch schools. The outcome in columns (1) and (2) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In columns (3) and (4), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In columns (5) and (6), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. The sample is children aged 6 to 12 years old from the household dataset enrolled in grades 0 to 5 in odd columns and grades 1 to 5 in even columns. The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. All regressions include year and village fixed effects. Standard errors clustered at the village level. The bottom panel shows the *p*-values for the statistical difference on the age point estimates. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Table 5: Private School Entry and Students Switching Schools

	Switch School		**Out of Public**		**Into Public**	
	(1)	(2)	(3)	(4)	(5)	(6)
	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5
6-7 years old	0.030	0.014	0.045***	0.042***	-0.025	-0.045
	(0.021)	(0.021)	(0.011)	(0.011)	(0.030)	(0.032)
8-9 years old	0.018	0.010	0.020**	0.017**	0.002	-0.015
	(0.017)	(0.017)	(0.008)	(0.008)	(0.025)	(0.024)
10-11 years old	-0.007	-0.007	0.018**	0.019**	-0.019	-0.025
	(0.015)	(0.015)	(0.008)	(0.008)	(0.024)	(0.024)
Female	-0.011	-0.009	-0.013**	-0.009	-0.011	-0.019
	(0.011)	(0.011)	(0.006)	(0.006)	(0.019)	(0.019)
SES Index	-0.001	0.003	0.016***	0.014***	-0.017*	-0.012
	(0.007)	(0.007)	(0.004)	(0.004)	(0.010)	(0.010)
Entry × 6-7 years old	0.057	0.054	0.087**	0.026	-0.010	0.019
	(0.045)	(0.050)	(0.038)	(0.037)	(0.045)	(0.053)
Entry × 8-9 years old	0.013	0.022	0.042*	0.041	-0.106**	-0.082*
	(0.038)	(0.042)	(0.022)	(0.025)	(0.048)	(0.046)
Entry × 10-11 years old	0.010	0.018	0.033	0.028	-0.039	-0.030
	(0.034)	(0.034)	(0.022)	(0.021)	(0.051)	(0.051)
Entry × 12 years old	0.026	0.031	0.045	0.042	-0.016	0.008
	(0.036)	(0.037)	(0.029)	(0.030)	(0.085)	(0.086)
Entry × Female	0.055	0.045	-0.007	0.000	0.037	0.044
	(0.042)	(0.043)	(0.024)	(0.022)	(0.058)	(0.060)
Entry × SES Index	0.013	0.009	0.012	0.020*	-0.008	-0.024
	(0.019)	(0.019)	(0.012)	(0.012)	(0.024)	(0.026)
Mean Outcome	0.217	0.207	0.048	0.044	0.138	0.133
Year & Village Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.079	0.080	0.047	0.043	0.080	0.076
Observations	8755	7912	6454	5820	2576	2338
Clusters	112	112	112	112	110	110

Notes: This table shows how private school entry affects the likelihood of switching schools by students' characteristics. The outcome in columns (1) and (2) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In columns (3) and (4), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In columns (5) and (6), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. The sample is children aged 6 to 12 years old from the household dataset enrolled in grades 0 to 5 in odd columns and grades 1 to 5 in even columns. The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. The variable *Entry* is a dummy variable that equals 1 after a new private school opens in the village. Interactions with private school exit are also included (see Appendix Table A3). All regressions include year and village fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Table 6: Private School Entry and Students Switching Schools by Socioeconomic Status

	Out of Public	
	(1)	(2)
	Gr. 0-5	Gr. 1-5
6-7 years old	0.044***	0.041***
	(0.011)	(0.011)
8-9 years old	0.020**	0.017**
	(0.008)	(0.008)
10-11 years old	0.018**	0.019**
	(0.008)	(0.008)
SES Index	0.016***	0.014***
	(0.004)	(0.004)
Entry × 6-7 years old	0.084**	0.019
	(0.039)	(0.038)
Entry × 8-9 years old	0.042*	0.041
	(0.022)	(0.025)
Entry × 10-11 years old	0.033	0.027
	(0.022)	(0.021)
Entry × 12 years old	0.047	0.044
	(0.029)	(0.030)
Entry × 6-7 years old × SES	0.028	0.045*
	(0.021)	(0.026)
Entry × 8-9 years old × SES	0.006	0.017
	(0.014)	(0.013)
Entry × 10-11 years old × SES	0.015	0.023
	(0.019)	(0.020)
Entry × 12 years old × SES	0.001	0.002
	(0.012)	(0.012)
Mean Outcome	0.048	0.044
Year & Village Fixed Effects	Yes	Yes
Adjusted R^2	0.047	0.043
Observations	6454	5820
Clusters	112	112

Notes: This table shows how private school entry affects the likelihood of switching schools by students' age and socioeconomic status (SES). The sample is restricted to children who in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. The sample is students from the household dataset aged 6-12 years old enrolled in grades 0 to 5 in column (1) and grades 1 to 5 in column (2). The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The variable *Entry* is a dummy variable that equals 1 after a new private school opens in the village. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. Controls for gender and interactions with exits are included but not displayed in this table. All regressions include year and village fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Table 7: Private School Entry and Exit, and Tested Students Switching Schools

	Switch School	**Out of Public**	**Into Public**
	(1)	(2)	(3)
	Gr. 3-5	Gr. 3-5	Gr. 3-5
Test Scores	-0.007***	0.004***	-0.046***
	(0.002)	(0.001)	(0.007)
SES Index	-0.002	0.005***	-0.004
	(0.002)	(0.001)	(0.003)
Entry × Test Scores	0.012**	0.005*	0.000
	(0.005)	(0.002)	(0.018)
Entry × SES Index	0.008*	0.002	-0.010
	(0.005)	(0.002)	(0.010)
Exit × Test Scores	0.000	-0.002	-0.028
	(0.005)	(0.002)	(0.021)
Exit × SES Index	0.006	-0.001	-0.015
	(0.004)	(0.002)	(0.010)
Mean Outcome	0.046	0.010	0.061
Year & Village Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.051	0.015	0.076
Observations	30458	22007	8450
Clusters	112	112	109

Notes: This table shows how private school entry and private school exit affect the likelihood of switching schools by students' characteristics. The sample is tested students enrolled in grades 3 to 5. The outcome in column (1) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In column (2), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In column (3), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. A child must be enrolled in two consecutive periods to be in the sample. The variable *Entry* is a dummy variable that equals 1 after a new private school opens in the village. The variable *Exit* is a dummy variable that equals 1 after a private school closes in the village. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education and assets. Controls for grades, and gender, and their interactions with private school entry and exit are included but not displayed. All regressions include year and village fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Table 8: Long-Term Effects of Private School Entry on Schooling Outcomes of Young Individuals

	Enrolled in Private		Test Scores (Public)		Highest Grade (Public)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Full	*Sibling*	Full	*Sibling*	Full	*Sibling*
$\leq$ 7 Years Old at Entry	0.091***	0.080*	-0.078	0.008	0.003	-0.347
	(0.027)	(0.040)	(0.082)	(0.278)	(0.083)	(0.226)
Mean Outcome	0.339	0.238	-0.227	0.469	3.156	4.613
Adjusted R^2	0.142	0.118	0.177	0.148	0.293	0.498
Observations	13912	2287	8233	832	8196	795
Clusters	112	112	112	110	112	110

Notes: This table shows how exposure to private school entry at a younger age affects the likelihood of being enrolled in private schools (Columns (1) and (2)), average test scores (Columns (3) and (4)), and highest grade attained (Columns (5) and (6)). Odd columns (*Full*) include the sample of all test-takers in 2011 and even columns (*Sibling*) include individuals from the *Sibling* dataset. Columns (3) to (6) includes only children aged 8 to 14 years old who were enrolled in public schools. The explanatory variable, $\leq$ 7 *Years Old at Entry*, is a dummy that equals 1 if the individual was 7 years old or less when the private school opened in their village. Controls for age, gender, and village fixed effects are included. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Private School Entry, Sorting, and the Performance of Public Schools: Evidence from Pakistan

Catherine Michaud-Leclerc

Appendices

Appendix A Analysis by Cohorts

In this section, I provide an additional analysis of the effects of private school entry on classroom composition and student academic performance.

The analysis on switching behaviors in Section 4.1 showed that younger students are more likely to switch schools. However, test scores are only available for students enrolled in grades 3 to 5 and student mobility is lower in those grades. To address this limitation, I take advantage of the two cohorts of tested students to explore the effects of private school entry on public school students exposed to private school entry at a younger age. The first cohort of students is enrolled in grade 3 in 2003 and is followed for four consecutive years. The second cohort of students is enrolled in grade 3 in 2005 and is followed for two consecutive years. Each cohort has approximately 12,000 students and information on socioeconomic status is available for approximately half the sample of tested students.

To explore the effects of private school entry on students of different age, I estimate the following regression:

$$\begin{aligned} y_{ivt} = {} & \beta_0 + \beta_1 Entry_{vt} + \beta_2 Young\_at\_Entry_{ivt} \times Entry_{vt} \\ & + \beta_3 Entry_{vt} \times grade_{it} + \beta_4 Young\_at\_Entry_{ivt} \times Entry_{vt} \times grade_{it} \\ & + grade_{it} + \alpha_t + \nu_v + \Gamma RCT_{vt} + \varepsilon_{ivt} \end{aligned} \tag{6}$$

where y_{ivt} is a measure of socioeconomic status or test scores for student i in village v at time t. $Entry_{vt}$ is a dummy that equals one if the village had a private school entry at time t or before. $Young\_at\_Entry_{ivt}$ is a dummy that equals one if the student is enrolled in grade 2 or grade 3 when the private school entered their village (as opposed to be enrolled in grade 4 or grade 5).[49] I control for grade fixed effects ($grade_{it}$), grade fixed effects interacted with entry ($Entry_{vt} \times grade_{it}$) and the triple interactions of young at entry, entry and grade ($Young\_at\_Entry_{ivt} \times Entry_{vt} \times grade_{it}$).[50] I also include year fixed effects (α_t), village fixed effects (ν_v), a dummy to control for whether the village was in the report card or school grants experiments (RCT_{vt}), and controls for private school exit. When the outcome is test scores, I also control for lagged test scores. The sample is students enrolled in public schools in grades 3 to 5.

Appendix Table A8 shows the point estimates on $Young\_at\_Entry_{ivt}$, $Entry_{vt}$, $grade_{it}$, and their interactions. I compare outcomes of students enrolled in public schools and exposed to private school entry at a different age. I can estimate the relative socioeconomic status and test scores of students in grade 4 and exposed to private school entry at a younger age compared to those exposed when older. The parameters of interest are in the bottom panel of Appendix Table A8 which shows the p-values of a test of mean difference for those groups of students.

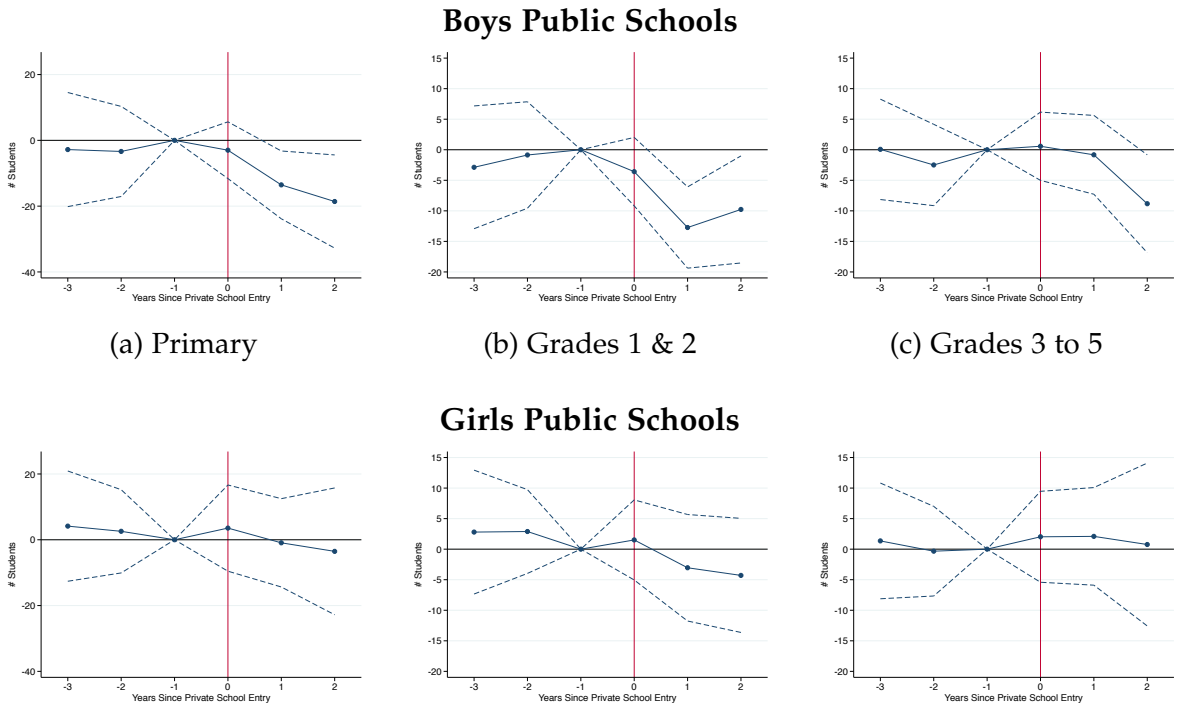
The results in Columns (1) and (2) suggest that students enrolled in public schools who were younger when a private school entered their village have a lower socioeconomic status than students who were older, but the difference is not statistically significant. Columns (3) and (4) shows that in the short term, grade 4 students in public schools and exposed to entry at a younger age have relatively higher test scores than grade 4 students who were older when exposed to private school entry. The test scores differences are marginally significant.

[49] The first year in which I observe a private school entry in the LEAPS project is 2004. The majority of students from the second and youngest cohort was enrolled in grade 2 in that year. For that reason, I group students enrolled in grades 2 and 3 in the youngest cohort and students enrolled in grades 4 and 5 in the oldest cohort.

[50] I note that the variable $Young\_at\_Entry_{ivt}$ equals 0 prior to a private school entry. For this reason, I do not include the interaction of $Young\_at\_Entry_{ivt}$ and $grade_{it}$ because it is collinear with the triple interaction.

Appendix A Appendix Figures and Tables

Appendix Figure A1: Private School Entry and Enrollment in Boys and Girls Public Schools



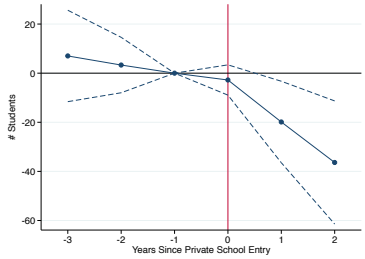
(a) Primary (b) Grades 1 & 2 (c) Grades 3 to 5

(a) Primary (b) Grades 1 & 2 (c) Grades 3 to 5

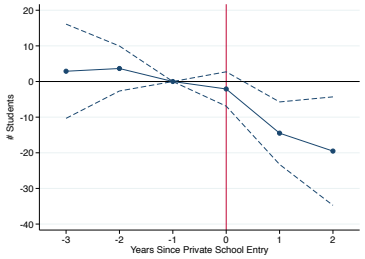
Notes: This event study graph shows the effect of private school entry on enrollment in boys (at the top) and girls (at the bottom) public schools. The outcome in Figures (a) is the number of students enrolled at the primary level (grades 1 to 5). The outcome in Figures (b) is the number of students enrolled in grades 1 and 2, and in Figures (c), the number of students in grades 3 to 5. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

Appendix Figure A2: Private School Entry and Public School Enrollment by Distance

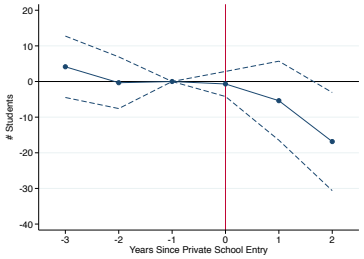
Public Schools Closer ($\leq$ 500 Meters) to New Private Schools



(a) Primary

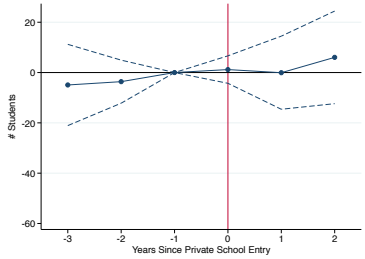


(b) Grades 1 & 2

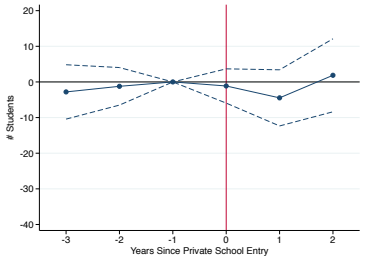


(c) Grades 3 to 5

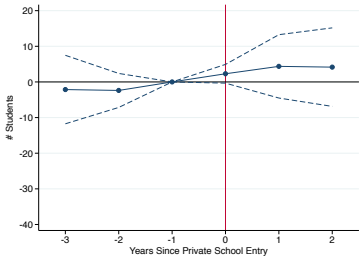
Public Schools Further ($>$ 500 Meters) to New Private Schools



(a) Primary



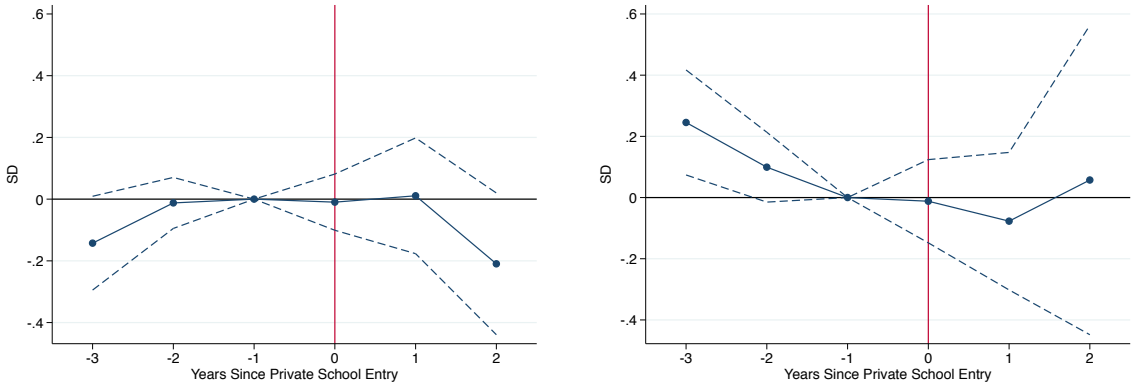
(b) Grades 1 & 2



(c) Grades 3 to 5

Notes: This event study graph shows the effect of private school entry on enrollment in public schools located closer (i.e. $\leq$ 500 meters at the top) and further (i.e. $>$ 500 meters at the bottom) to the new private schools. The outcome in Panels (a) is the number of students enrolled at the primary level (grades 1 to 5). The outcome in Panels (b) is the number of students enrolled in grades 1 and 2, and in Figures (c), the number of students in grades 3 to 5. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

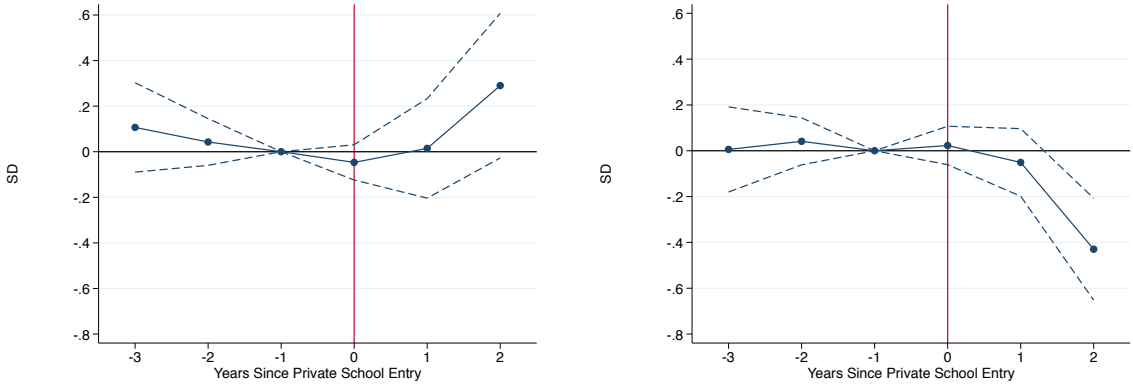
Appendix Figure A3: Private School Entry and Classroom Composition in Boys and Girls Public Schools



(a) Boys Public Schools (b) Girls Public Schools

Notes: This event study graph shows the effect of private school entry on the composition of students in boys (left panel) and girls (right panel) public schools. The outcome is the average socioeconomic status (SES) index for students enrolled in grades 3 to 5 in public schools. The SES index is constructed using the first principal component analysis on parental education and assets. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

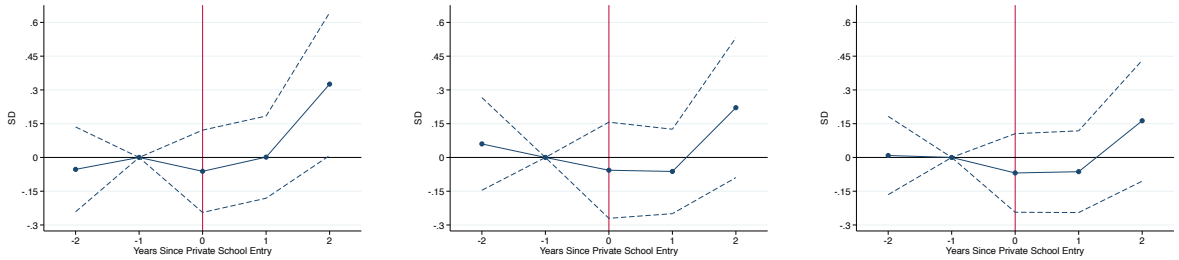
Appendix Figure A4: Private School Entry and Classroom Composition in Public Schools by Distance



(a) Public Schools Closer (b) Public Schools Further

Notes: This event study graph shows the effect of private school entry on the composition of students in public schools located closer (i.e. $\leq$ 500 meters) to new private schools (left panel) and further (i.e. $>$ 500 meters) (right panel). The outcome is a socioeconomic status (SES) index for students enrolled in grades 3 to 5 in public schools. The SES index is constructed using the first principal component analysis on parental education and assets. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

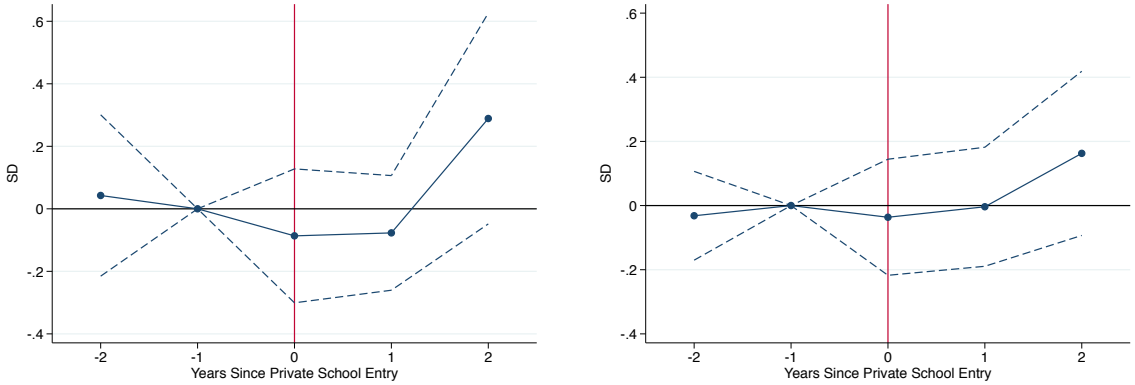
Appendix Figure A5: Private School Entry and School Value-Added in Public Schools by School Subject



(a) English (b) Mathematics (c) Urdu

Notes: This event study graph shows the effect of private school entry on school value-added in public schools. It plots the γ estimates from equation 2. The outcome is the school value-added in public schools for students enrolled in grades 3 to 5 in (a) English, (b) Mathematics, and (c) Urdu. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

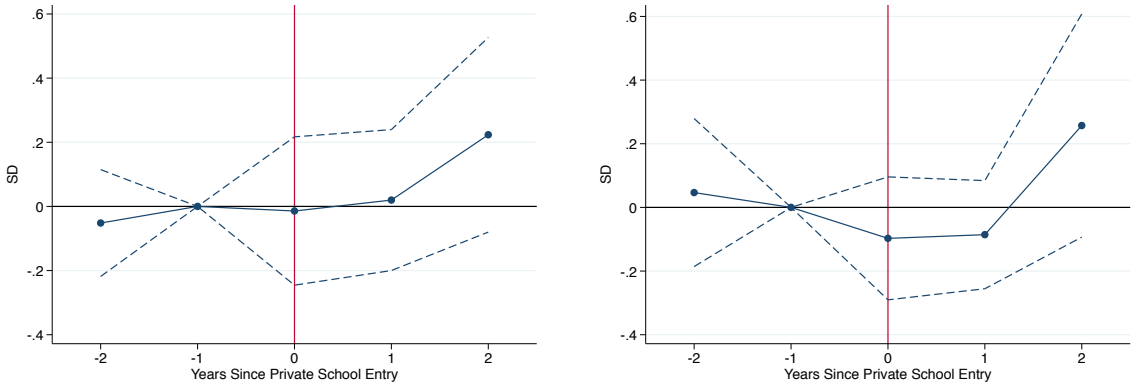
Appendix Figure A6: Private School Entry and School Value-Added in Boys and Girls Public Schools



(a) Boys Public Schools (b) Girls Public Schools

Notes: This event study graph shows the effect of private school entry on school value-added in boys (left panel) and girls (right panel) public schools. The outcome is the average school value-added in public schools for students enrolled in grades 3 to 5 (i.e. the school-year fixed effect SVA_{vt} from equation 3). The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

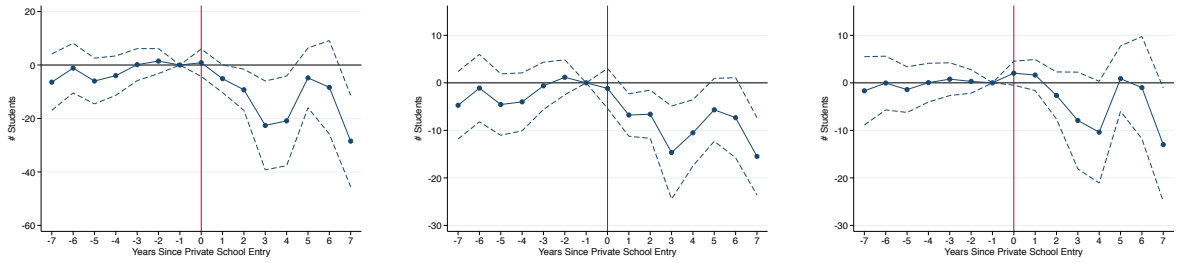
Appendix Figure A7: Private School Entry and School Value-Added in Public Schools by Distance



(a) Public Schools Closer (b) Public Schools Further

Notes: This event study graph shows the effect of private school entry on school value-added in public schools located closer (i.e. $\leq$ 500 meters) to new private schools (left panel) and further (i.e. $>$ 500 meters) (right panel). The outcome is the average school value-added in public schools for students enrolled in grades 3 to 5 (i.e. the school-year fixed effect SVA_{vt} from equation 3). The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

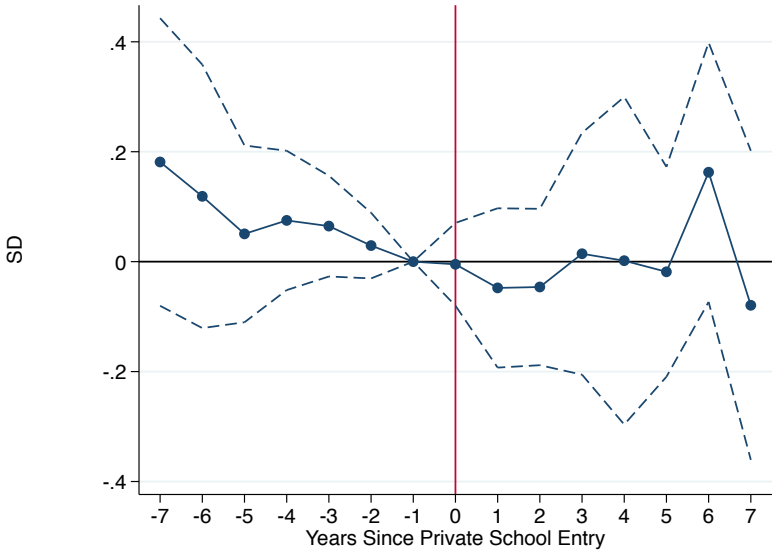
Appendix Figure A8: Private School Entry and Enrollment in Public Schools by Grades in the Long Term



(a) Primary (a) Grades 1 & 2 (b) Grades 3 to 5

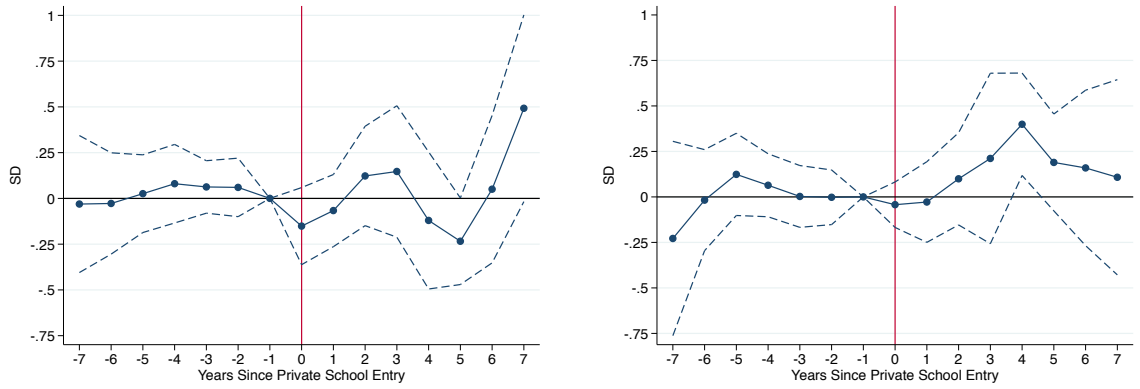
Notes: This event study graph shows the long-term effect of private school entry on enrollment in public schools. It plots the γ estimates from equation 4. The outcome in Panel (a) is the number of students enrolled at the primary level in public schools (grades 1 to 5). The outcomes in Panels (b) and (c) are the number of public school students enrolled in grades 1 and 2 and enrolled in grades 3 to 5, respectively. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

Appendix Figure A9: Private School Entry and Classroom Composition in Public Schools in the Long Term



Notes: This event study graph shows the long-term effect of private school entry on the composition of students in public schools. It plots the γ estimates from equation 4. The outcome is a socioeconomic status (SES) index for students enrolled in grades 3 to 5 in public schools. The SES index is constructed using the first principal component analysis on parental education and assets. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

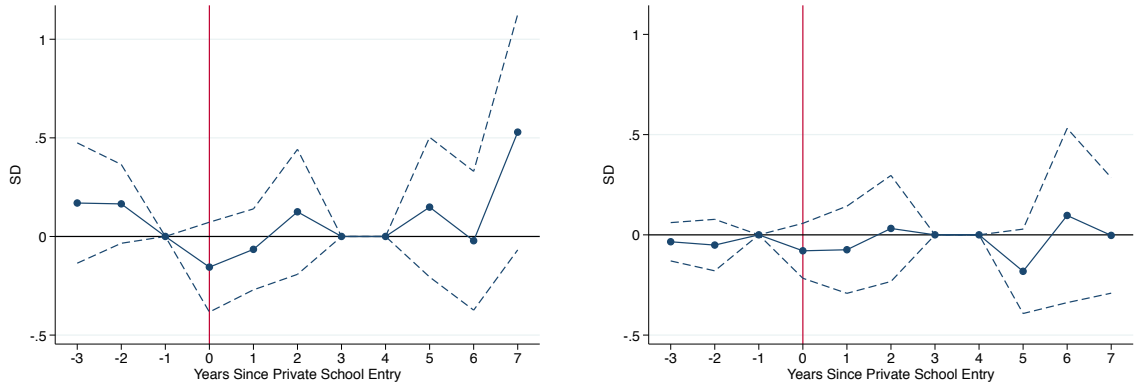
Appendix Figure A10: Private School Entry and Test Scores in Boys and Girls Public Schools in the Long Term



(a) Boys Public Schools (b) Girls Public Schools

Notes: This event study graph shows the long-term effect of private school entry on average test scores in boys public schools (left panel) and girls public schools (right panel). It plots the γ estimates from equation 4. The outcome is average test scores in the school. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

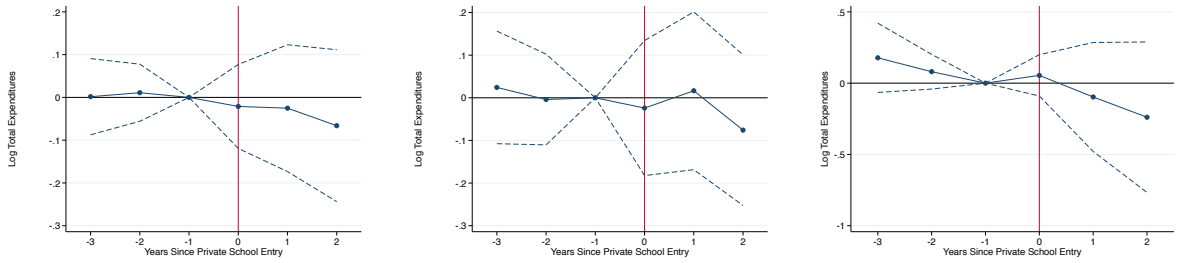
Appendix Figure A11: Long-Term Private School Entry and Test Scores in Public Schools by Distance



(a) Public Schools Closer (b) Public Schools Further

Notes: This event study graph shows the long-term effect of private school entry on average test scores in public schools located closer (i.e. $\leq$ 500 meters) to new private schools (left panel) and further (i.e. $>$ 500 meters) (right panel). It plots the γ estimates from equation 4. Only events between 2004 and 2006 are included because distance to new schools cannot be computed for schools that opened after 2007. The long-term effects appear in periods 5, 6, and 7. The outcome is average test scores in the school. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

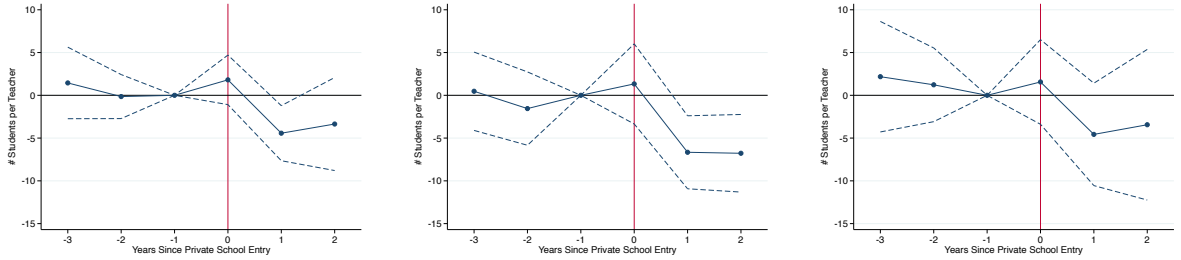
Appendix Figure A12: Private School Entry and Public Schools' Log Monthly Total Expenditures



(a) All Public Schools (b) Boys Public Schools (c) Public Schools Closer

Notes: This event study graph shows the effect of private school entry on the log of monthly expenditures in public schools. Monthly expenditures are calculated by adding monthly teachers' salaries to other monthly expenses occurred such as the purchase of furniture, education material, utilities, building construction. Panel (a) includes all public schools. Panels (b) and (c) show the heterogeneous effects for boys public schools and public schools located within 500 meters of the new private school, respectively. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

Appendix Figure A13: Private School Entry and Student-Teacher Ratio in Public Schools



(a) All Public Schools (b) Boys Public Schools (c) Public Schools Closer

Notes: This event study graph shows the effect of private school entry on the student-teacher ratio in public schools. Panel (a) includes all public schools. Panels (b) and (c) show the heterogeneous effects for boys public schools and public schools located within 500 meters of the new private school, respectively. The red vertical line at $x = 0$ represents the year in which we observe a new private school in the village. Year and village fixed effects are included. The dashed lines represent the 95 percent confidence intervals. Standard errors are clustered at the village level.

Appendix Table A1: Summary Statistics at Baseline (2003) by Type of Village

	No Event		Entry			Exit		
	(1) Mean	(2) N	(3) Mean	(4) N	(5) p-value	(6) Mean	(7) N	(8) p-value
Villages								
# Public Schools	4.197	61	4.484	31	0.654	4.647	34	0.456
# Private Schools	2.639	61	2.645	31	0.991	3.147	34	0.307
Share Enrolled	0.720	61	0.726	31	0.872	0.703	34	0.631
# Children	1,036	61	1,198	31	0.281	1,222	34	0.219
Public Schools								
Prim. Enrol.	96.742	256	101.381	137	0.575	97.905	156	0.888
Mom Educ.	0.283	252	0.299	135	0.515	0.253	151	0.201
Dad Educ.	0.610	252	0.582	135	0.252	0.567	151	0.068
Assets Index	-0.475	252	-0.507	135	0.737	-0.585	151	0.227
Test Scores	-0.698	252	-0.826	135	0.116	-0.743	151	0.561
Private Schools								
Prim. Enrol.	80.758	161	63.963	82	0.022	57.189	106	0.000
Mom Educ.	0.497	159	0.507	78	0.798	0.500	101	0.935
Dad Educ.	0.802	159	0.783	78	0.493	0.742	101	0.031
Assets Index	0.427	159	0.483	78	0.615	0.199	101	0.027
Test Scores	0.123	159	0.119	78	0.953	-0.057	101	0.009
Children Aged 6 to 12								
Enrolled	0.834	2057	0.843	1115	0.498	0.828	1180	0.673
Household Size	8.748	2058	8.628	1115	0.405	8.513	1180	0.093
Low Caste	0.276	2058	0.281	1115	0.755	0.327	1180	0.002
Mom Educ.	0.237	2058	0.259	1115	0.168	0.223	1180	0.356
Dad Educ.	0.513	2058	0.496	1115	0.356	0.508	1180	0.764
Assets Index	-0.253	2058	-0.550	1115	0.000	-0.440	1180	0.008

Notes: Columns (1) (3) and (6) show the mean characteristics for villages, schools, and children in villages with no event, with a private school entry, and a private school exit at baseline (2003). The table restricts to events happening between 2004 and 2006 (see Table 2 for more details). Columns (2) (4) and (7) shows the number of observations. Columns (5) and (8) show the *p*-values of a test of mean differences of villages with a private school entry or exit, relative to villages with no event.

Appendix Table A2: Descriptive Statistics of Students Switching Schools Within Households

	Switch School		**Out of Public**		**Into Public**	
	(1)	(2)	(3)	(4)	(5)	(6)
	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5
6-7 years old	0.034*	0.028	0.040***	0.034***	-0.050*	-0.061**
	(0.018)	(0.019)	(0.008)	(0.009)	(0.026)	(0.028)
8-9 years old	0.026*	0.020	0.025***	0.022***	-0.015	-0.026
	(0.015)	(0.016)	(0.007)	(0.008)	(0.026)	(0.027)
10-11 years old	-0.005	-0.007	0.018***	0.015**	-0.023	-0.026
	(0.013)	(0.013)	(0.006)	(0.007)	(0.022)	(0.023)
Female	-0.020	-0.016	-0.033***	-0.027***	0.026	0.022
	(0.013)	(0.013)	(0.008)	(0.008)	(0.016)	(0.018)
SES Index	0.023	0.032	0.012	0.013	0.028	0.021
	(0.020)	(0.021)	(0.011)	(0.011)	(0.024)	(0.027)
Mean Outcome	0.217	0.207	0.043	0.038	0.119	0.112
p-value 6-7 vs. 8-9	0.554	0.633	0.043	0.134	0.011	0.034
p-value 6-7 vs. 10-11	0.007	0.029	0.003	0.024	0.078	0.043
p-value 8-9 vs. 10-11	0.002	0.008	0.162	0.209	0.583	0.974
Year & Household Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.239	0.242	0.296	0.266	0.307	0.263
Observations	8629	7776	6291	5642	2413	2167
Clusters	112	112	112	112	108	108

Notes: This table shows the characteristics of students who switch schools within households. The outcome in columns (1) and (2) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In columns (3) and (4), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In columns (5) and (6), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. The sample is children aged 6 to 12 years old from the household dataset enrolled in grades 0 to 5 in odd columns and grades 1 to 5 in even columns. The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. All regressions include year and household fixed effects. Standard errors clustered at the village level. The bottom panel shows the *p*-values for the statistical difference on the age point estimates. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Appendix Table A3: Private School Exit and Students Switching Schools

	Switch School		**Out of Public**		**Into Public**	
	(1)	(2)	(3)	(4)	(5)	(6)
	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5
Exit × 6-7 years old	0.081**	0.100**	0.007	0.007	0.055	0.069
	(0.038)	(0.046)	(0.024)	(0.026)	(0.054)	(0.059)
Exit × 8-9 years old	0.040	0.031	0.026	0.016	0.073	0.075
	(0.033)	(0.034)	(0.018)	(0.018)	(0.057)	(0.057)
Exit × 10-11 years old	0.040	0.015	0.006	-0.011	0.094*	0.097*
	(0.031)	(0.031)	(0.018)	(0.020)	(0.055)	(0.056)
Exit × 12 years old	0.022	0.012	-0.006	-0.016	0.061	0.045
	(0.034)	(0.034)	(0.020)	(0.020)	(0.089)	(0.089)
Exit × Female	-0.056	-0.026	-0.025*	-0.018	-0.024	-0.023
	(0.034)	(0.036)	(0.014)	(0.014)	(0.055)	(0.059)
Exit × SES Index	0.006	0.005	-0.008	-0.005	-0.018	-0.020
	(0.017)	(0.017)	(0.008)	(0.008)	(0.022)	(0.022)
Mean Outcome	0.217	0.207	0.048	0.044	0.138	0.133
Year & Village Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.079	0.080	0.047	0.043	0.080	0.076
Observations	8755	7912	6454	5820	2576	2338
Clusters	112	112	112	112	110	110

Notes: This table shows how private school exit affects the likelihood of switching schools by students' characteristics. The outcome in columns (1) and (2) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In columns (3) and (4), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In columns (5) and (6), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. The sample is children aged 6 to 12 years old from the household dataset enrolled in grades 0 to 5 in odd columns and grades 1 to 5 in even columns. The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The variable *Exit* is a dummy variable that equals 1 after a new private school opens in the village. The point estimates on the main characteristics and their interactions with *Entry* are displayed in the Table 5. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. All regressions include year and village fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Appendix Table A4: Private School Entry and Students Switching Schools, Logistic Regression

	Switch School		Out of Public		In Public	
	(1)	(2)	(3)	(4)	(5)	(6)
	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5
6-7 years old	0.189	0.090	1.205***	1.155***	-0.214	-0.416
	(0.136)	(0.140)	(0.336)	(0.343)	(0.293)	(0.334)
8-9 years old	0.116	0.056	0.691**	0.618*	0.035	-0.126
	(0.116)	(0.120)	(0.317)	(0.321)	(0.226)	(0.220)
10-11 years old	-0.060	-0.068	0.619**	0.640**	-0.152	-0.215
	(0.110)	(0.111)	(0.313)	(0.314)	(0.223)	(0.224)
Female	-0.068	-0.059	-0.318*	-0.233	-0.115	-0.204
	(0.074)	(0.079)	(0.172)	(0.187)	(0.193)	(0.199)
SES Index	-0.005	0.023	0.383***	0.360***	-0.172*	-0.122
	(0.046)	(0.048)	(0.091)	(0.097)	(0.090)	(0.091)
Entry × 6-7 years old	0.255	0.261	0.923*	0.283	-0.131	0.103
	(0.234)	(0.261)	(0.478)	(0.619)	(0.440)	(0.492)
Entry × 8-9 years old	0.060	0.124	0.648*	0.659	-1.166**	-0.960*
	(0.218)	(0.242)	(0.381)	(0.479)	(0.570)	(0.570)
Entry × 10-11 years old	0.089	0.139	0.624	0.576	-0.448	-0.367
	(0.205)	(0.212)	(0.382)	(0.409)	(0.524)	(0.538)
Entry × 12 years old	0.173	0.206	1.215*	1.163*	-0.229	0.047
	(0.217)	(0.227)	(0.636)	(0.669)	(0.722)	(0.712)
Entry × Female	0.333	0.281	0.150	0.147	0.424	0.515
	(0.226)	(0.239)	(0.379)	(0.379)	(0.583)	(0.589)
Entry × SES Index	0.063	0.037	0.012	0.152	-0.046	-0.207
	(0.102)	(0.105)	(0.163)	(0.200)	(0.229)	(0.245)
Mean Outcome	0.217	0.207	0.057	0.054	0.145	0.142
Year & Village Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8755	7912	5437	4710	2439	2177
Clusters	112	112	95	92	100	97

Notes: This table shows how private school entry affects the likelihood of switching schools by students' characteristics using a logistic regression. The outcome in columns (1) and (2) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In columns (3) and (4), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In columns (5) and (6), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. The sample is children aged 6 to 12 years old from the household dataset enrolled in grades 0 to 5 in odd columns and grades 1 to 5 in even columns. The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. The variable *Entry* is a dummy variable that equals 1 after a new private school opens in the village. Interactions with private school exit are also included (see Appendix Table A3). All regressions include year and village fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Appendix Table A5: Private School Entry and Students Switching Schools, Probit Regression

	Switch School		Out of Public		In Public	
	(1) Gr. 0-5	(2) Gr. 1-5	(3) Gr. 0-5	(4) Gr. 1-5	(5) Gr. 0-5	(6) Gr. 1-5
6-7 years old	0.102	0.042	0.566***	0.553***	-0.137	-0.240
	(0.077)	(0.079)	(0.152)	(0.158)	(0.160)	(0.180)
8-9 years old	0.056	0.019	0.327**	0.283**	-0.002	-0.090
	(0.065)	(0.067)	(0.141)	(0.144)	(0.125)	(0.122)
10-11 years old	-0.042	-0.046	0.299**	0.307**	-0.100	-0.131
	(0.061)	(0.062)	(0.141)	(0.142)	(0.122)	(0.123)
Female	-0.045	-0.041	-0.158**	-0.130	-0.070	-0.119
	(0.042)	(0.044)	(0.078)	(0.084)	(0.103)	(0.106)
SES Index	-0.001	0.015	0.181***	0.170***	-0.097**	-0.072
	(0.026)	(0.026)	(0.042)	(0.046)	(0.049)	(0.050)
Entry × 6-7 years old	0.142	0.140	0.494**	0.119	-0.075	0.041
	(0.137)	(0.154)	(0.251)	(0.307)	(0.242)	(0.279)
Entry × 8-9 years old	0.028	0.062	0.330*	0.342	-0.640**	-0.517*
	(0.126)	(0.138)	(0.187)	(0.227)	(0.308)	(0.305)
Entry × 10-11 years old	0.028	0.055	0.281	0.260	-0.266	-0.226
	(0.118)	(0.123)	(0.191)	(0.200)	(0.289)	(0.299)
Entry × 12 years old	0.087	0.107	0.596*	0.567*	-0.172	-0.015
	(0.127)	(0.133)	(0.306)	(0.320)	(0.414)	(0.411)
Entry × Female	0.193	0.162	0.055	0.057	0.306	0.348
	(0.135)	(0.143)	(0.193)	(0.194)	(0.310)	(0.319)
Entry × SES Index	0.040	0.027	0.014	0.085	-0.026	-0.107
	(0.059)	(0.061)	(0.081)	(0.097)	(0.124)	(0.131)
Mean Outcome	0.217	0.207	0.057	0.054	0.145	0.142
Year & Village Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8755	7912	5437	4710	2439	2177
Clusters	112	112	95	92	100	97

Notes: This table shows how private school entry affects the likelihood of switching schools by students' characteristics using a probit regression. The outcome in columns (1) and (2) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In columns (3) and (4), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In columns (5) and (6), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. The sample is children aged 6 to 12 years old from the household dataset enrolled in grades 0 to 5 in odd columns and grades 1 to 5 in even columns. The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. The variable *Entry* is a dummy variable that equals 1 after a new private school opens in the village. Interactions with private school exit are also included (see Appendix Table A3). All regressions include year and village fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Appendix Table A6: Private School Entry and Students Switching Schools Within Households

	Switch School		**Out of Public**		**In Public**	
	(1)	(2)	(3)	(4)	(5)	(6)
	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5	Gr. 0-5	Gr. 1-5
6-7 years old	0.021	0.011	0.036***	0.032***	-0.060**	-0.076**
	(0.022)	(0.023)	(0.009)	(0.010)	(0.030)	(0.032)
8-9 years old	0.028	0.022	0.025***	0.022**	-0.018	-0.032
	(0.018)	(0.018)	(0.008)	(0.008)	(0.029)	(0.030)
10-11 years old	-0.004	-0.005	0.021***	0.019**	-0.030	-0.036
	(0.015)	(0.016)	(0.007)	(0.007)	(0.025)	(0.026)
Female	-0.020	-0.020	-0.030***	-0.025***	0.022	0.020
	(0.013)	(0.014)	(0.008)	(0.008)	(0.018)	(0.019)
SES Index	0.021	0.030	0.013	0.013	0.034	0.028
	(0.021)	(0.022)	(0.011)	(0.011)	(0.024)	(0.028)
Entry × 6-7 years old	0.061	0.061	0.055	0.032	-0.022	-0.060
	(0.051)	(0.047)	(0.040)	(0.040)	(0.041)	(0.045)
Entry × 8-9 years old	0.006	0.029	0.028	0.025	-0.064	-0.053
	(0.038)	(0.042)	(0.028)	(0.030)	(0.043)	(0.043)
Entry × 10-11 years old	0.015	0.031	0.035	0.034	-0.030	-0.024
	(0.033)	(0.035)	(0.023)	(0.024)	(0.051)	(0.051)
Entry × 12 years old	0.019	0.029	0.036	0.038	-0.071	-0.077
	(0.039)	(0.042)	(0.026)	(0.026)	(0.065)	(0.067)
Female × Entry	0.065	0.058	-0.014	-0.005	0.049	0.039
	(0.048)	(0.052)	(0.030)	(0.029)	(0.047)	(0.051)
SES Index × Entry	0.012	0.003	0.007	0.009	-0.032	-0.027
	(0.018)	(0.018)	(0.010)	(0.010)	(0.030)	(0.031)
Mean Outcome	0.217	0.207	0.043	0.038	0.119	0.112
Year & Village FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.240	0.244	0.297	0.266	0.309	0.265
Observations	8629	7776	6291	5642	2413	2167
Clusters	112	112	112	112	108	108

Notes: This table shows how private school entry affects the likelihood of switching schools by students' characteristics within households. The outcome in columns (1) and (2) is a dummy variable that equals 1 if a student is enrolled in a different school than the previous academic year. In columns (3) and (4), the sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. In columns (5) and (6), the sample is restricted to children enrolled in private schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a public school. The sample is children aged 6 to 12 years old from the household dataset enrolled in grades 0 to 5 in odd columns and grades 1 to 5 in even columns. The omitted category for age is children who are 12 years old. A child must be enrolled in two consecutive periods to be in the sample. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education, caste of the male household head, and household assets. The variable *Entry* is a dummy variable that equals 1 after a new private school opens in the village. Interactions with private school exit are also included but not displayed. All regressions include year and household fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Appendix Table A7: Private School Entry and Tested Students Switching Schools by School Subject

	Outcome: Switch Out of Public Schools			
	Avg. Test Scores	**English**	**Math**	**Urdu**
	(1)	(2)	(3)	(4)
Test Scores	0.004***	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Entry × Test Scores	0.005*	0.008**	0.002	0.002
	(0.002)	(0.003)	(0.002)	(0.002)
Exit × Test Scores	-0.002	-0.002	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Mean Outcome	0.010	0.010	0.010	0.010
Year & Village Fixed Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.015	0.017	0.014	0.014
Observations	22007	22007	22007	22007
Clusters	112	112	112	112

Notes: This table shows how private school entry and private school exit affect the likelihood of switching out of public schools by school subject. The sample is tested students enrolled in grades 3 to 5. The sample is restricted to children enrolled in public schools in the previous academic year and the outcome is a dummy variable that equals 1 if the child switched to a private school. A child must be enrolled in two consecutive periods to be in the sample. The variable *Entry* is a dummy variable that equals 1 after a new private school opens in the village. The variable *Exit* is a dummy variable that equals 1 after a private school closes in the village. The explanatory variable *SES index* is constructed using the first principal component analysis on parental education and assets. Controls for socioeconomic status, grades, and gender, and their interactions with private school entry and exit are included but not displayed. All regressions include year and village fixed effects. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.

Appendix Table A8: Private School Entry and Students' Composition in Public Schools by Cohort

	SES Index		Test Scores	
	(1) No Exit	(2) With Exit	(3) No Exit	(4) With Exit
Entry=1	-0.071	-0.101	-0.008	-0.037
	(0.185)	(0.181)	(0.179)	(0.179)
Grade=4	0.003	0.001	0.337***	0.342***
	(0.032)	(0.034)	(0.049)	(0.054)
Grade=5	-0.093***	-0.100***	0.563***	0.561***
	(0.030)	(0.034)	(0.058)	(0.062)
Entry=1 × Grade=4	0.023	0.058	-0.102	-0.074
	(0.189)	(0.186)	(0.172)	(0.168)
Entry=1 × Grade=5	0.092	0.114	-0.038	-0.025
	(0.191)	(0.191)	(0.166)	(0.173)
Younger at Entry	0.015	0.046	-0.024	0.005
	(0.168)	(0.163)	(0.119)	(0.117)
Younger at Entry × Grade=4	-0.062	-0.114	0.167	0.143
	(0.169)	(0.162)	(0.116)	(0.111)
Young at Entry, Gr. 4	-0.092	-0.110	0.371	0.380
	(.072)	(.071)	(.108)	(.111)
Old at Entry, Gr. 4	-0.045	-0.042	0.227	0.232
	(.043)	(.045)	(.091)	(.095)
No Entry, Gr. 4	0.003	0.001	0.337	0.342
	(.032)	(.034)	(.049)	(.054)
***p*-value Young-Old**	0.425	0.230	0.074	0.100
***p*-value Young-No Entry**	0.131	0.067	0.724	0.706
Mean Outcome	-0.239	-0.239	-0.126	-0.126
Year & Village Fixed Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.068	0.068	0.572	0.572
Observations	31165	31165	22250	22250
Clusters	112	112	112	112

Notes: Sample of tested students enrolled in grades 3 to 5 in public schools. The outcome in Columns (1) and (2) is an index for socioeconomic status using the first principal component analysis on parental education and assets. The outcome in Columns (3) and (4) is average test scores. Even columns controls for private school exit. *Younger at Entry* is a dummy variable that equals 1 if the student was enrolled in grades 2 or 3 when the private school entered the schooling market. The omitted category is students who were in grades 4 or 5 when the private school opened. All regressions include year and village fixed effects. Regressions in Columns (3) and (4) include a control for lagged test scores. At the bottom of the table, *Younger at Entry, Gr. 4*, *Older at Entry, Gr. 4* and *No Entry, Gr. 4* are the point estimates for students in grade 4 who were younger or older when the private school entered, or did not have a private school entry. The *p*-values show significance of the difference of younger and older at entry, and younger and students with no entry. Standard errors clustered at the village level. * denotes $p < 0.1$, ** denotes $p < 0.05$, and *** denotes $p < 0.01$.